WHY MIND AND MEMORY CANNOT BE BRAIN EFFECTS

by Mark Mahin

New York City, 2020

This book consists of posts from my "Head Truth" blog at www.headtruth.blogspot.com. The common theme of all these posts I wrote is that the human mind and human memory cannot be explained as effects of the human brain. Using a huge number of references to neuroscience papers, this book will debunk the common claims that the brain produces the human mind and that the brain stores memories. Such claims are not things taught us by nature, but are merely speech customs of an academia belief community, a community that has discovered many facts contradicting such claims. A fuller introductory discussion of the theme of this book can be found in the second post in this book, entitled "Introduction to This Site." This book will be of interest to anyone curious about reasons for believing in a human soul, or anyone interested in the philosophy of mind. Nothing in this book should be interpreted as any type of medical advice.

Please excuse the repetitive links at the right margin of this book. By using the + control at the bottom of a page, you can "zoom in" to read the text easier, and exclude such unneeded links.

Mark Mahin, September, 2020
www.markmahin.com
www.orbpro.blogspot.com
www.futureandcosmos.blogspot.com

Head Truth

The huge case for thinking minds do not come from brains

Monday, April 2, 2018

Cases of High Mental Function Despite Large Brain Damage

It has been known for decades that mental function can operate at a high level even though large portions of a brain are destroyed. This was proven by the memory experiments of Karl Lashley. Over many years, Lashley did extensive research in which he tested how memory and learning is affected when you take out various parts of an animal's brain. Lashley tested using three types of mazes of varying difficulty. Astonishingly, Lashley found that you could remove half of a rat's brain, and it had very little effect on the rats ability to remember either of the two simpler types of mazes.

Here are some startling results listed by Lashley:

1. Rats, trained to have a differential reaction to light, showed no reduction in accuracy of performance when the entire motor cortex of the brain, along with the frontal poles of the brain, was removed.
2. Monkeys were trained to open various latch boxes. The entire motor areas of the monkeys' brains were removed. After 8 to 12 weeks of paralysis, during which they had no access to the latch boxes, the monkeys were then able to open the boxes "promptly" and "without random exploratory movements."
3. Rats were trained to solve mazes, and the rats then had incisions made separating different parts of their brains. This produced no effect in memory retention.
4. Monkeys were trained to unlatch latch boxes. After having their prefrontal cortex removed, there was "perfect retention of the manipulative habits."
5. Lashley said, "A number of experiments with rats have shown that habits of visual discrimination survive the destruction of any part of the cerebral cortex except the primary visual projection area."

Details on these experiments can be found online in Karl Lashley's paper, "In Search of the Engram." In this paper, Lashley noted on page 276 that animals can remember simple mazes just as well even though half of their cerebral cortex has been removed:

The habit of threading a complex maze is seriously disturbed by destruction of any part of the cortex, provided the lesion involves more than 15 per cent. The habit of a simpler maze is unaffected by lesions involving as much as 50 per cent of the cortex.

Recently there was published a superb scientific paper describing cases of very high mental activity despite very great brain damage.

Entitled "Discrepancy Between Cerebral Structure and Cognitive Functioning," the paper (authored by Nahm, Rousseau and Greyson, two

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PhD's and an MD) will be read by some who are merely interested in reading about weird curiosities. But a better way to read the paper is to examine its examples and ask: is the standard "mind from brain" dogma taught by neuroscientists (the dogma that minds are generated by brains) consistent with these examples? Together the examples seem to provide a very strong challenge to such a dogma.

On page 1 we learn of a case reported by Martel in 1823 of a boy who after age five lost all of his senses except hearing, and became bed-confined. Until death he "seemed mentally unimpaired." But after he died, an autopsy was done which found that apart from "residues of meninges" there was "no trace of a brain" found inside the skull. How could the boy have seemed "mentally unimpaired" with almost no brain?

The paper then discusses a case examined by physician John Lorber, who studied many patients with hydrocephalus, in which healthy brain tissue is gradually replaced by a watery fluid. A mathematics student with an IQ of 130 and a verbal IQ of 140 was found to have "virtually no brain." His vision was apparently perfect except for a refraction error, even though he had no visual cortex (the part of the brain involved in sight perception).

We are told that of about 16 patients Lorber classified as having extreme hydrocephalus (with 90% of the area inside the cranium replaced with spinal fluid), half of them had an IQ of 100 or more. The article mentions 16 patients, but the number with extreme hydrocephalus was actually 60, as this article states, using information from this original source that mentions about 10 percent of a group of 600. So the actual number of these people with tiny brains and above-average intelligence was about 30. The article states:

[Lorber] described a woman with an extreme degree of hydrocephalus showing "virtually no cerebral mantle" who had an IQ of 118, a girl aged 5 who had an IQ of 123 despite extreme hydrocephalus, a 7-year-old boy with gross hydrocephalus and an IQ of 128, another young adult with gross hydrocephalus and a verbal IQ of 144, and a nurse and an English teacher who both led normal lives despite gross hydrocephalus.

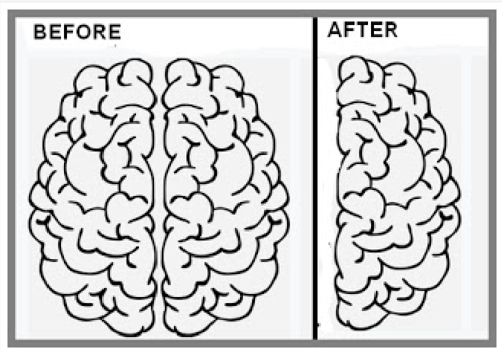
Lorber's cases date from several decades ago, but more recent cases have been reported of people with good mental functioning despite having almost all of their brains replaced by a watery fluid due to hydrocephalus. The scientific paper cites the cases below:

Another interesting case is that of a 44-year-old woman with very gross hydrocephalus described by Masdeu (2008) and Masdeu et al.(2009). She had a global IQ of 98, worked as an administrator for a government agency, and spoke seven languages. In Leipzig, Germany, staff members of the Max Planck Institute for Human Cognitive and Brain Sciences recorded a similar case. A man was examined because of his headache, and to his physicians' surprise, he had an "incredibly large hydrocephalus." Villinger, the director of the Cognitive Neurology Department, stated that this man had "almost no brain," only "a very thin layer of cortical tissue." This man led an unremarkable life, and his hydrocephalus was only discovered by chance (Hasler, 2016, p. 18)

The paper informs us of cases of people who functioned well despite losing half of their brains. We are told of a 36-year-old man whose "intellect and language abilities were unimpaired" despite the fact that the left hemisphere of his brain was "almost completely lacking." We are told of a boy who was an average student at a regular school, even though he had a "nearly complete absence" of the right hemisphere of his brain. The paper also cites cases of people who had large portions of their brain missing, but who did not notice any problem until they had seizures or headaches. The paper states this:

For example, Baudoin (1996) described the case of a 30-year-old woman who had a large lesion on her right cerebral hemisphere. The right occipital and parietal lobes were entirely missing, as well as the inferior part of the right temporal lobe. The brain lesion was discovered only because of the patient's first seizures at the age of 30. Similarly, Duyff et al. (1996) presented the case of a 32-year-old lawyer whose brain showed a large arachnoid cyst in the right frontotemporal region that had displaced (or replaced) the temporal lobe and parts of the frontal and parietal lobes. His development had been completely normal, and no abnormalities were discovered upon neurological examination. His condition was discovered only because he had a persistent headache after a skiing accident in which he had fallen on his head.

Hemispherectomy is a surgical procedure in which half of the brain is removed. I knew that the procedure can be performed on young children suffering from seizures, with surprisingly little negative impact. But the paper also tells us on page 3 that "Although most hemispherectomies are performed on young children, adults are also operated on with remarkable success."



Schematic diagram of a hemispherectomy

Very interestingly, we are told that when half of their brains are removed in these operations, "most patients, even adults, do not seem to lose their long-term memory such as episodic (autobiographic) memories." The paper tells us that Dandy, Bell and Karnosh "stated that their patient's memory seemed unimpaired after hemispherectomy," the removal of half of their brains. We are also told that Vining and others "were surprised by the apparent retention of memory after the removal of the left or the right hemisphere of their patients."

The paper then tells the case of Kim Peek, an autistic savant who had no corpus callosum (the "bridge" connecting the two brain hemispheres). Much of Peek's brain consisted of empty areas filled with cerebrospinal fluid. But still "he memorized more than 12,000 books, apparently verbatim."

On page 59 of the book *The Biological Mind*, the author states the following:

A group of surgeons at Johns Hopkins Medical School performed fifty-eight hemispherectomy operations on children over a thirty-year period. "We were awed," they wrote later of their experiences, "by the apparent retention of memory after removal of half of the brain, either half, and by the retention of the child's personality and sense of humor."

In the paper "Neurocognitive outcome after pediatric epilepsy surgery" by Elisabeth M. S. Sherman, we have some discussion of the effects on children of temporal lobectomy (removal of the temporal lobe of the brain) and hemispherectomy, surgically removing half of their brains to stop seizures. We are told this:

After temporal lobectomy, children show few changes in verbal or nonverbal intelligence....Cognitive levels in many children do not appear to be altered significantly by hemispherectomy. Several researchers have also noted

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increases in the intellectual functioning of some children following this procedure....Explanations for the lack of decline in intellectual function following hemispherectomy have not been well elucidated.

Referring to a study by Gilliam, the paper states that of 21 children who had parts of their brains removed to treat epilepsy, including 10 who had surgery to remove part of the frontal lobe, "none of the patients with extra-temporal resections had reductions in IQ post-operatively," and that two of the children with frontal lobe resections had "an increase in IQ greater than 10 points following surgery."

The paper here gives precise before and after IQ scores for more than 50 children who had half of their brains removed in a hemispherectomy operation in the United States. For one set of 31 patients, the IQ went down by an average of only 5 points. For another set of 15 patients, the IQ went down less than 1 point. For another set of 7 patients the IQ went up by 6 points.

The paper here (in Figure 4) describes IQ outcomes for 41 children who had half of their brains removed in hemispherectomy operations in Freiburg, Germany. For the vast majority of children, the IQ was about the same after the operation. The number of children who had increased IQs after the operation was greater than the number who had decreased IQs.

It also should be remembered that brain-damaged patients taking standard IQ tests may have higher intelligence than the test score suggests. A standard IQ test requires visual perception skill (to read the test book) and finger coordination (to fill in the right answers using a pencil). Brain damage might cause reduced finger coordination and reduced visual perception unrelated to intelligence; and such things might cause a subject to do below-average on a standard IQ test even if his intelligence is normal.

At this URL there was recently published a case of a man with a 9-centimeter (3 inch) wide "air-filled cavity" in the right frontal lobe of his brain.

Although the paper is entitled "The man that lost (part of) his mind," the paper indicates no sign of mental damage:

An 84-year-old man was referred to the emergency department by his general practitioner having been complaining of recurrent falls and feeling unsteady over several months. He then developed a 3-day history of left-sided arm and leg weakness. There was no confusion, facial weakness, visual or speech disturbance, and he was feeling otherwise well.

The man showed good judgment in declining a risky operation that wasn't vitally necessary. But how could someone have so little damage from a giant hole in a part of the brain that supposedly is involved in language, memory, and judgment? Cases like these are inconsistent with dogmas about minds being generated by brains.

Now for another similar anomaly that is even more amazing. This is a case in which a human managed to function well in society as a French civil servant, even though *he had almost no functional brain.* The case is discussed here in a story entitled “Man lives normal life with abnormal brain”:

Inside a normal brain are tiny structures called lateral ventricles that hold brain fluid. In this man's case, the ventricles had swollen up like balloons, until they filled almost all of the man's brain. When the 44-year-old man was a child, doctor's had noticed the swelling, and had tried to treat it. Apparently the swelling had progressed since childhood. The man was left with what the Reuters story calls “little more than a sheet of actual brain tissue.”

But this same man, with almost no functioning brain, had been working as a French civil servant, and had his IQ tested to be 75, higher than that of a mentally retarded person. The Reuters story says: “A man with an unusually tiny brain managed to live an entirely normal life despite his condition, caused by a fluid buildup in his skull.” The case was written up in the British medical journal *The Lancet* in a paper entitled “Brain of a white-collar worker.”

In a later "ScienceAlert" story on this case, a cognitive psychologist states, "Any theory of consciousness has to be able to explain why a person like that, who's missing 90 percent of his neurons, still exhibits normal behavior."

90 percent of his neurons lost, and normal behavior -- that's radically inconsistent with the "brains make minds" dogma.

In the medical paper “Revisiting Hydrocephalus as a Model to Study Brain Resilience” by de Oliviera and Pinto, we are shown a photo of a patient with almost no brain, because he had hydrocephalus that has replaced almost all of his brain tissue with a watery fluid. But the patient is described in the paper as “normal,” and is contrasted with another patient with a similar condition who had cognitive problems. Apparently this “normal” patient suffered few cognitive effects from having lost almost all of his brain. The paper is at the URL here.

At the URL here you can find a book chapter entitled, “Memory consolidation, retrograde amnesia, and the temporal lobe.” Tables 4 and 5 of this paper give us detailed information on 16 cases of severe brain damage documented in the medical literature. The patients had damage in between three and ten different parts of their brain, with an average of about four or five different brain areas being damaged. The tables give IQ scores for these 16 patients, and the average score was 99 – just one point less than 100, the average IQ. But how could their average intelligence be so normal, if they had such heavy brain damage?

As discussed here, years ago a man named Pat Martino had an operation in which 70 percent of his left temporal lobe was removed. But today he plays virtuoso jazz guitar flawlessly, and you can see his impressive performances and instructional guitar videos on youtube.com, made after his operation. You would never guess there was any problem in his brain.

In his essay “A Map of the Soul,” neuroscientist Michael Egnor states the following:

I have scores of patients who are missing large areas of their brains, yet who have quite good minds. I have a patient born with two-thirds of her brain absent. She’s a normal junior high kid who loves to play soccer. Another patient, missing a similar amount of brain tissue, is an accomplished musician with a master’s degree in English.

The same author tells us here that the patient with two-thirds of her brain absent made the honor roll at school.

It is often claimed that certain mental capabilities such as intelligence come from a part of the brain called the prefrontal cortex. But the authors of a scientific paper say “we have studied numerous patients with bilateral lesions of the ventromedial prefrontal (VM) cortex” and that “most of these patients retain normal intellect, memory and problem-solving ability in laboratory settings.” On page 342 of the book *Developmental Neuropsychology* we read the following about brain surgery on children: "Removal of benign astrocytic and oligodendrocytic tumors in one of the cortical hemispheres had little effect on personality and intelligence; 72 percent of 42 consecutive cases had no problems in school on follow-up (Hirsch et al. 1989)."

Such cases are powerful evidence against the dogma that our minds are merely a product of our brains. Repeated countless times in mainstream literature, but never proven, such a dogma is also discredited by both the inability of neuroscience to plausibly account for consciousness and very-long-term human memory, and the inability of a "mind from brain" dogma to account for psychic phenomena such as ESP, remote viewing, and near-death experiences. Nature never told us that minds come from brains. It was merely neuroscientists who told us that, without having sufficient evidence to support such a claim. Don't confuse such ideologically-motivated scientist speech customs with facts.

Alternatives to the "mind from brain" dogma include the idea of a human soul and the idea that human consciousness may have some mysterious consciousness infrastructure as its source, possibly something cosmic in scope. When asked "Where do your smartphone games come from," a child may answer with great certainty, "From the smartphone, of course." But such games may actually come from some mysterious information infrastructure involving the Internet and remote servers, something the child knows nothing about. Similarly, our minds may have as their main source some mysterious non-biological consciousness infrastructure we know nothing about.

In this post I have merely listed some of the very many cases showing high mental function despite large brain damage. See this post for many more such cases.

at April 02, 2018 No comments:

Labels: hemispherectomy, high mental function despite large brain damage

Introduction to This Site

We have all been brain-brainwashed.

We have been brainwashed into believing unproven dogmas about the brain: the dogma that the human mind is produced entirely by the brain, and that all our memories are stored in our brains. Scientists have not proven such dogmas. But they constantly assert or assume such dogmas, so often that the average person is as unlikely to question them as the average person in a dictatorship is unlikely to question an assertion he constantly hears, that his dictator is a brilliant genius.

On this web site I will present a large number of powerful reasons for rejecting the claim that the brain is the source of the human mind. The case I will present is a massive one, consisting of a huge amount of evidence, and many compelling arguments.

There are actually many severe problems involved in explaining the most basic intellectual capabilities of humans through the theory that brains generate such capabilities. Scientists have not made any progress in giving a credible explanation as to how a brain could generate any such thing as an abstract idea. An idea is a mental thing. We have some idea of how mental things can produce other mental things (such as how one idea can lead to another idea). We also understand how physical things can produce other physical things. But no one really has any idea at all how a physical thing could possibly produce a mental thing. Intuitively the idea that a neuron or a set of neurons can generate a thought seems no more likely than the idea that blood might drip from a stone.

Romain Brette is a neuroscientist actively engaged in neuroscience research. He states in a post on his blog, "I have no idea why neural activity should produce any conscious experience at all." Neither does any other neuroscientist.

Were it true that the human mind is merely the product of the brain, we would expect there to be a very high correlation between brain health and mind function. Consider a computer. If you open up the back and yank one little chip, you will probably disable it. If our thoughts are a kind of computation produced by a brain that acts like a computer, and our memories are stored physically like our computers store things physically, we would expect that any major damage to the brain would have catastrophic effects on the mind.

But there is no such high correlation between brain health and mental function. Astonishingly, there are many cases of people who had normal or almost-normal mental function even though very much or most of the brain was destroyed by disease. One of many cases this site will review is the case of a Frenchman who was employed as a civil servant even though 90% of his brain was destroyed by disease. There are numerous similar cases, such as cases of people who suffered little loss in memory even after half of their brains were removed. Such cases are incompatible with the dogma that the human mind is produced by the brain, and that our memories are stored in our brains.

Consider the dogma that all our memories are stored in our brains. When you recall something, your body does nothing to suggest that you are using your brain to retrieve the memory. If I retrieve an apple on my table, my body gives me two different signals that my hand is being used to retrieve the apple. The first is the sight of my hand grasping the apple, and the second is the feeling of the apple in my hand. But if I retrieve a memory of my childhood, my body does absolutely nothing to hint to me that my brain is being used to perform this retrieval. The memory could be stored locally in my soul, or non-locally in some mysterious external consciousness infrastructure unknown to us.

Even when we scan brains with medical devices such as MRI machines, when a person recalls something there is no convincing evidence that information is being loaded from a brain location. A typical MRI scan of someone retrieving a memory will show something like a 1% variation from region to region in the brain, something that tells us basically nothing.

We can imagine an experiment that might prove that memories are stored in brains. Some animal might be trained to learn some information. The animal's brain might then be dissected, and scientists might somehow attempt to retrieve information supposedly stored in the brain. If the scientists could retrieve very specific information that was unknown to them – such as an image that the animal had been fear-conditioned with – that might be proof that a memory was stored in a brain. No such experiment has ever been done.

Do scientists have at least a plausible theory to explain how a brain could store memories? No, they do not. Their shortfall in this regard is extremely great, but little known. The most popular theory of how the brain stores memories is that memories are stored in synapses. But this theory has a gigantic defect that makes it untenable. Synapses are made of proteins, and we know that the proteins that make up synapses have very short lifetimes, with an average lifetime of only a few weeks. But humans can reliably remember memories for more than 50 years. There is a huge discrepancy here. The medium which our scientists have speculated is a storage place for memories does not have even *one per cent* of the stability that would be required to store memories for 50 years.

This is one of only several major reasons why all attempts to explain the brain as a long-term memory storage place are doomed to failure. An equally powerful reason is that there is no plausible way to account for how a brain might allow a human to instantly recall memories learned long ago. Consider the case of someone who hears the name “John F. Kennedy” and who instantly recalls several relevant facts and images, such as the exact date of his death and how his face looked. How is someone able to recall such things instantly, if such information is stored on some tiny portion of the brain? The brain has no coordinate system and no indexing system by which the physical location of some tiny part of the part might be identified. So we can't imagine that the brain somehow knows how to look in some exact brain storage site such as neuron location #235,632,226. Nor can we imagine that the brain scans through all of millions of tiny sites it is storing information, to recall some particular data item. We remember things too quickly for such a thing to be going on.

Astonishingly, the near instantaneous recall of obscure data items learned long ago is a wonder we simply cannot plausibly explain through any theory of the storage of memory in brains. Scientists just kind of shrug their shoulders when faced with this difficulty, and kind of suggest, “We'll learn how that works one day.” But given the architecture of brains, completely lacking in indexing and a coordinate system, there is every reason to think scientists will never be able to explain instantaneous recall of obscure data items through any theory based on a brain storage of memories.

Explaining a brain storage of memories has still another difficulty as grave as the two just mentioned. This is the encoding problem. A memory (a mental thing) could not simply be kind of poured into some storage spot, as one might pour water into ice-cube trays. For the information in our minds to be physically stored in a brain, miracles of encoding would have to be constantly going on, with all kinds of intricate translation occurring. It would have to be something vastly more complicated and sophisticated than the multiple layers of encoding that occur when language is translated into binary bits stored on a computer. There would have to be a brilliant encoding scheme for storing language, another for storing images, another for storing feelings, another for storing smells, and so forth. The problem is that no one has any idea how encoding so sophisticated could occur, or how encoding schemes so complicated could possibly have arisen. Explaining how such encoding schemes came about would be a nightmare much worse than explaining how the genetic code appeared, a problem scientists still haven't solved.

So why does the typical person firmly believe that the brain is the source of his mind? Because he has been told this again and again by people who never proved or well-established the claim they were making. If we had been told again and again throughout our lives by authorities that the liver was the source of the human mind, we would believe that without doubting.

What other type of things might argue powerfully against the claim that the human mind is merely the product of the brain? One such thing would be if human minds had a capability that we could never explain as a result of brain activity. There is very strong evidence for such capabilities. One such type of evidence is the massive and extremely convincing evidence that has been gathered for extrasensory perception. Besides massive anecdotal evidence, we have many decades of very convincing laboratory evidence gathered by scientists such as Joseph Rhine working at Duke University. We also have extensive gathered by the US government for a psychic ability known as remote viewing.

Recognizing that such observations are fatal to claims that the human mind is purely the product of the brain, many scientists have simply declared all such evidence for human psychic abilities to be void and taboo. In this regard they are like people who want to believe Earth is the biggest planet, and who regard all photos of Saturn and Jupiter as frauds. You do not make a large body of convincing observations go away by just declaring it fake.

Besides evidence for human psychic abilities, there is another line of evidence that refutes claims that the human mind is merely the product of the brain. This line of evidence is near-death experiences. The dogma that the mind is just a product of the brain predicts that mental activity should cease whenever brain activity stops, as it does when a person's heart stops. But to the contrary, in near-death experiences we very frequently see people having vivid mental experiences after their hearts have stopped and their brain activity has stopped. Skeptics claim that such stories are fake or hallucinations. But the reality of near-death experiences is proven by many cases in which people were able to successfully describe the details of medical procedures occurring while their hearts were stopped. This site will review such cases.

All of the claims made here will be thoroughly explained, substantiated and documented on this site. By the time the reader is finished reading this site, he or she may realize that the claim that the human mind is a product of the brain is simply a speech custom of professors, neither something that is well-established, nor something that is consistent with observations.

If minds do not come from brains, where do minds come from? At this stage in human ignorance, this question must remain unanswered. But here and there on this site I will speculate about possibilities, while acknowledging that we don't know the answer. One possibility many believe in is that each human has an individual soul locally associated with his body. Another possibility is that humans derive their minds in a top-down way from some type of cosmic mind source or cosmic consciousness infrastructure. Nowadays scientists advance the subtle doctrine that all material particles derive their mass from some cosmic reality called the Higgs Field. It may be that all conscious minds derive their consciousness from some cosmic consciousness field that can be roughly compared to the Higgs Field. In one post on this site I will speculate how such a possibility can be visualized.

We may use the term *neuralism* for the doctrine that minds come from brains. Although sometimes sold as science, neuralism is a philosophical position, not science. This site will be arguing for the opposite position, the simple position that minds do not come from brains. We may use the term *nonneuralism* for this position. Nonneuralism is a non-sectarian position in the philosophy of mind that may be held without contradiction by Christians, Muslims, Buddhists, philosophical theists, agnostics or atheists, regardless of whether they do or not believe in Darwinism. Not wishing to assume that the user has learned these terms "neuralism" and "nonneuralism," I will make very little use of them on this site, and will instead simply use clearer phrases such as "the idea that brains make minds" and "the idea that minds do not come from brains."

I may note this is a "philosophy of mind" site, not a medical site. Nothing stated at this site should be construed as any type of medical advice. Regardless of whether it generates our minds, the brain is an important part of the body you should be careful to preserve from injury, by doing things such as wearing your seat belt and wearing a helmet while biking. If you have any medical issue, consult a board-certified physician for advice.

Click *here* to go to the home page of this site.

at April 02, 2018 2 comments:

Labels: nonneuralism

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Head Truth

The huge case for thinking minds do not come from brains

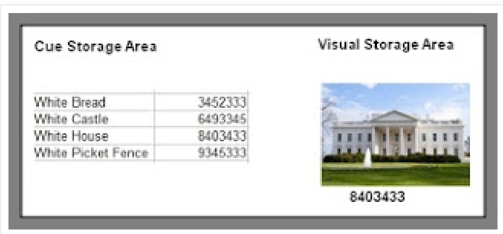
Monday, April 2, 2018

Why the Instantaneous Recall of Old Memories Should Be Impossible for a Brain

One of the most powerful arguments against the claim that minds are made by brains is what I may call the navigation argument. This argument can be simply stated like this: a long-term memory cannot be stored in some particular part of the brain, because there could be no way in which your brain could ever instantly find the exact location where such a memory was stored.

Let's consider a simple case. You hear the name of a movie star. You then instantly recall what that person looks like, and see a faint image of that person in your “mind's eye.” But how could this ever happen, if the memory of that person is stored in some particular part of your brain? In such a case, you would need to know or find the exact place in the brain where that memory was stored. But there would be no way for your brain to do such a thing. It would be like trying to find one particular needle in a skyscraper-sized stack of needles.

Let's try to imagine some ways of getting around this difficulty, and consider whether they are viable. One possibility is that a memory hypothetically created in the brain might have some type of unique positional identifier, something rather than a GPS coordinate or a longitude/latitude coordinate (although it might be something like a 3D coordinate). When a visual memory was created, the brain might associate this coordinate with some memory cue (such as the person's name). So, for example, when you hear the phrase “White House” maybe your brain subconsciously retrieves some 3D coordinate allowing you to find where you have stored in your memory an image of the White House in Washington, D.C. The visual below illustrates the idea.



But there are three reasons why this doesn't work as an explanation. The first is that there is no way that the brain could ever know what the 3D coordinate was for some particular spot where a new memory was created. For example, if a brain is creating a new memory at a location with an X coordinate of 23.23342, a Y coordinate of 45.34245, and a Z coordinate of 33.3293, the brain would have no way of knowing that the memory was being created at that exact location. A second reason is that even if there was some brain storage area storing the location coordinates for particular memories, there would still be the question of: how could the brain instantly find the correct spot in such a cue storage area to find where these coordinates were? Since your brain can store millions of different memories, we must imagine that this cue storage area would also have millions of items. There is no reason we can

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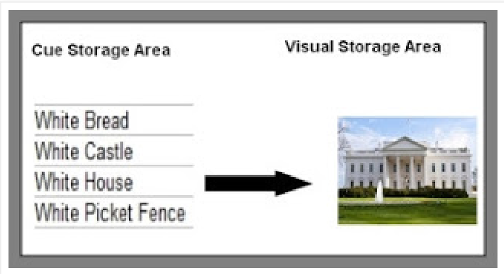
think of why you would be instantly be able to find the exact part of this cue storage area that would have the coordinate needed to locate the appropriate memory. Third, there is the difficulty that even if the brain had the physical coordinates at which the memory stored, it would have no way of navigating to such a coordinate.

To try to make things a little better, let's get rid of this idea of a coordinate system. Let's imagine that there is some kind of cue memory area with direct neural connections leading to the spots where memories are formed. So then if you hear a particular name, your brain merely finds that name in the cue storage area, and then follows this little neural connection (rather like a wire or telephone line) to where the memory is stored. The visual below illustrates the idea.



But this still does not give us a plausible answer as to how you could recall a memory stored in a particular spot in your brain. For one thing, there would be the difficulty of explaining how this wiring-up was occurring. It doesn't seem plausible to maintain that each time you memorize something, you are adding an entry in two different storage areas of your brain, and also instantly creating a neural wire or line connecting only these two. That seems like too much work and coordination to be occurring so quickly. We have no evidence that coordinated changes occur in two different areas of the brain when a memory is stored. While we know that connections can gradually form between neurons, this isn't something that can instantaneously occur to link separate areas of the brain when a memory is created.

You would also still have the previously mentioned problem of how your brain could instantly find the correct spot in this cue storage area where these cues are located. Since your brain can store millions of different memories, we must imagine that this cue storage area would also have millions of items. There is no reason we can think of why you would be instantly able to find the exact part of this cue storage area that would have the direct wire or neural connection needed to locate the appropriate memory in the visual storage area.

So we seem to be getting nowhere trying to imagine how the brain could allow you to instantly recall memories. Let's try looking at how computers are able to quickly retrieve data. Perhaps that might offer some clue.

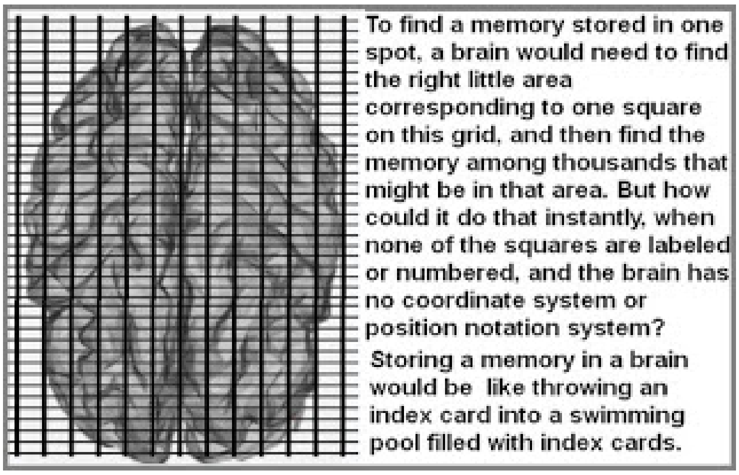
One basic technique computers use to speed retrieval access is physical sorting. The same technique is used by a simple file cabinet in which the files are alphabetically sorted. But we cannot believe that the brain uses physical sorting. A mass of microscopic neurons (rather like a city-sized blob of tangled spaghetti that has been shrunk) is not something in which physical sorting is possible. All the different brain connections make physical sorting impossible, just like you can't sort a giant ball of tangled string into different parts (unless you disassemble and reassemble). A brain structured totally different from the human brain might be able to use physical sorting, but not the human brain. We have zero evidence that neurons are physically sorted.

Another basic technique computers use to speed retrieval access is physical grouping, such as when different types of information are placed in different computer files. The same technique is used by a simple file cabinet in which

- Vacillating Disarray of the Memory Trace Theorists
- Study Finds "Poor Overall Reliability" of Brain Scanning Studies
- "Brains Store Memories" Dogma Versus the Reality of Noisy Brains
- The Brain Has Nothing Like 7 Things a Computer Uses to Store and Retrieve Information
- Exhibit A Suggesting Scientists Don't Understand How a Brain Could Store a Memory
- The Dubious Dogma That Brains Make Decisions
- Long Article Tries to Show Neural Memory Storage, but Gives No Real Evidence for It
- How Evidence for ESP Undermines the “Minds Come From Brains” Dogma
- Gender Differences in Brains Help Discredit Prevailing Dogmas About Brains
- Study Finds Equal Brain Connectivity in All Mammals
- Some Reasons the Main Theory of Neural Memory Storage Is Unbelievable
- Scientists Can't Persuasively Explain How a Brain Could Instantly Retrieve a Memory
- The Lack of Evidence for Memory-Storage Engram Cells
- Candid Confessions of the Cognitive Experts
- Global Workspace Theory Sure Isn't an Explanation for Consciousness
- When Animals Cast Doubt on Dogmas About Brains
- Memories Can Form Many Times Faster Than the Speed of Synapse Strengthening
- The Guy with the Smallest Brain Had the Highest IQ
- He Had Half a Brain and Above Normal Intelligence
- The Truth About Neurons and Synapses
- A Diagram of Explanatory Dysfunction in Academia
- The Brain Shows No Sign of Working Harder During Thinking or Recall
- More Evidence of High Mental Function Despite Large Brain Damage
- The Lack of a Viable Theory of Neural Memory Encoding
- More Evidence That Neuron Loss Has Little Effect on Cognition
- Fraud and Misconduct Are Not Very Rare in Biology
- Reasons for Doubting Thought Comes from the Frontal Lobes or

different types of information are put into different manila files. But we cannot believe that the brain uses physical grouping. A mass of neurons filled with connections between neurons is not something in which physical grouping is possible. A brain structured totally different from the human brain might be able to use physical grouping, but not the human brain. When we look at the brain, we see no evidence that a physical grouping of neurons is occurring. Neurons are not arranged into little clusters like stars are arranged into galaxies. Neurons exist in incredibly tangled arrangements, and when everything is so tangled, physical grouping is not possible.

In short, it seems physically impossible that a brain structured such as ours could ever instantly retrieve memories, if such memories were stored in particular parts of the brain. There is no physical mechanism that can explain how this could occur in the human brain.



One way to try to resist such an argument is to claim that a particular memory is not stored in a particular place in the brain, but *throughout* the brain. If that were true, there would be no problem of the brain trying to find just one particular spot where a memory is stored. But a human mind has many thousands or millions of memories. We can hardly believe that each of these is stored throughout the brain. If my memory of my first kiss was stored throughout my brain, that would leave no space for the thousands or millions of other memories I have. We may also note how absurd it is to imagine that, for example, that I have stored throughout all the neurons of my brain some trivial image such as the image of SpongeBob Squarepants.

It is sometimes maintained that a specific memory is stored not in one little spot in the brain, or throughout the entire brain, but is scattered across several different places. This does nothing to make the retrieval of a memory from a brain more plausible. You do not lessen the difficulty of "how could the brain

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know where to find one specific spot where a particular memory is stored" if we assume that the memory is read from five or ten different specific places, because there is still the problem of how the brain could find those specific locations. Similarly, there would be no way for someone to find some information very quickly if it is in some book among many thousands of books in a library that all had no title on their cover; and it would be even harder to get such information quickly if the information was scattered across five or ten such books in such a library. Lacking any coordinate system, a brain storing memories would be like such a library.

In a blog post, a neurologist has replied to the type of argument being made here (after it had been made by another writer). The neurologist writes: "You don't have to know (nor does your brain) where in your physical brain a memory is located, because you can access that memory simply because it is integrated with so many other memories."

This reasoning is fallacious. Using similar reasoning, I could argue that I don't have to know the phone number of someone in California to telephone that person, because all of the telephones are integrated with each other in a telephone network. But that's erroneous. You do have to know someone's phone number to instantly access that person's phone. To instantly access a memory such as occurs when you recall a face after seeing a name (or vice versa), the brain would absolutely need to know where that memory is stored (or have some mechanism for instantly locating that precise brain location), if the memory was stored in one particular location in the brain. But no one can give any explanation of how the brain could know such a thing, or how the brain could instantly find the correct memory. I may note that when you recall a face instantly after seeing it, it is not at all a case of one memory leading you to find another. We absolutely cannot use "integration of memories" to explain such a thing.

If you say the name of a famous person such as John Kennedy, I do not have some mental experience of searching through memory like someone flipping the pages of an encyclopedia. I do not see in my mind's eye many images flashing until I finally reach the image of John Kennedy. Instead, you suddenly say "John Kennedy," and I instantly retrieve nothing at all except the image of John Kennedy. How could that work so quickly, if the image is stored in, say, brain location #834,342,430, and I have no way of remembering that the image is stored in that location, in a brain that has no coordinate or addressing system allowing exact brain addresses?

The complete lack of any workable theory for how memory recall can occur so quickly is admitted by neuroscientist David Eagleman, who states:

Memory retrieval is even more mysterious than storage. When I ask if you know Alex Ritchie, the answer is immediately obvious to you, and there is no good theory to explain how memory retrieval can happen so quickly.

Another difficulty is that there is nothing in the brain that seems to have the job of reading. Consider the question: how does the reading of information occur when someone reads a book or when a computer reads a file? In the case of someone reading a book, we know how it works. A person's eyes can focus on a particular spot on a page. So when you read a book, your hands open to a particular page, and then your vision focuses on one particular line. Similarly, we know how reading occurs when your computer reads a file on your hard disk. The disk is a circular spinning surface. Something called a read-write head can move to any spot on the disk, to read from that location. But in the brain there seems to be no comparable item that might allow the brain to focus on one particular spot where a memory is stored.

A brain has absolutely nothing like a vision system that can focus on one particular spot. Nor is there anything in the brain remotely similar to a read-write head. So how could "reading from one particular spot" in the brain even occur?

The reasoning above suggests that our neurologists will never be able to solve the problem of how the mind is able to recall things so quickly. The human brain is simply not structured the way a physical system would need to be structured in order for an instantaneous recall of detailed complex memory information to occur from one particular storage location in the brain. The impossibility of explaining how instant memory recall occurs is a powerful reason for believing that long-term memories are not stored in your brain. We must postulate that the human mind is part of some reality that transcends the human nervous system. Call it a soul reality, or call it a spiritual reality – it is something that must go beyond the human brain.

We can compare the idea that brains store our memories to the theory of Santa Claus, the idea that there is someone who goes around the world on Christmas Eve delivering toys to all the children. If we give just a moment's thought, neither idea seems untenable. But if we try to construct a detailed hypothetical account of how either of the things might work, we begin to realize neither idea can hold up to scrutiny. Once we start trying to construct a detailed theory of Santa Claus, we start to realize things such as that no Santa Claus sled could store millions of toys (enough for all the world's children) in a sled, and that no Santa Claus would have time to deliver toys to even a tenth of the world's children in a single night. Similarly, once we try to construct a detailed theory of memory storage and retrieval using neurons, we realize that because of rapid protein turnover there is no stable place for a brain to store memories lasting 50 years, and that there is no way a brain could instantly recall a particular memory from some very specific spot where just that memory was stored, given the complete lack of an indexing system or coordinate system in the brain, no means by which some very precise location in the brain could be identified. Nor can we think of any realistic theory of how something like episodic memories or learned abstract concepts could ever be physically represented by something like synapse arrangements or neuron arrangements.

Given the complete lack of any coordinate system in the brain by which the exact locations of neurons can be specified, the brain can be compared to these things:
(1) the US phone system if no one's phone number had ever been published;
(2) a vast post office with countless post office boxes, none of them numbered;
(3) a city in which none of the streets were named, none of the buildings had an outside identifier, none of the apartments had apartment numbers, and none of the houses had street numbers.
(4) a vast library in which none of the books have titles on their covers, and none of the chapters have chapter titles.

Imagine how hard it would be in any of such things to navigate to a precise location -- a particular post office box, a particular phone, a particular chapter of a particular book, or a particular apartment. That's the kind of situation that should exist in a brain storing abundant memories, because there is no coordinate system in a brain, and neurons don't have neuron numbers or something like a brain longitude and latitude. Instantaneous recall of obscure memories should be impossible if our memories are stored in brains. The fact that we routinely perform such instantaneous recalls is strong evidence our memories are not mainly stored in brains.

Nor do we get out of these difficulties that assuming that perhaps a particular memory item is scattered across multiple spots in the brain. If I have to access, say, ten particular neuron locations in my brain to retrieve the mind's eye image of Abraham Lincoln when I hear his name, like someone reading from

- memory recall
- memory storage
- morphogenesis
- natural selection
- near death experiences
- neural noise
- non-local consciousness
- nonneuralism
- optogenetics
- panpsychism
- precognition
- prefrontal cortex
- remote viewing
- savants
- scientist misconduct
- source of thoughts
- split-brain operation
- synapse theory of memory
- top-down theory of mind
- visual recognition

ten particular books in a vast library where none of the books have titles, that is simply ten times harder to explain than if I have to get that image stored in one particular brain location (like getting information from one particular book in such a library). The same difficulty is involved, that there is no way for me or my brain to know where those exact locations were, to be able to instantly retrieve the information.

at April 02, 2018 No comments:

Labels: memory recall

Why We Should Not Think the Human Brain Can Store Very Old Memories

Neurologists like to assume that all your memories are stored in your brain. But there are actually quite a few reasons for doubting this unproven assumption, including the research of scientists such as Karl Lashley and John Lorber. Their research showed that minds can be astonishing functional even when large parts of the brain are destroyed, either through disease or deliberate surgical removal. Lorber documented 600 cases of people with heavy brain damage (mostly due to hydraencephaly), and found that half of them had above average intelligence. Some children with brain problems sometimes undergo an operation called a hemispherectomy, in which half of their brain is removed. An article in Scientific American tells us, “Unbelievably, the surgery has no apparent effect on personality or memory.”

Given such very astonishing anomalies, we should give serious consideration to all arguments against the claim that your brain is storing all your memories. I will now discuss such an argument. The argument can be summarized as follows: there is no plausible mechanism by which the human brain could store very long-term memories such as 50-year-old memories. Every neurological memory theory that we have cannot explain any memories that have persisted for more than a year.

The Fact That Humans Can Remember Things for 50 Years

First, let's look at the basic fact of extreme long-term memory storage. It is a fact that humans can recall memories from 50 years ago. Some people have tried to suggest that perhaps human memory doesn't work for such a long time, and that remembering very old memories can be explained by the idea of what is called “rehearsal.” The idea is that perhaps a 60-year-old remembering is really just remembering previous recollections that he had at an earlier age. So perhaps, this idea goes, when you are 60 you are just remembering what you remembered from your childhood at 50, and that at 50 you were just remembered what you remembered from your childhood at age 40, and so forth.

But such an idea has been disproved by experiments. A scientific study by Harry Bahrick was entitled “Semantic memory content in permastore: Fifty years of memory for Spanish learned in school.” It showed that “large portions of the originally acquired information remain accessible for over 50 years in spite of the fact the information is not used or rehearsed.” The same researcher tested a large number of subjects to find out how well they could recall the faces of high school classmates, and found very substantial recall even with a group that had graduated 47 years ago. Bahrick reported the following:

Subjects are able to identify about 90% of the names and faces of the names of their classes at graduation. The visual information is retained virtually unimpaired for at least 35 years...Free-recall probability does not diminish over 50 yr for names of classmates assigned to one or more of the Relationship Categories A through F.

I know for a fact that memories can persist for 50 years, without rehearsal. Recently I was trying to recall all kinds of details from my childhood, and recalled the names of persons I hadn't thought about for decades, as well as a Christmas incident I hadn't thought of for 50 years (I confirmed my recollection by asking my older brother about it). Digging through my memories, I was able to recall the colors (gold and purple) of a gym uniform I wore, something I haven't thought about (nor seen in a photograph) for some 47 years. Upon looking through a list of old children shows from the 1960's, I saw the title "Lippy the Lion and Hardy Har Har," which ran from 1962 to 1963 (and was not syndicated in repeats, to the best of my knowledge). I then immediately sung part of the melody of the very catchy theme song, which I hadn't heard in 53 years. I then looked up a clip on a youtube.com, and verified that my recall was exactly correct. I also recently recalled "The Patty Duke Show" from the 1960's, a show I haven't seen in 50 years, and recalled that in the opening title sequence we saw Patty walking down some stairs. I looked up the title sequence on www.youtube.com, and verified that my 50-year-old memory was correct. This proves that a 53-year-old memory can be instantly recalled.

So in trying to explain human memory, we need to have a theory that can explain human memories that persist for 50 years. Very confusingly, scientists use the term "long-term memory" for any memory lasting longer than an hour, which is very unfortunate because almost every thing you will find on the internet (seaching for "long term memory") does not actually explain very long-term memory such as memories lasting for 50 years.

Why LTP and Synapse Plasticity Cannot Explain Very Long-Term Memory

Now let's look at neuroscientists' theories of memories. Quora.com is a "expert answer" website which claims to give "the best answer to any question." One of its web pages asks the question, "How are memories stored and retrieved in the human brain?" The top answer (the one with most upvotes) is by Paul King, a computational neuroscientist. King very dogmatically gives us the following answer:

At the most basic level, memories are stored as microscopic chemical changes at the connection points between neurons in the brain..As information flows through the neural circuits and networks of the brain, the activity of the neurons causes the connection points to become stronger or weaker in response. The ***strengthening and weakening of the synapses*** *(synaptic plasticity) is how the brain stores information. This mechanism behind this is called* ***"long-term potentiation"*** *or "LTP."*

But there is actually no proof that any information is being stored when synapses are strengthened. From the mere fact that synapses may be strengthened when learning occurs, we are not entitled to deduce that information is being stored in synapses, for we also see blood vessels in the leg strengthen after repeated exercise, and that does not involve information storage. In order to actually prove that a synapse is storing information, you would need to do an experiment such as having one scientist store a symbol in an animal's brain (by training), and then have another scientist (unaware of what symbol had been stored) read that symbol from some synapses in the animal's brain, correctly identifying the symbol. No such experiment has ever been done.

The idea that a memory forms after repeating strengthening of synapses is inconsistent with the fact people very commonly remember things they experienced only one time. Almost every time someone tells you about a TV show they saw last night, or a conversation they recently had with a friend, they are remembering something they only were saw or heard one time, not through repeated experiences.

The evidence does not even clearly indicate that LTP correlates with memory, as one scientist's summary of experimental results indicates (a summary utterly inconsistent with the claim LTP is a general mechanism to explain memory).

What this means is that LTP and memory have been dissociated from each other in almost every conceivable fashion. LTP can be decreased and memory enhanced. Hippocampus-dependent memory deficits can occur with no discernable effect on LTP...There will be no direct quantitative or even qualitative relationship between LTP measured experimentally and memory measured experimentally—that is already abundantly clear from the available literature...The most damning observations probably are those examples where LTP is completely lost and there is no effect on hippocampus-dependent memory formation.

A scientific paper states this about LTP:

Based on the data reviewed here, it does not appear that the induction of LTP is a necessary or sufficient condition for the storage of new memories.

LTP is so weak an effect it is hard to even detect it. A scientific paper asks the following:

Why is it so difficult to see learning-associated synaptic changes?And does their absence in numerous experiments favor the null hypothesis?

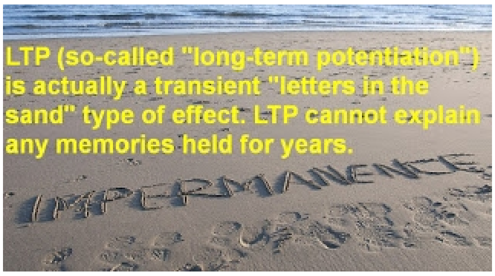
What is misleadingly called "long-term potentiation" or LTP is a not-very-long-lasting effect by which certain types of high-frequency stimulation (such as stimulation by electrodes) produces an increase in synaptic strength. Synapses are gaps between nerve cells, gaps which neurotransmitters can jump over. The evidence that LTP even occurs when people remember things is not very strong, and in 1999 a scientist stated (after decades of research on LTP) the following:

[Scientists] have never been able to see it and actually correlate it with learning and memory. In other words, they've never been able to train an animal, look inside the brain, and see evidence that LTP occurred.

Since then a few studies have claimed to find evidence that LTP occurred during learning. But there is actually an insuperable problem in the idea that long-term potentiation could explain very long-term memories. The problem is that so-called long-term potentiation is actually a very *short-term* phenomenon. Speaking of long-term potentiation (LTP), and using the term "decays to baseline levels" (which means "disappears"), a scientific paper says the following:

Potentiation almost always decays to baseline levels within a week. These results suggest that while LTP is long-lasting, it does not correspond to the time course of a typical long-term memory. It is recognized that many memories do not last a life-time, but taking this point into consideration, we would then have to propose that LTP is only involved in the storage of short-term to intermediate memories. Again, we would be at a loss for a brain mechanism for the storage of a long-term memory.

A more recent scientific paper (published in 2013) says something similar, although it tells us even more strongly that so-called long-term potentiation (LTP) is really a very short-term affair. For it tells us that "in general LTP decays back to baseline within a few hours." "Decays back to baseline" means the same as "vanishes."



Another 2013 paper agrees that so-called long-term potentiation is really very short-lived:

LTP always decays and usually does so rapidly. Its rate of decay is measured in hours or days (for review, see Abraham 2003). Even with extended "training," a decay to baseline levels is observed within days to a week.

Scientists distinguish between two types of LTP: an E-LTP that can be produced by a single electrical stimulus, but only lasts one to three hours, and an L-LTP that requires multiple electrical stimulations, and can last about 8 hours or a little longer. But this fails to correspond to what we know about human memory, which is that humans can form a memory lasting decades after a single sensory experience.

So evidently long-term potentiation cannot be any foundation or mechanism for long-term memories. This is the conclusion reached by the previous paper when it makes this conclusion about long-term potentiation (LTP):

In summary, if synaptic LTP is the mechanism of associative learning—and more generally, of memory—then it is disappointing that its properties explain neither the basic properties of associative learning nor the essential property of a memory mechanism. This dual failure contrasts instructively with the success of the hypothesis that DNA is the physical realization of the gene.

The book "Neuronal Mechanisms of Memory Formation" hints on page 451 that LTP may be a poor candidate for such a thing. It says this:

Definitive empirical support for synaptic plasticity modeled by LTP being a mechanism of memory processing is still lacking. For each piece of evidence that lends some support to the theory, there is likely to be equally strong evidence to suggest the contrary. The field of research reached a veritable stalemate some years ago when so-called cornerstones of research that supported the hypothesis were unable to be replicated...and the outcome was an increasing skepticism about whether LTP can be considered a neural substrate for learning and memory.

Referring to this scientific paper, another paper suggests that "LTP as a memory mechanism" may be more of a dogma than something well established by observations:

Shors and Matzel,,.concluded that LTP did not meet the criteria for providing a causal mechanism of memory. To make a long argument very short, they documented instances where changes in memory occur without LTP and where LTP occurs without changes in memory.....They report that between 1974 and 1997, more than 1300 articles occurred with "LTP" in the title. Of these, fewer than 80 described any behavioral manipulation relevant to assessing changes in memory. Furthermore, the articles that contained behavioral manipulations tended to provide evidence against the hypothesis that LTP is a *memory mechanism. Thus, the claim that LTP is a molecular mechanism for learning and memory may be more of a dogma of neuroscientific memory research than a hypothesis that is being rigorously tested.*

A 2014 book stated, "Although LTP is considered to be the primary model for how learning and memory storage occur at the synapse level, the evidence supporting this claim is still inconclusive and speculative." A 1995 scientific paper found. "There is a striking negative correlation of spatial learning ability with LTP." This is the exact opposite of what we should expect if LTP was some type of memory mechanism.

But what about syntaptic plasticity, previously mentioned in my quote from the neurologist King ? Since he claimed that LTP is the mechanism behind synaptic plasticity, and LTP cannot explain any memory lasting longer than a year, then synaptic plasticity will not work to explain very long-term memories.

To study LTP, scientists typically perform something artificial called tetanic stimulation, using a frequency of 100 hertz. A normal brain does not transmit signals at a frequency so high. Of the common brain waves (alpha, beta, and gamma), only gamma waves have a frequency of greater than 30 hertz, and such gamma waves generally do not have a frequency higher than 50 hertz. LTP can be induced using a lower frequency, but only by prolonged stimulation such as stimulation lasting minutes. That type of sluggish low-frequency stimulation cannot explain human memories that can form instantly.

Why Synapses Cannot Explain Very Long-Term Memory

Long-term memory cannot be stored in synapses, because synapses don't last long enough. Below is a quote from a scientific paper:

A quantitative value has been attached to the synaptic turnover rate by Stettler et al (2006), who examined the appearance and disappearance of axonal boutons in the intact visual cortex in monkeys.. and found the turnover rate to be 7% per week which would give the average synapse a lifetime of a little over 3 months.

You can read Stettler's paper here.

You can google for "synaptic turnover rate" for more information. We cannot believe that synapses can store-long memories for 50 years if synapses only have an average lifetime of about 3 months. The paper here says the half-life of synapses is "from days to months."

Synapses often protrude out of bump-like structures on dendrites called dendritic spines. But those spines have lifetimes of less than 2 years. Dendritic spines last no more than about a month in the hippocampus, and less than two years in the cortex. This study found that dendritic spines in the hippocampus last for only about 30 days. This study found that dendritic spines in the hippocampus have a turnover of about 40% each 4 days. This 2002 study found that a subgroup of dendritic spines in the cortex of mice brains (the more long-lasting subgroup) have a half-life of only 120 days. A paper on dendritic spines in the neocortex says, "Spines that appear and persist are rare." While a 2009 paper tried to insinuate a link between dendritic spines and memory, its data showed how unstable dendritic spines are. Speaking of dendritic spines in the cortex, the paper found that "most daily formed spines have an average lifetime of ~1.5 days and a small fraction have an average lifetime of ~1–2 months," and told us that the fraction of dendritic spines lasting for more than a year was less than 1 percent. A 2018 paper has a graph showing a 5-day "survival fraction" of only about 30%

for dendritic spines in the cortex. A 2014 paper found that only 3% of new spines in the cortex persist for more than 22 days. Speaking of dendritic spines, a 2007 paper says, "Most spines that appear in adult animals are transient, and the addition of stable spines and synapses is rare." A 2016 paper found a dendritic spine turnover rate in the neocortex of 4% every 2 days. A 2018 paper found only about 30% of new and existing dendritic spines in the cortex remaining after 16 days (Figure 4 in the paper).

Furthermore, it is known that the proteins existing between the two knobs of the synapse (the very proteins involved in synapse strengthening) are very short-lived, having average lifetimes of no more than a few days. A graduate student studying memory states it like this:

It's long been thought that memories are maintained by the strengthening of synapses, but we know that the proteins involved in that strengthening are very unstable. They turn over on the scale of hours to, at most, a few days.

A scientific paper states the same thing:

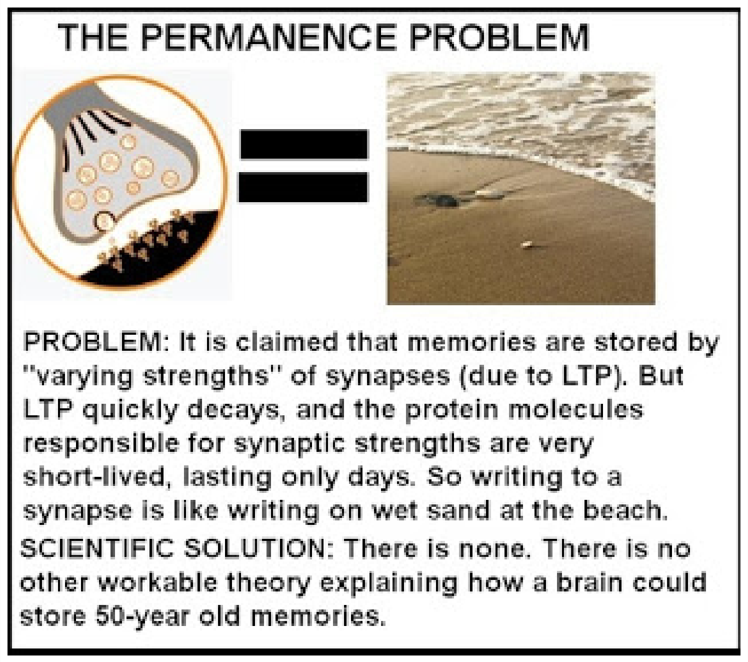
Experience-dependent behavioral memories can last a lifetime, whereas even a long-lived protein or mRNA molecule has a half-life of around 24 hrs. Thus, the constituent molecules that subserve the maintenance of a memory will have completely turned over, i.e. have been broken down and resynthesized, over the course of about 1 week.

The paper cited above also states this (page 6):

The mutually opposing effects of LTP and LTD further add to the eventual disappearance of the memory maintained in the form of synaptic strengths. Successive events of LTP and LTD, occurring in diverse and unrelated contexts, counteract and overwrite each other and will, as time goes by, tend to obliterate old patterns of synaptic weights, covering them with layers of new ones. Once again, we are led to the conclusion that the pattern of synaptic strengths cannot be relied upon to preserve, for instance, childhood memories.

The latest and greatest research on the lifetime of synapse proteins is the June 2018 paper “Local and global influences on protein turnover in neurons and glia.” The paper starts out by noting that one earlier 2010 study found that the average half-life of brain proteins was about 9 days, and that a 2013 study found that the average half-life of brain proteins was about 5 days. The study then notes in Figure 3 that the average half-life of a synapse protein is only about 5 days, and that all of the main types of brain proteins (such as nucleus, mitochondrion, etc.) have half-lives of 15 days or less. The 2018 study here precisely measured the lifetimes of more than 3000 brain proteins from all over the brain, and found not a single one with a lifetime of more than 75 days (figure 2 shows the average protein lifetime was only 11 days).

When you think about synapses, visualize the edge of a seashore. Just as writing in the sand is a completely unstable way to store information, long-term information cannot be held in synapses. The proteins in between the synapses are turning over very rapidly (lasting no longer than about a week), and the entire synapse is replaced every few months.



In November 2014 UCLA professor David Glanzman and his colleagues published a scientific paper publishing research results. The authors said, “These results challenge the idea that stable synapses store long-term memories." Scientific American published an article on this research, an article entitled, “Memories May Not Live in Neuron's Synapses.” Glanzman stated, “Long-term memory is not stored at the synapse,” thereby contradicting decades of statements by neuroscientists who have dogmatically made unwarranted claims that long-term memory is stored in synapses.

Why Very Long-Term Memories Cannot Be Stored in the Cell Nucleus

His research has led Glanzman to a radical new idea: that memories are not stored in synapses, but in the nerve cell nucleus. In fact, in this TED talk Glanzman dogmatically declares this doctrine. At 15:34 in the talk, Glanzman says, “memories are stored in the cell nucleus – it is stored as changes in chromatin.” This is not at all what neurologists have been telling us for the past 20 years, and few other neuroscientists have supported such an idea.

We should be extremely suspicious and skeptical whenever scientists suddenly start giving some new answer to a fundamental answer, an answer completely different from the answer they have been dogmatically declaring for years. For example, if scientists were to suddenly start telling us that galaxies are not hold together by gravity (as they've been telling us for decades), but by, say, “dark energy pulsations,” we should be extremely skeptical that the new explanation is correct. In this case, there are very good reasons why Glanzman's recently-hatched answer to where long-term memories are stored cannot be right.

Chromatin is a term meaning DNA and surrounding histone protein molecules. Histone molecules are not suitable for storing very long-term memories because they are too short-lived. A scientific paper tells us that the half-life of histones in the brain is only about 223 days, meaning that every 223 days half of the histone molecules will be replaced.

So histone molecules are not a stable platform for storing very long-term memories. But what about DNA? The DNA molecule is stable. But there are several reasons why your DNA molecules cannot be storing your memories. The first reason is that your DNA molecules are already used for another purpose – the storing of genetic information used in making proteins. DNA molecules are like a book that already has its pages printed, not a book with empty pages that you can fill. The second reason is that DNA molecules use a bare bones “amino acid” language quite unsuitable for writing all the different types of human memories. The idea that somewhere your DNA has memory of your childhood summer vacations (expressed in an amino-acid language) is laughable.

The third reason is that the DNA of humans has been exhaustively analyzed by various multi-year projects such as the Human Genome Project and the ENCODE project, as well as various companies that specialize in personal analysis of the DNA of individual humans. Despite all of this huge investigation and analysis, no one has found any trace whatsoever of any type of real human memory (long-term or short-term) being stored in DNA. If you do a Google search for “can DNA store memories,” you will see various articles (most of them loosely-worded, speculative and exaggerating) that discuss various genetic effects (such as gene expression) that are not the same as an actual storage of a human memory. Such articles are typically written by people using the word “memories” in a very loose sense, not actually referring to memories in the precise sense of a recollection.

The fourth reason is that there is no known bodily mechanism by which lots of new information can be written to the storage area inside a DNA molecule. The fifth reason is that the DNA we see in brain neurons is basically identical to the DNA we see in other parts of the body (such as the DNA from foot cells). If memories were stored in DNA, the DNA in brain neurons would be much different from that of the DNA in other body parts.

To completely defeat the idea that your memories may be stored in your DNA, I will merely remind the reader that DNA molecules are not read by brains – they are read by cells. It takes about 1 minute for a cell to read only the small part of the DNA needed to make a single protein (and DNA has recipes for thousands of proteins). If your memories were stored in DNA, it would take you hours to remember things that you can actually recall instantly. Thinking that DNA can store memories is like thinking that your refrigerator can cook a steak.

But couldn't very-long term memories just be stored in some unknown part of a neuron? No, because the proteins that make up neurons have short lifetimes. A scientist explains the timescales:

Protein half-lives in the cell range from about 2 minutes to about 20 hours, and half-lives of proteins typically are in the 2- to 4-hour time range. Okay, you say, that's fine for proteins, but what about "stable" things like the plasma membrane and the cytoskeleton? Neuronal membrane phospholipids turn over with half-lives in the minutes-to-hours range as well. The vast majority of actin microfilaments in dendritic spines of hippocampal pyramidal neurons turn over with astonishing rapidity—the average turnover time for an actin microfilament in a dendritic spine is 44 seconds...As a first approximation, the entirety of the functional components of your whole CNS [central nervous system] have been broken down and resynthesized over a 2-month time span. This should scare you. Your apparent stability as an individual is a perceptual illusion.

It is occasionally speculated that long-term memories might be stored in microtubules in a cell. But such things do not last long enough to be a storage place for memories lasting decades. A scientific paper tells us how short-lived brain microtubules are:

Neurons possess more stable microtubules compared to other cell types (Okabe and Hirokawa, 1988; Seitz-Tutter et al., 1988; Stepanova et al., 2003). These stable microtubules have half-lives *of several hours and co-exist with dynamic microtubules with half-lives of several minutes.*

Why Long-Term Memories Cannot Be Stored in the DNA Methylome

DNA methylation occurs when a very simple molecule becomes attached to part of a DNA molecule. Such a simple methyl molecule can act like a kind of flag that switches part of a gene on or off. The set of all of these methyl molecules attached to DNA is known as the DNA methylome. It has been suggested by a few that maybe memories are stored in this DNA methylome.

The DNA methylome seems like a fairly stable thing, and so you don't have the "low stability" problem of very rapid protein molecule turnover that you have with the theory that memories are stored in synapses. But there are several reasons why it is not credible to maintain that human memories are being stored in such a DNA methylome.

The first reason is that we already know the function of this DNA methylome, that it is something other than storing memories. The methyl molecules that make up the methylome serve the purpose of genetic expression, a very different task than storing memories. If you were to maintain that the DNA methylome serves *both* of these purposes, it would be kind of like the Saturday Night Live comedic sketch that described a product like "Miracle Whip." It went like this:

Wife: New Shimmer is a floor wax!
Husband: No, New Shimmer is a dessert topping!
Wife: It's a floor wax!
Husband: It's a dessert topping!
Wife: It's a floor wax, I'm telling you!
Husband: It's a dessert topping, you cow!
Spokesman: [enters quickly] Hey, hey, hey, calm down, you two. New Shimmer is both a floor wax **and** a dessert topping!

The second reason for doubting that memories are stored in the DNA methylome is that the DNA methylome couldn't be read with the speed needed for memory recall that is very fast. The DNA methylome consists of methyl molecules scattered across a DNA molecule. All evidence suggests that reading DNA is relatively slow. DNA transcription occurs at a rate of about 40 to 80 nucleotides per second, and there are billions of such nucleotides. But think of how fast people can recall memories. On the TV show *Jeopardy* we see people recalling very obscure memories in only a few seconds. When someone talks rapidly, he is retrieving language memories (such as the memory of what a particular word means) in a fraction of a second. That couldn't happen so fast if some relatively slow process of reading DNA was being used.

The third reason for doubting that memories are stored in the DNA methylome is that the methylome does not grow in size as learning occurs. As discussed here, the DNA methylome is larger (percentage-wise) in a newborn baby than in either a young adult or an old man.

The fourth reason for doubting that memories are stored in the DNA methylome is that methylation suppression experiments do not affect memory very dramatically. Scientists have ways of suppressing DNA methylation, and they have tested the effects of such suppression on learning and memory. A scientific paper says that "inhibiting DNA methylation alters olfactory extinction but not acquisition learning." Another scientific paper says that when DNA methylation was inhibited, "long-term memory strength itself was not affected."

A scientific paper states the following:

Prior studies found no effects of zeb, a DNA methylation inhibitor (Zhou et al., 2002), on learning in A. mellifera (Lockett et al., 2010; Biergans et al., 2012). More recently, Biergans et al. (2016), conducted a meta-analysis of multiple honey bee studies with methylation inhibitors (zeb and RG108), but found no strong overall effect of inhibiting DNA methylation on honey bee learning.

These are not the type of very dramatic effects on learning and memory that one would expect from DNA methylation inhibition if memories were being stored in the methylome. Other studies claiming a stronger effect of DNA methylation inhibition are typically unreliable studies using fewer than 15 animals per study group, and in such low-statistical-power studies there is a high chance of a false alarm or false positive.

There are actually two drugs for humans that work mainly by inhibiting DNA methlyation: azacitidine and decitabine. If DNA methlyation was a mechanism for memory storage, we would expect that the side effect lists for these drugs would make some mention of a possible effect on learning or memory. But these drugs do not produce such a side effect.

When It Comes to Explaining Very Long-Term Memory, Our Neuroscientists Are in Disarray

So how can we summarize the current state of scientific thought on how long-term memory is stored? The word that comes to mind is: *disarray.* In this matter our scientists are flailing about, wobbling this way and that way; but they aren't getting anywhere in terms of presenting a plausible answer as to how very long-term memory can be stored in the brain. Our scientists have done nothing to plausibly solve the permanence problem – the problem that very long-term memories cannot be explained by evoking transient “shifting sands” mechanisms such as LTP which last much less than a year (or in neurons, which are rebuilt every two months due to protein turnover). On this matter our scientists have merely presented explanatory facades – theories that do not hold up to scrutiny, like some movie studio building facade that you can see is a fake when you walk around and look behind it, finding no rooms behind the front.

Another sign of this disarray is a 2013 scientific paper with the title, “"Very long-term memories may be stored in the pattern of holes in the perineuronal net." After basically explaining in its first paragraph why current theories of long-term memories do not work and are not plausible, the author goes on to suggest a wildly imaginative and absurdly ornate speculation that perhaps the brain is a kind of a giant 3D punchcard, storing information like data used to be stored on the old 2D punchcards used by IBM electronic machinery in the 1970's. The author provides no good evidence for this wacky speculation, mainly discussing imaginary experiments that would lend support to it. The very appearance of such a paper is another sign that currently scientists have no good explanation for very long-term memory. I may note that IBM punchcards only worked because they were read by IBM punchcard-reader machines. In order for the brain to work as giant 3D punchcard, we would have to imagine a brain-reader machine that is nowhere to be found in the human body. There has never existed such a thing as a punchcard that can read itself.

This scientific article quotes a neuroscientist speculating about memory storage. The article says:

Neuroscience has also been struggling to find where the brain stores its memories. "They may be 'hiding' in high-dimensional cavities," Markram speculates.

High-dimensional *cavities*? Cavities are *holes*, not information storage media. I think the quote bolsters my claim that scientists do not have any plausible explanation of how brains can be storing memories for 50 years.

Often the modern neuroscientist will engage in pretentious talk which makes it sound as if there is some understanding of how very long-term memory storage can occur. But just occasionally we will get a little candor from our neuroscientists, such as when neuroscientist Sakina Palida admitted in 2015, "Up to this point, we still don't understand how we maintain memories in our brains for up to our entire lifetimes."

Concluding Remarks on Long-Term Memory

For the reasons given above, there is no plausible mechanism by which brains such as ours could be storing memories lasting longer than a year. There are only a few possible physical candidates for things that might store very long-term memory in our brain, and as we have seen, none of them are plausible candidates for a storage of very long-term memory.

The fact that our neurologists claim to have theories as to how very long-term memories could be stored does not mean that any such theory is tenable. Imagine if you lived on a planet in which your consciousness and long-term memory was due to a soul, and that the first time scientists dissected a brain, they found that the brain was filled with sawdust. No doubt such scientists would get busy inventing clever theories purporting to explain how sawdust can generate consciousness and long-term memories.

I may note that memories stretching back 50 years are inexplicable not merely from a neurological standpoint but also from a Darwinian standpoint. As I will argue later, from the standpoint of survival of the fittest and natural selection, there is no reason why any primate organism should ever need to remember anything for longer than about a year or two (it would work just fine to just keep remembering last year's memories). I may note that according to an article on wikipedia.com, the average life span in the Bronze Age was only 26 years old. There is no reason why natural selection (prior to the Bronze Age) would have equipped us to remember things for a length of time twice the average life span in the Bronze Age, and it is not plausible that very long-term memories are a recent evolutionary development.

In this post and in other places on this site, when I use the term "memory" I am referring to things such as episodic memories of life events, learned vocabulary, learned facts, and learned visual information that we can recall (such as identifying the name of an object, or recognizing a face). I do not refer to muscular skills such as the skill of how to ride a bike. Such skills are best referred to as "muscular skills" rather than memory.

Head Truth

The huge case for thinking minds do not come from brains

Monday, April 2, 2018

How Evidence for ESP Undermines the “Minds Come From Brains” Dogma

The question of whether or not humans have paranormal abilities is extremely relevant to the issue of whether our minds come purely from our brains. For example, there is no way that extrasensory perception (ESP) or telepathy could be occurring if our minds are purely coming from our brains. A human has no antenna that would allow him to pick up a thought transmitted from another brain, nor does the brain have any antenna or transmission system that might cause a thought to travel like a radio signal from a brain to a brain. If humans do not have any ESP or telepathic ability, this does nothing to show that the “minds come from brains” idea is correct. But if some humans do have such an ability, it is a very strong reason for thinking that minds do not come from brains, and that the human mind must involve some psychic or spiritual reality compatible with telepathy or ESP.

Recognizing that the idea of ESP is incompatible with the dogma that minds come from brains, many a scientist has assured us that there is no good evidence for something like ESP. Such claims are very untruthful. Convincing evidence for ESP has been gathered by careful and conscientious researchers for more than a hundred years. The best evidence for ESP meets all of the requirements of solid experimental science. The truth is that ESP is a firmly established fact, but a fact that is unreasonably denied by mainstream authorities.

Let us consider the experiment results produced at Duke University, in experiments conducted by Joseph Rhine testing with the subject Hubert Pearce. The experiments are described in great detail at the link here.

The experimental protocol is described below by Rhine, and it is not a protocol in which he can imagine any opportunity for cheating over a long series of trials. The Zener cards he refers to are cards that have one one of five symbols on one side.

The working conditions were these: observer and subject sat opposite each other at a table, on which lay about a dozen packs of the Zener Cards and a record book. One of the packs would be handed to Pearce and he be allowed to shuffle it. (He felt it gave more real "contact".) Then it was laid down and was cut by the observer. Following this Pearce would, as a rule, pick up the pack, lift off the top card, keeping both the pack and the removed card face down, and, after calling it, he would lay the card on the table, still face down. The observer would record the call. Either after 5 calls or after 25 calls,—and we used both conditions generally about equally—the called cards would be turned over and checked off against the calls recorded in the book. The observer saw each card and checked each one personally though the subject was asked to help in the checking by laying off the cards as checked. There is no legerdemain by which an alert observer can be repeatedly deceived at this.

Translate

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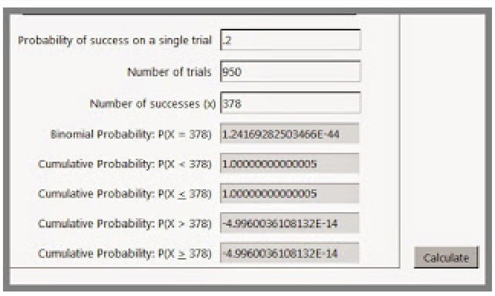
- Introduction to This Site
- Preservation of Mind and Memories After Removal of Half a Brain
- Why We Should Not Think the Human Brain Can Store Very Old Memories
- Why the Instantaneous Recall of Old Memories Should Be Impossible for a Brain
- Cases of High Mental Function Despite Large Brain Damage
- Reasons for Doubting a Brain Could Do the Super-Complex Encoding Needed to Neurally Store Episodic Memories or Concepts
- The Many Cases Showing a Person's Mind Can Operate When His Brain Has Shut Down
- Your Physical Structure Did Not Arise Bottom-Up, So Why Think Your Mind Did?
- The Brain Seems to Have No Mechanism for Reading or Writing Memories
- No One Understands How a Brain Could Generate Ideas
- 30 Reasons for Rejecting the Theory of Neural Memory Storage
- Groupthink and Peer Pressure Make It Taboo for Neuroscientists to Put Two and Two Together
- Synaptic Delays Mean Brain Signals Must Move at a Snail's Pace
- Brain Dogmas Versus Case Histories That Refute Them
- In Neuroscience Papers Bluffing Is More Common Than Candor
- Young Age of Languages Contradicts Claims of Neural Storage of Linguistic Information

The table below (from the link here) summarizes the results of Rhine's experiments with Pearce. These are tests in which the expected success rate is 5 out of 25, or 1 in 5. There is no way to work in some hypothesis of cheating with the results reported here. The table shows that Pearce got the same super-dramatic results even in a series of 650 trials when he was looking away from the cards, and also in a series of 300 trials in which there was a screen separating the cards and Pearce.

Ser. No.	Conditions	No. of Trials	No. of Hits	Deviation and p.e.		Value of X	Avge. per 25
1.	General B.T. as described above *Special Conditions*	5,000	1,834	+834	±19.1	43.7	9.2
2.	S. looks away from cards	650	279	149	6.9	21.6	10.7
3.	Same as 2, plus calling before removing	475	236	141	5.9	23.9	12.4
4.	Same as 3; no contact with cards	275	74	19	4.5	4.2	6.7
5.	Same as 3, plus *New cards*; data on first 3 times used	1,675	626	291	11.0	26.5	9.3
6.	(a) Screen, concealing cards (B.T)	300	99	39	4.7	8.3	8.3
	(b) Same, plus P.T. (*i.e.*, gen. E.S.P.; Agent screened)	300	116	56	4.7	11.9	9.7
7.	D.T., pack left unbroken till end of run	1,625	482	157	10.9	14.4	7.4
Total, P.C. (except 6b)		10.300	3,746	+1.686	±27.4	61.5	9.1

We can use the very handy binomial probability calculator at the StatTrek.com site site to calculate the likelihood of these results. The calculator gives a probability of simply 0 when we type in the overall results, so let's use a subset to try to get some non-zero result. Let's use only rows 2 and 6, involving either Pearce looking away from the cards or a screen between Pearce and the cards, either one of which should have ruled out any possibility of cheating. When I type these results in the binomial probability calculator, I get a result with a chance probability of 5 chances in 100 trillion, which we can round to be 1 chance in 10 trillion. This is a result we should never expect to get by pure chance even if we tested with every single person in the human race.



What we have in the case of Pearce and Rhine is a very well-documented case of experimental results far, far in excess of what chance can account for, what is basically "smoking gun" evidence of ESP.

There were two other tests involving Pearce that provided dramatic evidence of ESP. One was the Pearce-Pratt series of tests, conducted by Rhine's assistant J. Gaither Pratt. In this test, Pratt dealt out one card a minute from a shuffled deck. Pearce (located in a building far away) recorded his guesses as to the cards, at the same time. 1850 cards were dealt, and the expected chance

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- Study Finds "Poor Overall Reliability" of Brain Scanning Studies
- "Brains Store Memories" Dogma Versus the Reality of Noisy Brains
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- Exhibit A Suggesting Scientists Don't Understand How a Brain Could Store a Memory
- The Dubious Dogma That Brains Make Decisions
- Long Article Tries to Show Neural Memory Storage, but Gives No Real Evidence for It
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- Scientists Can't Persuasively Explain How a Brain Could Instantly Retrieve a Memory
- The Lack of Evidence for Memory-Storage Engram Cells
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- When Animals Cast Doubt on Dogmas About Brains
- Memories Can Form Many Times Faster Than the Speed of Synapse Strengthening
- The Guy with the Smallest Brain Had the Highest IQ
- He Had Half a Brain and Above Normal Intelligence
- The Truth About Neurons and Synapses
- A Diagram of Explanatory Dysfunction in Academia
- The Brain Shows No Sign of Working Harder During Thinking or Recall
- More Evidence of High Mental Function Despite Large Brain Damage
- The Lack of a Viable Theory of Neural Memory Encoding
- More Evidence That Neuron Loss Has Little Effect on Cognition
- Fraud and Misconduct Are Not Very Rare in Biology
- Reasons for Doubting Thought Comes from the Frontal Lobes or

success rate was about 370 cards. Instead, Pearce got 558 correct guesses. The chance probability of such a result was less than 1 in 10,000,000,000,000,000,000,000. In another informal test conducted in front of Rhine, Pearce correctly guessed 25 cards in a row. The chance of that? One in three hundred quadrillion.

Under laboratory university conditions, Joseph Rhine got extremely convincing experimental evidence for ESP with many other subjects other than Pearce, although Pearce was the one who did best in Rhine's tests. As astonishing as Pearce's results were, he was not the most successful test subject in laboratory tests for ESP. One subject did even better, in an ESP test conducted by Bernard. F. Riess in 1937, a professor at Hunter College in New York. The test was the most successful ESP test ever recorded. The test is described at the link here, which can be found by doing a Google search for “ESP and Personality Patterns” or “Riess ESP Test.”

Riess was very skeptical about ESP, but when one of his students said that a friend claimed to have ESP, Riess began an ESP test with a 26-year-old woman who was never identified by name. At 9:00 PM on each evening the test was run, the woman stayed in a room a quarter of a mile away, in a room facing away from the home of Riess. Riess at that time would be in a room facing away from the room in which the woman was in. Before 9:00 PM Riess would shuffle a deck of ESP cards, and lay out one card each minute, recording the value of each card. At the same time the woman would make one guess each minute as to the value of the card.

Each such test involved two series of 25 cards, so a total of 50 cards were laid out in each session. Thirty-seven such sessions were held, meaning the woman guessed a total of 1850 cards. The woman returned her response sheets to Riess, and was never told the degree of success she obtained.

The ESP cards used have 5 possible values. The expected chance result per session was only 5 correct guesses. But the woman guessed an average of 18.24 cards correctly per 25 cards, achieving a phenomenal 73% accuracy rate (instead of the expected accuracy rate of 20%).

The chance of getting such a result accidentally is far less than 1 in 1,000,000,000,000,000 (this link estimates the probability of getting these results by chance as 1 in 10 to the 700th power, which is smaller than the chance of you correctly guessing all of the social security numbers of a set of 70 strangers). After the test the woman moved to the midwestern US, and refused to participate in further tests. Riess had to be prodded to publish the results, which were published in the Journal of Parapsychology in 1937 (1, 270-273).

Attempts by skeptics to debunk this test have been futile. Riess pointed out that while the tests were done, his house was continually occupied by a housekeeper, meaning the woman being tested could not have strolled into the house, and altered Riess' response sheets to match her responses. Riess also pointed out his response sheets were written in his own handwriting, and showed no signs of being altered. So even the ridiculously far-fetched idea of some conspiracy between the woman and the housekeeper is not tenable.

The term “smoking gun evidence” is used to describe a situation like you might have if you had a photo of someone pointing a smoking gun at a dead body. But what would be better evidence? Perhaps a video actually showing someone firing a gun into the body of someone. The Riess experiment must be described as that type of evidence, something better than “smoking gun” evidence.

About Me

Mark Mahin

www.markmahin.com

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The experiments I have discussed thus far were done before 1950, but there is a wealth of more recent experimental evidence establishing the reality of ESP. A ganzfeld experiment is one in which a test for extra-sensory perception is combined with sensory deprivation achieved through methods such as cutting a ping-pong ball in half and taping it over someone's eyes, and having someone wear an earphone transmitting white noise. In these ESP experiments, the expected chance hit rate (matching of a user's selection and a random target) is 25%. But as wikipedia reports here, "In 2010, Lance Storm, Patrizio Tressoldi, and Lorenzo Di Risio analyzed 29 ganzfeld studies from 1997 to 2008. Of the 1,498 trials, 483 produced hits, corresponding to a hit rate of 32.2%." That success rate of 32.2% is hugely above the expected by-chance success rate of 25%. The review article can be found here. The probability of such a hit rate occurring by chance is incredibly low. The Law of Large Numbers dictates that whenever you do a huge number of trials, there is only a very low chance of exceeding the result expected by chance.

We can plug the results above into the binomial probability calculator at the Stat Trek web site. When you plug into numbers above into Stat Trek's binomial probability calculator, we get a probability of less than 1 in a million.

IN 2014 the biologist Rupert Sheldrake published a paper describing experiments involving ESP and telephone, E-mails, and text messages. It is supposedly not uncommon for people to get a phone call from a distant acquaintance, and to say something like, "Funny, I was just thinking of you." Sheldrake did experiments to try and verify whether there is anything more than just coincidence behind such thoughts. The paper can be found here.

Sheldrake and Pam Smart tried a phone call test in which participants get a call from one of four different people, and must guess beforehand who the person is. Testing 63 subjects in a total of 570 trials, the average success rate was 40%, hugely above the expected 25% success rate. This 40% success rate had a probability of less than 1 in 1,000,000,000,000,000. Four of the subjects who did best were then retested under rigorous videotaped conditions. In 271 trials, the average hit rate was 45%, even more dramatically above the expected success rate of 25%., with a probability of less than 1 in 1,000,000,000,000.

Sheldrake and Pam Smart also did email experiments in which participants get an e-mail from one of four different people, and must guess beforehand who the person is. Testing 50 subjects in a total of 552 trials, the average success rate was 43%, hugely above the expected 25% success rate. This 43% success rate had a probability of less than 1 in 1,000,000,000,000,000,000. Five of the subjects who did best were then retested under filmed conditions. The average hit rate was 47%, even more dramatically above the expected success rate of 25%. These tests provide overwhelming evidence for the reality of ESP.

A spectacular ESP test result was reported in 2014
at the recent annual convention of the Parapsychological Association, in a paper entitled "Evidence for Telepathic Communication in a Nonverbal Autistic Child" written by Diane Hennacy Powell, MD. You can read the abstract here by scrolling down to page 25. Powell did experiments with an autistic girl named Hayley who can supposedly engage in telepathy with her therapists. The results reported below by Powell seem to be some of the most spectacular results ever reported in an ESP experiment:

Data from the first session with Therapist A includes 100% accuracy on three out of twenty image descriptions containing up to nine letters each, 60 to 100% accuracy on all three of the five-letter nonsense words, and 100% accuracy on two random numbers: one eight digits and the other nine. Data from the second session with Therapist A includes 100% accuracy on six out of twelve equations with 15 to 19 digits each, 100% accuracy on seven out of 20 image descriptions containing up to six letters, and between 81 to 100%

accuracy on sentences of between 18 and 35 letters. Data from the session with Therapist B showed 100% accuracy with five out of twenty random numbers up to six digits in length, and 100% accuracy with five out of twelve image descriptions containing up to six letters. There was no evidence of cueing or fraud.

Besides abundant experimental evidence for extra-sensory perception, there is also abundant anecdotal evidence, consisting simply of the experiences of ordinary people. The researcher Louisa Rhine collected some 14,000 cases of anecdotal evidence for ESP.

A strong piece of anecdotal evidence for ESP is the fact that telepathy is very commonly reported in accounts of near death experiences. Person having such experiences will often report that they communicated with someone telepathically during such an experience, with a kind of crystal-clear telepathic communication occurring.

I will give an example of anecdotal evidence for ESP that I can personally testify to. Years ago I was at the Queens Zoo in New York City with my two daughters when they were teenagers. We were looking at a feline animal called a puma, which we could see distantly, far behind a plastic barrier. Suddenly (oddly enough) I had a recollection of a zoo visit I had about eight or ten years previously, when I saw a gorilla just behind a plastic barrier, at the zoo at Busch Gardens in Florida. About three seconds later (before I said anything), my younger daughter said, "Do you remember that gorilla we saw close-up in Busch Gardens?" I was flabbergasted. It was as if there was telepathy going on. The incident seems all the more amazing when you consider that teenagers live very much in the present or the near future, and virtually never talk about things that happened 8 years ago. There was nothing in our field of view that might have caused both of us to have that recollection at the same time. On that zoo visit we hadn't seen a gorilla, nor had we seen any animal near a plastic barrier.

When we moved to the next zoo exhibit, just for laughs I asked my older daughter whether perchance she also was thinking of that gorilla we saw about 8 or 10 years ago, before anyone mentioned the gorilla. My jaw dropped when she reported: yes, she also was thinking of that gorilla we saw about eight or ten years ago in Busch Gardens, before anyone had said anything about it. So apparently before anyone said anything, we had three out of three people all recalling the same very distant memory – a memory of seeing a gorilla about eight or ten years ago. How do you explain such a thing without a hypothesis of something like ESP? The odds of such a coincidence seem less than 1 in a billion.

When I was a young man, I played a guessing game with one of my sisters. We were in a large house with quite a few rooms. The game worked like this: in each round, one person would think of an object somewhere in the house, and ask the other person to guess it. The other person could only ask questions with a yes or no answer, and as soon as there was a single "no" answer, the round was considered a failure. Objects were picked from random locations all over the house, with my sister and me alternating as the guessers. There were about 10 consecutive rounds in which all of the answers were "yes," with the object being correctly guessed without any "no" answers. The odds of this happening by chance seem like less than 1 in a trillion.

Innumerable people all over the world have reported such experiences. But despite massive anecdotal evidence, and despite the absolutely convincing laboratory evidence I have discussed, materialists continue to claim, very inaccurately, that there is no evidence for ESP. They claim that ESP experiments have been debunked. No such thing has actually occurred. They claim that Rhine's experiments haven't been replicated. They have repeatedly been replicated.

See the link here for Dean Radin's page giving links to very many successful experiments in ESP and other psychic abilities, a page including a very large amount of evidence of successful replication.

What we have in the case of the mainstream's treatment of ESP is simply the construction of a social taboo that has no intellectual justification. The taboo exists purely for ideological reasons. Our materialists know that the evidence for ESP is irreconcilable with claims that minds are purely a product of brains. So our materialists are stonewalling, simply refusing to accept the very large body of convincing evidence that ESP exists. Wearing such horse blinders is conduct unbecoming a scientist.

Despite massive convincing evidence for ESP and other psychic phenomena, science is held back because the dogma-bound interpretations of scientists lag far behind the data they have accumulated and the technology at their disposal. In some cases our data demands a bold new twenty-first century outlook that never appears because the minds of scientists are hampered by the dogmas of earlier decades or the thought customs that became fashionable in the little professor tribes of academia.

at April 02, 2018 No comments:

Labels: ESP

The Brain Has Nothing Like 7 Things a Computer Uses to Store and Retrieve Information

Our neuroscientists like to claim that our memories are stored in our brain. There is a way to test this claim. I will review each of the things that a computer uses to store and retrieve data, and in each case I will ask: is there something like that in the brain? I will use pretty much the simplest example of data storage and retrieval I can think of: the storage of a small file containing a few words of text. Below are the things that a computer uses to store and retrieve such information.

Item # 1: An Operating System

Besides applications that do specific things, a computer has what is called an operating system that does various low-level tasks. Bill Gates originally made his fortune by selling the MS-DOS operating system that was the first high-selling operating system used by personal computers. Nowadays if you have a desktop computer you may be using some Windows operating system such as Windows 10, or some Apple operating system. An operating system is a highly complex and coordinated base of code that serves as a kind of foundation for applications that are built to leverage that operating system.

As far as we know, the brain has no such thing as an operating system. There are particular genes that list the amino acid constituents of particular brain proteins, but those structural proteins are like hardware, rather than the software that is an operating system.

Item # 2: An Application to Store and Retrieve Data

While it is possible to store a small amount of data on a computer merely using a nerdy command-line string of characters, almost no one does that to store text data. Instead, 99% of the time someone will use an application to store data. An application is a program that does some specific type of work, typically by leveraging the functionality in the operating system. A person using a Windows operating system might use an application program such as Notepad, Wordpad, or Microsoft Word to store text data.

As far as we know, the brain has no such thing as application programs. No one has ever given a coherent description of how storing information to the brain would involve making use of "how to" instructions stored elsewhere in the brain, some set of instructions that could be compared to an application program.

Item # 3: The ASCII Code for Encoding Information

Text is never directly written to a file stored on your computer's hard drive or a zip-drive. If, for example, you were to break apart your computer's hard drive (or break apart a small zip drive), and look at its contents in a high-magnification microscope, you would never see little tiny "a," "b," and "c" characters. What actually happens when your text data is stored is this: (1) the ASCII code is used to convert each of your text characters into a number; (b) those numbers are then converted from decimal into binary; (c) the binary information is then stored on your computer's hard drive or a zip drive. The ASCII code consists of a table in which each character is represented by a number.

Does the brain have anything like this? As far as we know, it does not. The ASCII code is an example of an encoding protocol, and no one has ever been able to discover any encoding protocol used by the brain to store information.

Item # 4: A Decimal to Binary Conversion Table or Utility

The ASCII code merely converts letter to decimal numbers, numbers that use the Base 10 system. But computers store information using binary code, and when binary is used, numbers are stored using the Base 2 system. So rather than directly writing text represented in the ASCII code, an application must convert from decimal to binary.

This is another encoding protocol that does not correspond to any functionality known to exist in the brain.

Item # 5: A Medium That Allows a Permanent, Stable Storage of Information

When a computer has all the bits needed to write, it must have a stable medium to write to. Some of the earliest stable media to write to were clay (used in writing cuneiform), parchment, and paper. Nowadays computers use a stable medium such as magnetic disks.

Does the brain have anything like this – some medium allowing a permanent, stable storage of information? It would seem not, at least nothing that could be used by the brain to store memories that last for years. The main assumption during the past decades has been that memories are stored in synapses. But synapses are an unstable "shifting sands" type of medium subject to high molecular turnover and structural turnover. As discussed earlier, rapid molecular turnover in synapses should make them unsuitable for storing memories that last longer than a year. But humans are able to remember many memories for 50 years or longer. As a scientific paper puts it:

Experience-dependent behavioral memories can last a lifetime, whereas even a long-lived protein or mRNA molecule has a half-life of around 24 hrs. Thus, the constituent molecules that subserve the maintenance of a memory will have completely turned over, i.e. have been broken down and resynthesized, over the course of about 1 week.

The DNA inside neurons is a stable medium for permanent information storage, but it doesn't seem to be used for storing our memories. Our DNA has been exhaustively studied by projects such as the Human Genome Project and the Encode project. No one has discovered the memories of any particular human in that human's DNA.

Shockingly, there seems to be no plausible candidate for a particular component in the brain where the brain could be storing memories that last for decades. Neither synapses nor DNA is such a plausible candidate.

Item # 6: A Storage Location System by Which the Exact Position of a Data Item Can be Specified, Allowing Fast Retrieval from an Exact Location

When a computer stores data on a hard drive or zip file, it's not similar to adding to a heap, something similar to pouring another cup of water in a swimming pool full of water. It's always rather like putting some new papers in a particular file of a filing cabinet. This is so that information can be retrieved rapidly. You can get papers from a file in a file cabinet quickly, but it would take you way too long to get that information if you just had some giant heap of papers in the middle of your office.

So whenever your computer stores data, it has some idea of a specific location where this data will be saved. For example, you may store your little text data in a file called SaturdayNote.txt in a folder or directory called MyTextFiles. That gives the computer a way to retrieve this information quickly, by first going to that particular folder or directory, and then searching for the file named SaturdayNote.txt file in that particular folder or directory.

Does the brain have any type of similar system for storing information in specific named locations? As far as we know, it does not. It's hard to conceive of how such a thing could possibly exist in the brain. The brain is more like a tower-sized ball of tangled spaghetti than some city with labeled streets. There seems to be no way in which a brain could ever know exactly where some data was that it was storing. Neurons don't have any coordinate system allowing anything to tell a precise location in the brain. If your brain somehow wrote some information to a brain position of X=2345, Y=24342, Z=73252, there would be no way for the brain to record that exact position in a way that would allow that exact location to be quickly accessed. Writing some information to the brain would seem to be like writing on some index card, and throwing it into the middle of an Olympic-sized swimming pool full to the brim with index cards. Under such a setup, instantaneous retrieval of some precise information should be impossible.

Item 7: Read/Write Functionality Allowing Data to Be Written to a Specific Location and Also Read From the Same Location

The discussion under Item #6 above was purely a discussion of an organizational system in which some data can be given a location for it to be stored. A separate requirement is that data can be written to a storage medium, and also read from that storage medium. The reading and the writing must occur in a very consistent way, so that the data read is exactly the same as the data written.

Your computer has one or more systems capable of such read/write functionality. For example, a hard disk in a computer is a read-write device. There is complicated hardware involved. There is a read-write arm which can move back and forth in a particular line, and also a spinning disk underneath that arm. At the end of the read-write arm is a read-write head that can read data when it is above some particular location. With the combination of these two things, the system can read and write from any desired location on the disk.

A read-write head of a hard drive

Does the brain have any such read-write functionality? Some think that what is called long-term potentiation acts like a write system for storing memories. But the term long-term potentiation is very misleading. Long-term potentiation (LTP) is actually a very short-lived effect, almost always lasting less than a few weeks. The brain may have some kind of system for writing something that will last a short time, rather comparable to someone writing in the wet beach sand with his fingers. But there is no known write mechanism by which the brain could permanently store data.

When it comes to read functionality, we know of no mechanism at all for such a thing. There seems to be absolutely nothing in the brain similar to the read-write head of a hard disk, something that might allow the brain to “zoom in” and read from one particular location. A system has to be organized in a very specific way for read-write functionality to be possible, and the brain seems to be organized in no such way.

Our neuroscientists tend to dogmatically speak as if our memories are all stored in brains, but this is more of an ossified dogma rather than a truth determined by observations. Neuroscience itself undermines such a doctrine, by indicating that there is no stable component that the brain could be using to store memories lasting decades. Comparing the brain to a computer, we find that the brain has nothing like any of the 7 main things that the computer uses to store and retrieve data. But our minds recall obscure information instantly, and a single phrase may get you to instantly recall some old tune you have not heard in 50 years (as recently happened to me).

The discussion above should be very discouraging to anyone who hopes to explain how brains could achieve the memory capabilities of human minds. To such a person I must merely say: you're barking up the wrong tree. The feats of our minds cannot be explained solely in terms of the brain. We must postulate some psychic or spiritual component to account for the feats of our minds, something beyond the brain. Such a thing is needed to account for the wonders of psychic phenomena, and is also needed to account for the ordinary marvels of the human mind such as the instantaneous recall of childhood memories.

We may imagine the following conversation between a curious young boy and a distracted mother walking on the street.

Boy: *Mommy, who made the clothes I wear? And who made the TV shows I watch? And who made the cars I see? And who made the street lights?*

Mother: *The answers are simple, my son. They are: Santa Claus, Santa Claus, Santa Claus, and Santa Claus.*

We can also imagine a similar conversation between a philosopher and a neuroscientist.

Philosopher: *From whence comes that hint of the transcendent we feel when we look at a sky ablaze with stars? From where do our loftiest ethical principles arise? Why do we lie awake and ponder the weightiest riddles of existence? How do we ever grasp the most abstract notions such as the idea of the universe and the eternal laws of nature?*

Neuroscientist: *The answers are simple. They are: neurons, neurons, neurons, and neurons.*

Such simplistic answers are convenient, but should we not suspect such complex questions have equally complex answers?

at April 02, 2018 No comments:

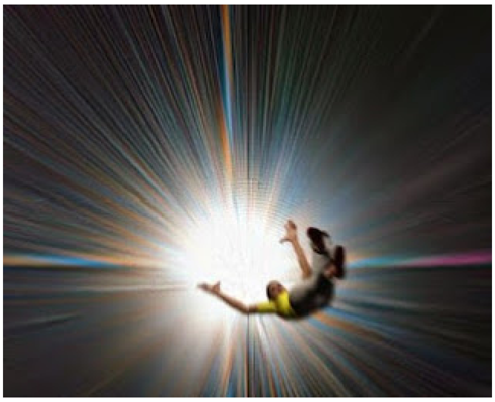
The Many Cases Showing a Person's Mind Can Operate When His Brain Has Shut Down

The dogma that our minds are produced by our brains is a dogma that makes some very definite predictions. One prediction of such a dogma is that human mental activity should completely stop both after someone dies and after someone's brain shuts down. During cardiac arrest, a person will “flatline.” Not only will his heart stop beating, but his brain waves will also stop within 2 to 20 seconds after his heart stops. This means the brain has stopped working. Unless the person is revived through medical resuscitation efforts, he will die.

Experimental results on the cessation of brain electrical activity after heart stoppage are summarized on page 28 of this document. There we are told that Hossmann and Kleihues in 1973 tested with 200 cats and 21 monkeys, and found that EEG (a measure of the electrical activity in the brain) became "isoelectric" (in other words, a flat line) within 20 seconds following the stop of blood to the heart. We are also told that a result of the brain flat-lining within 15 seconds was produced in 1991 with 37 dogs (Stertz et. al.), with 143 cats (Hossmann, 1988), and with 10 monkeys (Steen et. al. 1985).

But contrary to the predictions of the dogma that minds are produced by brains, it is often found that mental activity continues after both the heart and the brain have shut down. Such events are called near-death experiences.

Near-death experiences first came to public light in the 1970's with the publication of Raymond Moody's book *Life After Life*. Patching together elements from different accounts, Moody described an archetypal typical near-death experience, while noting that most accounts include only some elements in the described archetype. The archetype NDE included elements such as a sensation of floating out of the body, feelings of peace and joy, a life-review that occurs very quickly or in some altered type of time, a passage through a tunnel, an encounter with a being of light, and seeing deceased relatives.



A study on near-death experiences was published in the British medical journal *The Lancet* in 2001. The study interviewed 344 patients who had a close encounter with death, generally through cardiac arrest. 62 of those reported some kind of near-death experience. 15 reported an out-of-body experience, 19 reported moving through a tunnel, 18 reported observation of a celestial landscape, 20 reported meeting with deceased persons, and 35 reported positive emotions.

The AWARE study was published in 2014 in the journal Resuscitation. It was entitled, "AWARE—AWAreness during REsuscitation—A prospective study." The URL can be found here.

The AWARE study name is an acronym for *awa*reness during *re*suscitation – the type of resuscitation that takes place when a person has a heart attack (cardiac arrest) and almost dies. The study collected data at 15 different hospitals, and was carried on over the course of four years. The study attempted to gather accounts of people's recollections in hospitals after they had very close encounters with death, typically during a heart attack or cardiac arrest. Over 2000 cardiac arrest cases were studied, and there were only 330 who survived to leave the hospital. Of those 330, only 101 met eligibility requirements, agreed to be interviewed, and also agreed to "stage 2" interviews.

So the study ended up with a group of only 101 persons who had experienced a close encounter with death, generally because of a cardiac arrest. Of this pool of 101 persons, 22% answered "Yes" to the question, "Did you have a feeling of peace or pleasantness?" 13% answered "Yes" to the question, "Did you feel separated from your body?" 13% answered "Yes" to the question, "Were your senses more vivid than usual?" 8% answered "Yes" to the question, "Did you seem to encounter a mystical being or presence, or hear an unidentifiable voice?" 7% answered "Yes" to the question, "Did you seem to enter some other, unearthly world?" Only 3% answered "Yes" to the question, "Did you see deceased or religious spirits?"

These results are corroboration of published accounts of what typically happens in a near-death experience, although the numbers are smaller than those reported in the Lancet study. As discussed here, the AWARE study does quote one respondent who gives an account very much like what has been published in previous books on near-death experiences:

I have comeback from the other side of life. ..God sent (me) back,it was not (my) time — (I) had many things to do. ..(I traveled) through a tunnel toward a *very strong light, which didn't dazzle or hurt (my) eyes. ..there were other people in the tunnel whom (I) did not recognize. When (I) emerged (I) described a very beautiful crystal city. .. there was a river that ran through the middle of the city (with) the most crystal clear waters. There were many people, without faces, who were washing in the waters. ..the people were very beautiful. .. there was the most beautiful singing. ..(and I was) moved to tears. (My) next recollection was looking up at a doctor doing chest compressions.*

While the AWARE study did not find a very large number of cases of near-death experiences, the study did "hit the jackpot" in regard to one case of a 57-year-old patient who said that he floated out of his body while being revived from his cardiac arrest. The man said that a woman appeared in a high corner of the room, beckoning him to come up to her. He said that despite thinking that was impossible, he found himself up in the high corner of the room, looking down on the medical team trying to revive him. The man described specific details of the revival efforts, including the presence of a bald fat man with a blue hat, a nurse saying, "Dial 444 cardiac arrest," his blood pressure being taken, a nurse pumping on his chest, a doctor sticking something down his throat, and blood gases and blood sugar levels being taken.

Here is what the AWARE scientific paper said in regard to the accuracy of these recollections:

He accurately described people, sounds, and activities from his resuscitation...His medical records corroborated his accounts and specifically supported his descriptions and the use of an automated external defibrillator (AED). Based on current AED algorithms, this likely corresponded with up to 3 minutes of conscious awareness during CA [cardiac arrest] and CPR.

So here is a man who had a heart attack, and should have been unconscious during the medical efforts to revive him. Instead he accurately describes the details of what happened. Moreover, he claims that he observed these details while in a position above his body, in the high corner of the medical room. What we have here is what seems like a good-as-gold vintage "out of the body experience," one with details that have been verified. This is an example of what is called a veridical near-death experience – one with observations that were subsequently verified.

In terms of its credibility and evidential value, the case may rival the famous Pam Reynolds case. At the time of her brain operation, the late Pam Reynolds was a 35-year old who had a large brain aneurysm. She underwent a very complicated operation that involved pumping out her blood and chilling her body temperature to only 60 degrees. Some twenty medical personnel worked on the complex operation.

After the successful operation was over, Reynolds reported having a near-death experience during the operation. She reported floating out of her body, and witnessing her operation. She accurately reported details of some medical equipment that was used to cut her skull open, describing it as a "saw thing...like an electric toothbrush," with "interchangeable blades" that were stored in "what looked like a socket wrench case." She reported someone complaining that her veins and arteries were too small. These details were later verified. This was despite the fact that during the operation Reynolds eyes were covered throughout the operation, and her ears were plugged with earplugs delivering noise of 40 decibels and 90 decibels (not to mention that her body was chilled to a level at which consciousness should have been impossible).

Reynolds said that she then encountered a tunnel vortex, saw an incredibly bright light, heard her deceased grandmother calling her, and encountered several of her deceased relatives. Reynolds says she was told by her uncle to go back through the tunnel, and to return to her body. These details were originally reported in the 1998 book *Light and Death* by Michael Sabom MD. That book includes diagrams of the medical equipment used to cut open Reynold's skull. They match her descriptions very well.

Many people have heard of one or two of these veridical near-death experiences, perhaps the Pam Reynolds case or the often-told story about "Maria's shoe." But judging from the book *The Self Does Not Die: Verified Paranormal Phenomena from Near-Death Experiences,* these veridical near-death experiences may not be so rare. Below are some of the cases documented in that book.

Case 2.1: A dying cancer patient remarked to Ricardo Ojeda-Vera (a doctor's assistant) that he had written a beautiful letter to his mother. Ojeda-Vera had written such a letter. The patient "described in detail exactly what he had written," and accurately recounted that he had worn a green bathrobe while writing the letter. The patient claimed to have seen Ojeda-Vera writing the letter while she had "looked down on him from the ceiling." Three days later the patient died.

Case 2.2: A patient reported having an out-of-body experience (OBE) during a cardiac arrest, and reported seeing a penny on the top of a cabinet. The cabinet was checked, and a penny was found there.

Case 2.3: In this well-known case, a woman named Maria reported floating out of her body during a cardiac arrest, and that during such an experience she saw a dark blue tennis shoe on a ledge near a window on the third floor. A search found such a shoe in such a location.

Case 2.5: At a hospital a woman who had a cardiac arrest reported having an out-of-body experience during which she floated out of her body, and saw a 12-digit serial number on the top of a six-foot tall respirator. The respirator was later checked and found to have exactly that number on its top.

Case 2.6: A man reported having an out-of-body experience during which he observed a 1985 quarter atop an 8-foot-high cardiac monitor. The top of the monitor was checked, and a 1985 quarter was found on its top.

Case 2.8: A man reported having an out-of-body experience during which he observed medical workers putting defibrillation paddles on him and gel. This matched his actual medical experience during his cardiac resuscitation.

Case 2.11: a woman reported floating out of her body during a cardiac arrest, and that during such an experience she rose up through the hospital's floors, rising up above the roof, where she saw the skyline and a red shoe. A search of the hospital's roof found a red shoe on the roof.

Case 2.12: A man reported that during his cardiac operation he floated out of his body and returned to his home, where he saw a caretaker having sex there with his girlfriend. The caretaker admitted this had happened.

Case 2.13: A woman reported that during her operation she floated out of her body and saw doctors telling her family (incorrectly) that she had died. It was later confirmed that the family had been told that.

Case 2.14: A woman reported having a near-death experience in which she looked down at her body from a corner of a hospital room during her operation. She then reported seeing in a paranormal way two of her grandmothers saying in a cafeteria that they were going to have a cigarette, even though neither smoked. It was confirmed that this improbable thing had happened.

Case 2.15: A patient in the intensive care unit of the hospital had a near-death experience in which he was reportedly able to hear the conversations of relatives elsewhere in the hospital, such as a waiting room conversation about a green toy tractor knocking down a wall of toy bricks. The conversations had occurred far away from his location in the hospital.

Case 3.1: A woman put under general anesthesia during her operation reported details of her operations from an "on the ceiling" perspective, and also correctly reported details of an operation in the adjacent operating room, such as the amputation of a leg and its placement in a yellow bag. She made the report as soon as she woke up, and had no way of knowing such information.

Case 3.7: A man missing his dentures correctly reported a nurse putting them in the drawer of a cart during his cardiac resuscitation, when he should have been completely unconscious.

Case 3.8 A man reported a near-death experience during cardiac arrest. He reported that during the medical efforts to revive him, he saw that a nurse dropped a tray and was scolded about it by a doctor. The account was confirmed.

Case 3.9 A woman had a near-death experience during cardiac arrest. She reported hovering in a corner of the room near the ceiling, and noticed a rose-shaped hair clip and a bottle breaking, details she should have been unaware of. The details were accurate.

Case 3.10 A patient unconscious during his operation reported floating above his body, and accurately described details of his operation.

Case 3.11 This dramatic near-death experience account is told in the youtube.com interview here. A patient was written off for dead, and had no vital signs for "close to 20 minutes." During that time he had "no heart beat, no blood pressure, no respiratory function." But then in a seemingly miraculous manner the patient's vital signs reappeared, and he eventually "recovered fully." The patient described a near-death experience in which he observed post-it notes in the operating room that he should have been unable to observe because his eyes were taped and he was unconscious. The details were accurate.

Case 3.12 A patient whose heart was stopped reported a near-death experience in which he heard some paramedic say something to the effect that the patient would never revive, but a rookie paramedic could use the patient to practice CPR. After undergoing an amazing recovery, the patient told what he had heard to one of the paramedics, who was amazed that the man had apparently heard what the paramedic had said.

Case 3.16 Medical staff tried to save a patient who had undergone cardiac arrest, and they decided to stop the resuscitation efforts. They later found a faint pulse, and resumed the revival efforts. The man survived, and described the medical efforts trying to revive him. He "got all the details right, which was impossible" because he had no pulse during such efforts.

Case 3.18 A man who had a cardiac arrest during an operation reported to his doctor that he had seen a brown leather key fob fall out of the doctor's pocket during the operation. The doctor confirmed that such a thing had happened, at a time when the patient should have been unconscious.

Case 3.29: This case is the famous Pam Reynolds case, which I discussed above. While having her senses blocked and her temperature dramatically lowered during an operation that should have guaranteed unconsciousness, Reynolds reported a near-death that included very specific details of her operation she should have been unaware of.

Case 3.30: A boy who underwent cardiac arrest recalled that during the medical efforts to revive him he "had been up in a corner of the room and had looked down on his body." He correctly recalled several details of the procedure.

Case 3.33: A man who underwent cardiac arrest reported an out-of-body experience in which he felt himself "rising up through the ceiling" and then seeing some hospital area in which there were mannequins. Above the ICU he was in was a CPR training area in which there were dummies (resembling mannequins) used for CPR training.

There are many other similar accounts in this compelling and well-documented book, which I recommend. The book documents all the original sources of these accounts.

Such accounts present two great difficulties for anyone claiming that these near-death experiences were just hallucinations. The first difficulty is accounting for the similarity of the accounts. Many times in the book we hear accounts of people who said they floated out of their bodies and watched their operations or medical resuscitation attempts from a corner of the hospital room or the ceiling of the room. Why should such a narrative element occur so often in hallucinations, which we would expect to have only random content? The second difficulty is explaining the accurate details in such accounts. To deal with that, the skeptic may tie himself in knots, telling us nonsense such as the suggestion that someone might record perceptions while he in unconscious, and then play them back in his mind when he awakes. No such ability of humans has ever been proven.

Such near-death experiences may or may not prove that you are destined to live forever after you die. But the veridical near-death experiences provide very good evidence that the human mind can continue to operate well after the brain has shut down, as a brain does during cardiac arrest. Such a thing is of decisive importance to the matter being investigated by this site. If a mind can continue to operate well after a brain has shut down, that is decisive evidence against the idea that the mind is merely something produced by a brain. Traditional dogmatic claims that the mind is a product of the brain are refuted by the cases discussed in this post.

If you do a Google search to research how soon the brain shuts down after the heart stops, you will find several articles claiming that the brain continues after the heart stops. But these stories are based not on brain wave readings, but on near-death experiences. What's going on is that the writer hears accounts of people experiencing near-death experiences after the heart has stopped, and then reasons, "So, his brain must have still been working." But the evidence is clear: the brain shuts down and brain waves "flat line" within a few seconds after the heart stops. Near-death experiences are cases of the mind continuing after the brain has stopped working.

A Google search may find various news reports of a single study that found a brain operating a few minutes after someone died. But that case is a fluke that was probably a false reading issue, and the type of brain wave found was only a delta wave (the type that people have during deep sleep). Near-death experiences don't have a faint dream-like quality. A study done by seven scientists found that the memories of near-death experiences are even more vivid than regular life experiences, and that therefore such near-death experiences "cannot be considered as imagined event memories."

at April 02, 2018 No comments:

Labels: near death experiences

Reasons for Doubting a Brain Could Do the Super-Complex Encoding Needed to Neurally Store Episodic Memories or Concepts

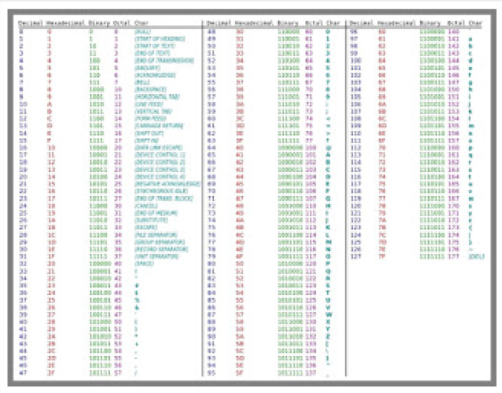
Scientists have published innumerable papers on memory that used "encoding" in their title. Encoding refers to a supposed translation effect in which information in our minds is translated so that it can be stored in our brains. But the existence of all these papers does not actually establish that any such thing as memory encoding actually occurs. In the past scientists published innumerable papers and essays on caloric, phlogiston and the ether, none of which is now believed to exist. And scientists in recent decades have published many thousands of papers on supersymmetry, superstrings, and dark matter, none of which has been proven to exist. The vast majority of papers that use "encoding" in their title are simply papers about human memory experiences and experiments, papers that do nothing at all to show that perceptual experiences or learning are translated into neural states. The term "encoding" is often used in such papers to give a hard-science aura to research that is purely psychological. No scientist has ever provided convincing evidence that experiences or conceptual learning are actually translated or encoded in some way that allows them to be stored as neural states.

The topic of encoding actually gives another argument for disbelieving that human memories are stored in brains. I can summarize the argument as follows: when we analyze in detail what a brain would need to do on a low-level in order to store memories, we find that the brain would need to use a whole set of encoding protocols so sophisticated that they could not have naturally arisen.

To explain this argument I must first explain what is meant by an encoding protocol. To understand the idea of encoding memories, you have to realize that there is pretty much no such thing as “just storing” information. Almost every type of information that we know of involves some type of encoding. Encoding is when information is stored using some particular system of representation.

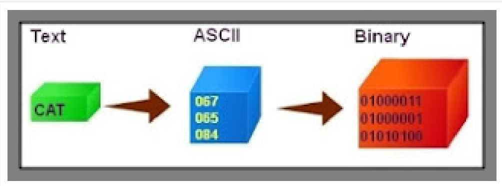
Let me give some examples to clarify the idea. Consider the storage of written words. A system of symbols (the alphabet) may be written to store the words. Each time someone types the letters “cat” to mean a cat, that person is using an encoding protocol known as the alphabet.

When words are stored on a computer or smartphone, multiple levels of encoding are involved. First, there is the alphabetic encoding. Then there is what is called an ASCII encoding. The individual letters are converted to numbers, using an ASCII table that signifies how particular letters will be stored as particular numbers (an example of an ASCII table is below). Then there is a binary encoding by which numbers such as 34 written in the base 10 system are converted to a series of 1's and 0's such as 100101101.

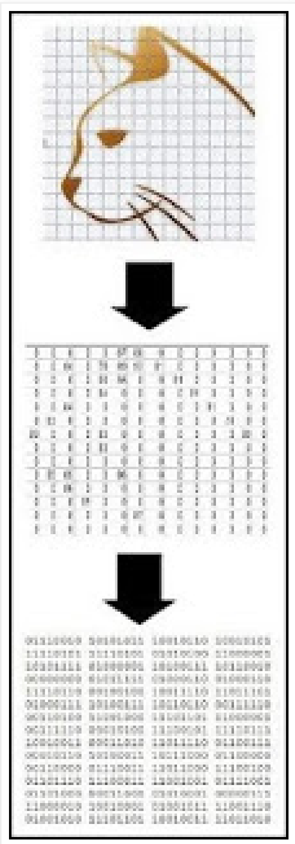


ASCII is an encoding protocol

We see in the diagram below three different types of encoding going on when the word “cat” is stored on a computer.



When an image is stored on a computer, there are also multiple types of encoding going on. The image is broken down into a grid of pixels; each pixel is translated into a number indicating a particular shade of color; then those numbers are translated into binary form that is ideal for storing on a computer hard drive.



Encoding of a visual image

Now let us consider how the brain might store memories. Just as there is pretty much no such thing as “just storing” information on a computer, without using some type of encoding, there could be no such thing as “just storing” a memory in the brain. If we are to imagine that the brain stores memories, we must imagine that the brain somehow does encoding to get the memory stored to the brain.

It is hypothesized that the brain might store memories using things such as molecules or nerve cell electrical states. But just as information must always be encoded before it can be stored on a hard drive, there would need to be encoding before any memory information could be stored in something like molecules or electrical states. For example, we cannot imagine that a molecule would ever directly store some letters that we could see using an electron microscope that might show a tiny little "Y" and "G" on a molecule. Nor can we imagine that if we scan your brain with an electron microscopic, we would find tiny images representing scenes from your life, images that could directly be seen in the electron microscope's closeup photos. Instead, if the brain stores memories, there would need to be some low-level encoding causing the memories to be stored in a way that can efficiently be represented by molecules or nerve cell electrical states or neuron connections.

But here a very great difficulty arises. The problem is that human memories include an incredibly diverse collection of things. Consider only a few of the types of things that can be stored in a human memory:

- Memories of daily experiences, such as what you were doing on some day
- Facts you learned in school, such as the fact that Lincoln was shot at Ford's Theater
- Sequences of numbers such as your social security number
- Sequences of words, such as the dialog an actor has to recite in a play
- Sequences of musical notes, such as the notes an opera singer has to sing
- Abstract concepts that you have learned
- Memories of particular non-visual sensations such as sounds, food tastes, smells, pain, and physical pleasure
- Memories of how to do physical things, such as how to ride a bicycle
- Memories of how you felt at emotional moments of your life
- Rules and principles, such as "look both ways before crossing the street"
- Memories of visual information, such as what a particular person's face looks like

Now given all these types of things that can be remembered, there would seem to be two possibilities if the brain is storing all your memories:

Possibility 1: The brain has a single "all-purpose" encoding system that somehow works for all of these extremely diverse types of memories.
Possibility 2: The brain uses many different types of encoding protocols; and when it is time to store a memory, the brain somehow figures out the appropriate encoding protocol to use.

The problem is that neither of these options seem credible.

Given the incredible diversity of the various types of memories listed above (which is not even a complete list of all the types of memories that can be stored), it seems unreasonable to imagine that there could ever be any universal "all purpose" encoding system that could work with things as dissimilar as memories of smells, miscellaneous learned facts, principles of living, and long sequences of musical notes or letters. It would seem that many of the types of memories would require their own distinctive type of encoding system.

But it also seems very hard to imagine that the brain could encode memories by using a variety of encoding schemes, and selecting the appropriate encoding scheme to use at the moment that a memory is stored. The problem with that idea is that it requires for us to believe that the brain subconsciously is able to instantly figure out what type of information a memory is, and to then select the appropriate encoding scheme. That would seem to involve some incredibly sophisticated instantaneous analysis, and how could such a thing all be going on subconsciously?

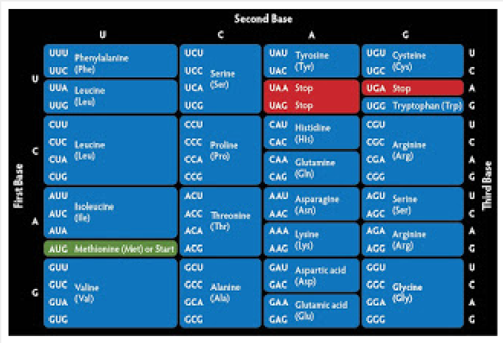
It seems very hard to believe, for example, that if you meet some young woman at a party, and ask for her phone number, that behind the scenes your brain subconsciously is acting like this: *well, well, I have a face to store, so let me use the "visual data encoding system" I have stored in such and such a place; and for the phone number let me use the "numerical sequence encoding system" I have stored in some other place; and to store her name let me use the "alphabetic data encoding protocol" I have stored in some other place; and to store the scent of her perfume, let me use the "smell encoding system" I have stored in some other place.* All this classification and selection seems to be far too much work to be done subconsciously. Nor can we believe that a selection of encoding systems occurs consciously, for we never (or virtually never) have any conscious thoughts about what type of encoding protocol to use when we remember things.

In short, explaining how encoding could work on a low-level to store memories is a practical nightmare. Our psychologists say that some encoding is going on when memories are stored, but none of them has succeeded in presenting a plausible and detailed description of exactly how such encoding could work. When discussing the issue, psychologists and neurologists will typically combine speculation and tangential findings in a way that will skillfully hide their lack of any mechanism for how such encoding could occur.

When we consider the storage of multifaceted or abstract ideas, it is hard to think of how encoding could possibly work. How, for example, could your brain possibly do some encoding that would represent your mother or the concept of treating people equitably or the idea of the United States as some series of electrical states in the brain, some molecular states, or some combination of the two? We cannot imagine any such encoding.

How can we escape such difficulties? We can abandon the materialist idea that your memories are all stored in your brain. We can believe that our minds are some mysterious spiritual or soul reality, and that memories are part of such a reality. If we no longer have to believe that all memories are being stored in particular parts of the brain, all of the difficulties in explaining memory encoding conveniently disappear. We could still continue to believe that our brains store some things that are rather loosely called memories, such as what are called motor memories, remembrance of how to do particular movements of parts of the bodies. But by believing that conceptual memories and experiential memories are part of some non-physical reality that the human mind is part of, we free ourselves from the seemingly impossible burden of having to explain how the brain could possibly have naturally developed encoding protocols that could represent such things.

We know of one encoding protocol that is definitely used by living things: the genetic code. This is the protocol by which particular amino acids are represented by particular trios of nucleotide bases. The genetic code is an encoding protocol roughly as complicated as the ASCII protocol. Below is how it is represented by *Genomics for Energy and Environmental Science*, US Department of Energy Office of Science:



But how did this genetic code ever appear naturally? This is a major explanatory nightmare for naturalists. The natural origin of the genetic code has never been plausibly explained.

But consider how great are the difficulties of a materialist who believes all of your memories are stored in your brain. It would seem that for memories to be stored in the brain, it would have to be that there naturally arose not just one sophisticated encoding protocol (the genetic code), but many such sophisticated encoding protocols –all the different encoding protocols needed to store our many different types of memories in our brains. The theorist who claims that your memories are all stored in your brain is like someone burdened by ten albatrosses hanging from his neck, each albatross being the burden of explaining how one of these encoding protocols could have naturally arisen. I haven't even mentioned the issue of decoding, which further doubles the explanatory burden of someone believing that the brain stores all your memories, by requiring such a person to believe that the brain also has a whole set of decoding protocols that are mirror images of the encoding protocols, decoding protocols used in retrieving stored memories that had been encoded using the encoding protocols.

It can be powerfully argued that if we have to believe that all of these sophisticated encoding protocols exist, this should make it ten times more difficult to explain how humans naturally came to exist. But there is an alternative. By believing that the mind has a spiritual reality or soul reality, we free ourselves from the burden of having to explain all these sophisticated encoding protocols that we would need to store all our memories in the brain – for we no longer have to believe that our memories are all stored in the brain.

I may note that there is zero direct evidence that brains or neurons actually do anything like an encoding of information as part of storing memories to brain. An article on a memory experiment states, "Press a scientist to tell you how memories are encoded and decoded in the brain, and you'll soon find that the scientific community doesn't have an answer." A psychologist notes, "Misleading headlines notwithstanding, no one really has the slightest idea how the brain changes after we have learned to sing a song or recite a poem." A 2010 book by two neuroscientists says in its preface, "One can search through the literature on the neurobiology of memory in vain for a discussion of the coding question: How do the changes wrought by experience in the physical structure of the memory mechanism encode information about the experience?"

When information is encoded, you may not be able to understand the encoding, but you can at least almost always tell that some type of encoding protocol was used (for reasons such as symbol repetitions). For centuries Europeans were unable to decipher the hieroglyphics of the ancient Egyptians, but at least they could tell that hieroglyphics were encoded information. There is nothing at all in the brain that we can point to and say, "This microscopic thing has some of the hallmarks of stored encoded information." Do a Google search for "signs of encoding in the brain" and you will find nothing referring to someone who found evidence that some matter in the brain showed a sign of encoding.

We know for sure that there is a simple type of encoding that goes on in human cells: the encoding needed to implement the genetic code, so that nucleotide base pairs in DNA can be successfully translated into the corresponding amino acids that combinations of the base pairs represent. To accomplish this very simple encoding, the human genome has 620 genes for transfer RNA. But imagine if human brains were to actually encode human experiential and conceptual memories, so that such things were stored in brains. This would be a miracle of encoding many, many times more complicated than the simple encoding that the genetic code involves. Such an encoding would require thousands of dedicated genes in the human genome. But the human genome has been thoroughly mapped, and no such genes have been found. This is an extremely powerful reason for rejecting the dogma that brains store human experiential and conceptual memories.

If you do a Google search for "genes for memory encoding," you will see basically no sign that any such things have been discovered, other than one of those hyped-up press stories with an inaccurate headline of "100 Genes Linked to Memory Encoding." The story is referring to a scientific study described by this paper, entitled "Human Genomic Signatures of Brain Oscillations During Memory Encoding." The very dubious methodology of the authors was to get data on gene expression, and try to see how much it correlated with oscillations in brain waves. Out of more than 10,000 genes studied, the authors have found about 100 which they claim were correlated with these brain wave oscillations. They state, "We were successful in identifying over 100 correlated genes and the genes identified here are among the first genes to be linked to memory encoding in humans." But the correlations reported are weak, with most of these 100 genes correlating no more strongly than .1 or .2 (by comparison, a perfect correlation is 1.0, and a fairly strong correlation is .5). The results reported do not seem any stronger than you would expect to get by chance. We would expect that even if there was no causal relation between gene expression and brain waves, that if you compared gene expression in more than 10,000 genes to brain waves, you might find purely by chance a tiny fraction such as 1% of the genes that would look weakly correlated to brain waves (or any other random data, such as stock market ups and downs). In one of the spreadsheet tables you can download from the study, there is a function listed for each of these roughly 100 genes, and in each case it's a function other than memory encoding. So such genes cannot be any of the thousands of dedicated genes that would have to exist purely for the sake of translating complex conceptual, verbal, and episodic memories into neural states, and vice versa, if a brain stored memories. No such genes have been identified in the genome.

The paper confesses, "All gene expression data are derived from different individuals than the ones that participated in the iEEG study." This means the paper is an absurdity. It is looking for correlations between one set of gene expression data measured in one set of individuals and another set of brain wave data measured in an entirely different set of individuals at a different time. That makes no more sense than trying to look for a correlation between some meal consumption in a 2016 woman's softball team and tooth decay rates in a 2017 male football team.

at April 02, 2018 No comments:

Labels: memory encoding

Head Truth

The huge case for thinking minds do not come from brains

Monday, April 2, 2018

Other Evidence of Human Paranormal Abilities

Essentially all cases of paranormal psychic abilities are evidence that the human mind involves something more than just a brain. In an earlier post I reviewed the massive evidence for extra-sensory perception. There is also very significant evidence that humans can have an anomalous ability to sense future events.

Experimental evidence for human precognition has been gathered by by Cornell University emeritus professor Daryl Bem. The research was published in a peer-reviewed scientific publication, the *Journal of Personality and Social Psychology*. The widely discussed paper was entitled, “Feeling the Future: Experimental Evidence for Anomalous Retroactive Influences on Cognition and Affect.”

In Experiment 1 described in the paper, subjects sat in front of a computer screen that displayed two images of a screen. The 100 subjects were told behind one of the screen was an image, and behind the other screen was nothing. The subjects were asked to guess which screen had the image behind it, during a series of trials running 20 minutes. When an erotic picture was used as the image behind the screen, subjects were able to guess correctly somewhat more often which screen had the image behind it. With erotic pictures, they guessed correctly 53% of the time, much more than the 50% expected by chance. With pictures that were not erotic, the subjects got results very close to the result expected by chance, 49.8%. Other similar experiments reported in the paper also got more statistically significant results.

Despite repeated claims by skeptics that these results have not been replicated, they have actually been well-replicated, as Bem has shown in a meta-analysis of similar experiments. His meta-analysis was published in the paper “Feeling the future: A meta-analysis of 90 experiments on the anomalous anticipation of random future events.” The meta-analysis can be found here.

Bem's meta-analysis discussed 90 experiments from 33 laboratories in 14 different countries. The analysis reported an overall effect of $p=1.2 \times 10^{-10}$. Roughly speaking, this means the results had a probability of about 1 in 10 billion. This is a very impressive result, showing statistical significance millions of times stronger than what is shown in typical papers reported by mainstream media. A typical paper that gets covered by the press will have an effect of only about p=.01 or p=.05.

There is also episodic evidence from human experiences outside of the laboratory. Larry Dossey's book *The Science of Premonitions* is an excellent summary of such episodic evidence. Below are some of the very interesting accounts in that book.

- A woman awoke at 2:30 AM, having had a nightmare that the chandelier above her baby's crib had fallen, crushing the child. In

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her dream she saw a clock with the numbers 4:35. She took the child out of the room with the chandelier, and brought the child to sleep with her. At 4:35 that morning, the chandelier did fall into the crib, exactly as in her dream.

- William Cox researched train accidents between 1950 and 1955, and found that in every case the number of people traveling on the trains was less than the number who rode similar trains that did not crash, suggesting a possible precognitive ability of humans.
- Quite a few people reported premonitions of the September 11, 2001 disaster before it happened. The four jet planes involved in the disaster had an average of only 21% of their seats filled, as if people had sensed something bad was going to happen.
- On May 3, 1812, John Williams had the same dream three times in a single night: a very specific dream about someone assassinating Spencer Perceval, the British Prime Minister. Eight days later Perceval was assassinated, and several of the details matched William's dream.
- A few days before he was assassinated, Abraham Lincoln had a dream that he would be assassinated.
- The famous writer Mark Twain had a dream about the death of his brother that turned out to closely match what happened a few days later.
- Several people had premonitions that something would go wrong on the Titanic before it sunk. One person who had a ticket on the ill-fated ship had two dreams that the ship would overturn, with passengers in the water.
- In 1950 a church blew up in Beatrice, Nebraska, at a time when the church normally would have had a choir practice. Amazingly, no one was hurt, because the church was empty. We can only guess at how many of these people felt a premonition of doom, and avoided their regular choir practice.
- According to research published in the Journal of the Society for Psychical Research, dozens of people had premonitions of disaster before the Aberfan avalanche that killed 144 people. Some had dreams about such a disaster before it happened.
- During World War II Winston Churchill had two premonitions that may have saved his life or those of others. One premonition led him to switch sides on his staff car. A bomb then went off near the side he moved away from. Another premonition led him to tell his kitchen staff to leave the kitchen and go underground. A bomb then destroyed the kitchen.
- Lawrence Francis Boisseau had a dream that the World Trade Center was collapsing around him. Boisseau was killed in the attack.

On page 263 of the book *Phenomena: The Secret History of the U.S. Government's Investigations Into Extrasensory Perception and Psychokinesis* by journalist Annie Jacobsen, we have an astonishing case of apparent precognition. The book states:

Out of Langford's mouth came a prophecy. "A United States Pentagon official would be kidnapped by terrorists on the evening of 17 December 1981."....Langford said he saw the terrorists breaking into the Pentagon official's apartment, binding and gagging the man, and then kidnapping him. Even more specifically, Langford saw this high-ranking official being shoved inside a trunk and secreted in the back of a van.

Sure enough, on December 17, 1981 exactly such a thing happened to Brigadier General James L. Dozier, who was kidnapped by a terrorist group called the Red Brigades. The van even had the same color mentioned by Langford.

I was not at all surprised to read about Boisseau's dream of the World Trade Center collapsing, for I had such a dream myself, several months before September 11, 2001. It was a very simple dream. In my dream, first I was standing inside the World Trade Center, and then the floor collapsed underneath my feet. In the dream I saw myself plunging as the whole building seemed to collapse. That day I told my wife that I had dreamed that the World Trade Center had collapsed. Several months later I was in the World Trade Center when a jet plane hit, but I was able to escape before the whole building collapsed. This is the only dream I have ever had about a building collapsing.

This is only one of many cases in which there was an uncanny match between something I dreamed and something that occurred. According to a wikipedia.org list, the most recent major earthquake in California was the Richter 6.0 quake of August 24, 2014, which caused over 300 million dollars of damage. About 4 hours before the earthquake, at about 2:00 AM I had a dream of a trash can mysteriously moving around on the floor, even though no one was touching it. I thought to myself: this might have been a dream of an earthquake tremor. Lying in my bed, I decided to send out a Tweet describing my dream – as soon as I woke up in the morning. When I woke up and checked the news, I saw it was too late – the earthquake had already occurred, a few hours after my dream.

One night I was eating dinner with my wife, watching the very entertaining and funny TV show *The Carbonaro Effect*. In this hidden camera reality TV show, magician Michael Carbonaro performs magic tricks in front of people who do not know that Michael is a magician and do not know that they are on TV.

I was watching the show in my living room, while my TV screen showed Carbonaro sitting with some other person at a table (I had not noticed they were in a room that was an office dining area). I went into my kitchen, where I could not see the show, and suddenly an idea popped into my head. It was an idea for something that would be very funny if it were done on *The Carbonaro Effect* show. My idea was that Michael Carbonaro could take a frozen fish and put it in a microwave oven, kind of saying, “I'm going to heat up my lunch now” in front of someone. Then when he opened the microwave door, there would be a live, moving fish about the same size as the fish he put in the microwave. I thought to myself: that would be very funny, to see something like that on this TV show.

I returned from my kitchen to the living room, to watch some more of the TV show. About 30 or 40 seconds later I saw Michael doing exactly what I had imagined. He took a frozen fish, and put it into the microwave. We saw the microwave oven apparently running, and then Michael appeared to take a live fish out of the microwave. He was saying something like, “Wow, I guess the fish came back to life,” or something to that effect. They might have done this trick by having a trick back door in the microwave, or maybe Michael had the live fish up his sleeve.

I had never seen the TV episode in question before, nor had I seen anything like it on any TV show. But my mind somehow managed to get the idea of exactly what was going to happen 30 or 40 seconds into the future – a totally weird and unpredictable type of thing. What are the odds of that happening by chance, maybe a million to one, or a billion to one?

The evidence for human precognition (cases of a paranormal foreknowledge of the future) is not as strong as the evidence for extra-sensory perception (ESP).

Prefrontal Cortex
- Why Most Animal Memory Experiments Tell Us Nothing About Human Memory
- Other Evidence of Human Paranormal Abilities
- Why Brains Are Not Suitable for Storing Long Sequences Like Humans Remember
- Why Brain Scans Don't Show Brains Make Minds
- Why Strokes, Alzheimer's Disease and Drunkenness Don't Prove the “Brains Make Minds” Dogma
- Synaptic Density Studies Contradict the Most Popular Memory Theory
- The Rare "Total Recall" Effect That Conflicts with Brain Dogmas
- Physical Connections Do Nothing to Explain Cognition
- The Sociological Reasons Why Bad Explanations Persist in Academia
- Split-Brain Cases Conflict with "Brains Make Minds" Dogma
- Why So Much of Neuroscience News Is Unreliable
- An Analogy Clarifying Why the "Brain Stores All Your Memories" Dogma Is Untenable
- Why Darwinism Fails to Explain the Human Mind
- What Is It That a Brain Does?
- Cloud Computing and a Non-Local Model of Consciousness
- Why We Do Not Understand the Origin of Complex Biological Innovations
- Our Minds May Arrive Top-Down Not Bottom-Up
- Fancy New Technology Fails to Prove Memory Dogmas
- The Argument for Determinism Collapses Once We Discard the "Minds Come from Brains" Dogma
- Animal Experiments Conflicting with the Dogma That the Brain Stores All Memories

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But the evidence for human precognition is nonetheless an additional reason for concluding that the human mind has a source other than mere neurons.

There is also strong evidence for another human paranormal ability: what is known as remote viewing. Most of this evidence has been gathered by a surprising source: the US government itself.

Remote viewing seems to occur when a human uses only his mind to gather information about external locations. The US government became interested in this topic because it thought that such a technique would have military applications, particularly in intelligence gathering.

A surprising fact is that between 1975 and 1995 the United States spent many millions of dollars investigating psychic phenomena. The investigations originated out of fears of falling behind the Soviet Union in this area (the Soviets were believed to have a vigorous program of psychic research). The US programs went under a variety of names, including the famous STARGATE program to investigate remote viewing (the alleged ability of certain people to gain knowledge of remote locations through paranormal means).

In 1995 the government paid a group called the American Institutes for Research to evaluate the program. The group issued a report recommending that the research be canceled, and it was. But many thought there was something very strange about this sudden termination of the program. If the remote viewing programs had not been producing positive results, why were they funded for twenty years? If humans are not capable of remote viewing, it should have taken no more than twenty days to discover that through testing, not twenty years.

In fact, there is every reason to think that the US government investigations into psychic phenomena were extremely successful, in terms of providing substantial evidence for the reality of certain paranormal phenomena. The historical record indicates that the US government experiments on remote viewing did produce positive results time and time again. One remote viewer, Joe McMoneagle, was awarded a Legion of Merit award for his successful remote viewing. A remote viewer working for the US government was apparently able to detect details of a new type of Soviet sub before its existence was known to the US government. There were numerous other remarkable successes, some involving the famous psychic Ingo Swann. Swann was reported to have detected rings around Jupiter at a time before such rings had been discovered by US spacecraft.

What is also interesting is that the very American Institutes for Research report that led to a cancellation of the program contained quite a few pages indicating that it was actually successful.

For example, on page 23 the report states the following (in a section written by University of California statistician Dr. Jessica Utts):

Using the standards applied to any other area of science, it is concluded that psychic functioning has been well established. The statistical results of the studies examined are far beyond what is expected by chance. Arguments that these results could be due to methodological flaws in the experiments are soundly refuted.

Then on page 35 of the report Dr. Utts reviews 154 experiments consisting of over 26,000 trials with 227 subjects. She says, “The statistical results were so overwhelming that results that extreme or more so would occur only about once in every 10^{20} such instances if chance alone is the explanation.” This is a statement that you would have to run the experiments

100,000,000,000,000,000,000 times before you would get by chance a result as significant as the results that were achieved. On page 50 of the report, Dr. Utts concludes the following:

It is clear to this author that anomalous cognition is possible and has been demonstrated. This conclusion is not based on belief, but rather on commonly accepted scientific criteria.

Journalist Annie Jacobsen has written an excellent new 500-page book entitled *Phenomena: The Secret History of the U.S. Government's Investigations Into Extrasensory Perception and Psychokinesis*. The book is a very fascinating look into decades of governmental involvement in paranormal phenomena.

We are told on page 72 that in 1960 a Soviet scientist said this:

Today the American Navy is investigating telepathy on their atomic submarines. Soviet scientists conducted a great many successful telepathy tests over a quarter of a century ago.

On page 78 the book tells us that the Russian woman known as Nina Kulagina (born as Ninel Kulagina) was filmed apparently stopping the heart of a frog through psychokinesis. We are told, "The film caused uproar within the American defense community." Page 79 tells us that in one test Kulagina attempted to increase the heart rate of a skeptical physician. An analyst wrote, "Abrupt changes were noted in both people [Kulagina and the skeptical physician] within one minute after the experiment began."

Page 95 tells us that psychic Uri Geller said that the president of Egypt (Gamal Abdel Nasser) "had just died or is about to die," at a time shortly before Nasser unexpectedly died of a heart attack. In a declassified documents obtained as part of a 2015 Freedom of Information Act, a researcher named Puharich claimed that he and another person had seen Geller "breaking a gold ring held in another person's clenched fist; concentrating on a pair of bimetal-type thermometers, and selectively making the temperature rise 6 to 7 degrees Fahrenheit on one or the other instrument; starting broken clocks and watches solely by concentration; moving the hands of a watch forward or backward without any physical contact with the watch," and also "telepathy...with 90% accuracy in telepathy tests, where Dr. Puharich would think of a 3-digit number" (page 98).

The government funded lab tests of Geller, who did well in the clairvoyance tests reported here. Another psychic investigated by scientists using government funds was Ingo Swann. In one test with Swann, he was asked to describe a "superconducting-shielded magnetometer" he had never seen. At this time witnesses observed a strange disturbance in the output of the device, something they couldn't explain (page 134). In one impromptu test, a scientist found a small moth and placed it in a sealed box. Asked to describe what was in the box, Swann said it was something like a leaf, "except that it seems very much alive, like it's even moving" (page 136).

Under controlled laboratory conditions, Geller was able to guess the faces of unseen dice with an accuracy that had a chance probability of 1 in a million, while in another clairvoyance test he produced results with a chance probability of 1 in a trillion (page 143-144). A psychokinesis test involving Geller and some fancy scientific apparatus "indicated an apparent ability of Geller to affect the apparatus by an as yet unidentified means," a scientist reported (page 144).

The government began to fund a program to test the feasibility of remote viewing, a process in which a person attempts by clairvoyance to obtain a physical description of a remote location. The program ended up being funded by the government for many years, because it continued to achieve impressive results. On page 161 a report is quoted on Pat Price's remote viewing of a secret location: “The names on the folders were correct...The location of the doors and the elevator, the number of floors, where the cabinets were located. The color of the cabinet was correct...It was all correct.”

Skeptics are fond of mentioning that Geller was unable to bend a spoon on the Johnny Carson show, but they neglect to discuss a later radio appearance on November 23, 1973 in which Geller asked for audience participation. Not only was Geller able to bend a spoon to the host's satisfaction, but phone calls started flooding in from the audience reporting things such as bent spoons in their houses or the hands of broken watches starting. Shortly thereafter a newspaper reported these results: “Clocks and watches restarted: a total of 1,031; forks and spoons bent or broken, a total of 293; other objects bent or broken: a total of fifty one.” (See page 174-176 of Jacobsen's book for details.)

The book includes some details of successes in remote viewing. On page 213 to 216 we are told about a remote viewer named Graff was apparently able to use a psychic “map dowsing” technique to specify the coordinates where a downed plane had crashed. Former president Jimmy Carter described the incident by saying:

[She] gave some latitude and longitude figures. We focused our satellite camera on that point and the plane was there.

On page 218 to 219 we have a story of how a psychic infuriated an army general. The government had hatched a plan to hide atomic missiles in a “shell game” setup in which the missiles would move around on rail tracks between different locations, making it hard for the Russians to guess where the missile was. But in a guessing simulation in which the chance of success was 10 percent per guess, a psychic was able to guess the correct location of the simulated moving missile 80% of the time. An infuriated general ordered a halt in ESP tests.

On page 235 to 236 we are told how Joe McMoneagle used remote viewing to psychically provide details of a new type of Soviet submarine, before anyone else in the US knew about them. The book says:

Joe McMoneagle had provided seminal information on the Typhoon submarine before any other intelligence asset in the United States. Fort Meades's Detachment G now had what is known in military and intelligence circles as an “intelligence first.”

On page 245 through 246 the book tells us about psychokenesis experiments in China:

A young girl could move an object across a desk using only her mind. Another could cause a flower bud inside a sealed jar to blossom in a matter of seconds. A boy could snap tree branches from a distance of several feet. Children with EHBF were tested in psychokinesis experiments. They could “turn the hands of watches, bend metal, break matches, and cause spontaneous combustion of flammable materials at the wave of a hand,” wrote an analyst with DIA.

On page 257 to 259 we are told that during the 1980's an American aerospace engineer named Jack Houck began hosting “spoon bending parties” in which people tried to bend spends by thought alone. Supposedly more than 1000 people were able to successfully bend spoons at such parties. This document in a recently declassified CIA repository describes these parties. The document says that when there was one helper between 20 people, the success rate would be between 80% and 100%.

Referring to PK (mind-over-matter psychokinesis) and "warm forming," meaning a person experiencing heat in a spoon he is trying to bend through mind-over-matter, the document states this:

In the spring of 1983, Cynthia Siegel, a graduate student at the John F. Kennedy University in Orinda, California did a survey of the first 800 people to attend Houck's PK Parties. Of the 311 people who returned her questionnaire, 72% believed that they experienced warm forming...A very high percentage of the people attending PK Parties now believed that PK really works.

Such an account should come as no surprise to anyone familiar with the table-tipping phenomenon that was very popular for quite a few years during the nineteenth century. People used to gather together and put their hands on a table, urging the table to rise. Very often heavy tables would rise in a way no one could explain. You can see amazing demonstrations of such a thing by going to youtube.com and searching for "table tipping."

On page 263 of Jacobsen's book we are told this astonishing account:

Out of Langford's mouth came a prophecy. "A United States Pentagon official would be kidnapped by terrorists on the evening of 17 December 1981."....Langford said he saw the terrorists breaking into the Pentagon official's apartment, binding and gagging the man, and then kidnapping him. Even more specifically, Langford saw this high-ranking official being shoved inside a trunk and secreted in the back of a van.

Sure enough, on December 17, 1981 exactly such a thing happened to Brigadier General James L. Dozier, who was kidnapped by a terrorist group called the Red Brigades. The van even had the same color mentioned by Langford.

On page 321 we are told of a remote viewing session in which Angela Dellafiora described with remarkable accuracy a randomly chosen target. On page 333 to 334 we are told how the US government apparently used Uri Geller to try to psychically influence a Soviet official so that he would support an arms control treaty, one the Soviets did agree to support. We are told on page 10 of this document (from a CIA repository) that "Dellafiora eschewed remote-viewing and instead 'channeled' her psychic data through a group of entities named 'Maurice' and 'George.'"

On page 343-345 of the book we are told of a case of a remote viewer named Paul Smith employed by the government to obtain information through clairvoyance. On May 15, 2017 he described an incident similar to what happened to the USS Stark two days later.

On page 358-360 we are told how Dellafiora said that a fugitive (believed to be out of the country) was in "Lowell, Wyoming." When informed that there was no such town, but only a Lovell, Wyoming, Dellafiora said, "That's probably it." After the fugitive was found, it was determined that he had actually been in Lovell, Wyoming.

Government-sponsored remote viewing investigations such as the StarGate project were supposedly closed down in the 1990's, although we have no idea whether such research is continuing in secret. On page 380 of Jacobsen's book we are told the government embarked in 2014 on a multi-million dollar program to explore premonition and intuition, so that sailors and Marines can make better use of it.

As Jacobsen's mesmerizing book documents, evidence for paranormal phenomena is very strong. Skeptics use two techniques to try to sweep such evidence under the rug. The first technique is simply the technique of "total denial," in which they dishonestly state that there is "no evidence whatsoever" for such phenomena. Another technique is for skeptics to invent imaginative explanations trying to account for the facts. As Jacobsen notes on page 173, an article in *New Scientist* tried to account for ESP in people like Geller by suggesting that Geller was using a radio receiver implanted in his tooth. Will our skeptics next be telling us that secretly implanted bionic fingers are behind all the cases of spoon bending?

The CIA recently declassified a set of documents that include extensive references to paranormal activies. An interesting paper in the CIA documents can be found here. It discusses a Chinese practice called qigong, and claims that 20 million people were practicing it by the 1980's. (The Washington Post describes qigong as "a 5000-year old Eastern healing art.") The paper discusses some “qigong masters.” A man named Zhang Baosheng is described as having the ability to read sealed envelopes, remove small insects from sealed bottles, burn cloth with a touch of his fingers, and write a message on a paper sealed in a box. The paper asserts: “Countless tests were performed, all under tightly controlled conditions, and their results published without a single attempted fraud.”

Another paper discusses efforts in China during the 1980's to find children with “extraordinary functions of the human body” (EFHB). We are told “many hundreds of children with EFHB were found throughout the nation.” A test in Beijing of ESP in children around age 10 reported that 40 to 63 percent of children around age 10 were found to have EFHB “to some extent.”

There is mention of the same person figuring prominently in the previously mentioned report, Zhang Baosheng. The report says he could “perform incredible miracles.” We are told, “Zhang caused objects, such as someone's photo identification card or personal name stamp to move to another room which had not been entered, or caused a torn personal letter to be restored to a single piece.” The paper also claims that Zhang could remove from sealed bottles (in a paranormal manner) things such as insects or small pills.

The paper also says that another “qigong master” named Yan Xing was associated with many paranormal healings, and “performed various transformations of the physical characteristics of samples at a distance of several meters,” also doing the same thing at a distance of 2000 kilometers.

Another 100-page document discussed Chinese paranormal research, while also advancing some interesting philosophical ideas. On page 11 the document says:

There were a number of experiments called “psychokinesis” experiments where the subject with paranormal abilities would turn the hand of watches, bend metal, break matches, pluck off twigs...as well as cause exposure of sealed unexposed film, and “spontaneous combustion” of some flammable materials with the wave of a hand, without touching the materials in the experiment. Successes in these experiments followed one after another.

All of the evidence mentioned in this long post counts as evidence that your mind comes from some source other than the brain. There is no way in which a brain could be producing phenomena such as precognition, telekinesis, clairvoyance and remote-viewing. But if your mind is not produced by your brain, but by some other unknown reality, then it could have such powers.

at April 02, 2018 No comments:

Labels: ESP, precognition, remote viewing

Why Brains Are Not Suitable for Storing Long Sequences Like Humans Remember

Let us look at yet another argument for why brains cannot be storing the long-term memories of humans. This argument I will call the insertable sequential memories argument. I can concisely state the argument as follows: humans have the ability to store memories involving very long sequences, with an easy ability for insertion; but the human brain has no structural capability that can support any such ability, so some of our memories or ideas are probably stored or created in some mental reality that transcends the human brain.

First, let us consider the human ability to remember memories involving long sequences. An average person shows this ability by being able to remember the words and notes of many different songs. Each song is a particular sequence that must be remembered. You might think to yourself, "I don't know the words of many songs," but if I were to have you browse though a list of the 500 most famous songs in history, you would find that you remembered the words and notes of lots of them. Of course, on the stage you might see something like a concert in which a singer sings from memory for 80 minutes. There are opera singers who have memorized various different roles in the operatic repertory, which may add up to many hours of words and notes they have memorized. In his prime years as an opera singer, Placido Domingo had at least 20 hours of opera roles he could sing upon demand (and would sometimes fill in for a sick singer, singing one of the many roles he knew by heart). Similarly, there are a number of Muslims who have memorized the entire Quran, a book of some 114 chapters or surahs.

We take this kind of sequential recall for granted, because this is the way we have always experienced memory working. Similarly, if we were able to exactly remember every word in each book we had read, we would take that for granted, and think it nothing special. But we must ask: does the brain have any type of structure that might allow such sequential recall to occur, if memories were all stored in the brain?

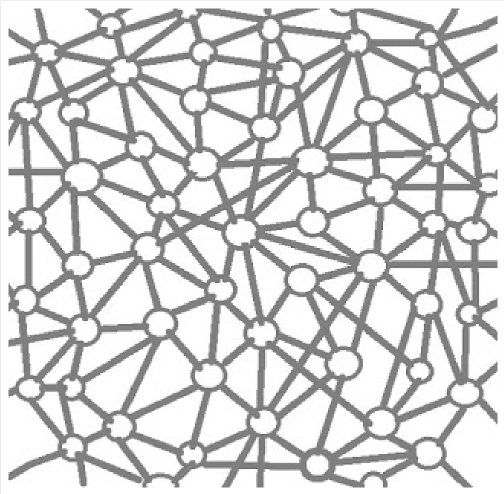
There is no such thing in the brain. The brain consists of billions of neurons, which are connected together. But there is a reason why the brain does not seem to have the right type of arrangement to allow for sequential recall of long sequences of information. The brain consists of neurons, and each neuron is connected to many other neurons. There is no "next" for a particular neuron. Neurons are not arranged in any type of chain-like structure that might support a recall of sequential memories.

Consider the physical way in which a book allows for a sequencing of information. Words are arranged in a linear order on a particular page. Also, the page order and binding of a book imposes a sequence on its contents, a sequential ordering we would not see if the pages were in a jumbled heap.

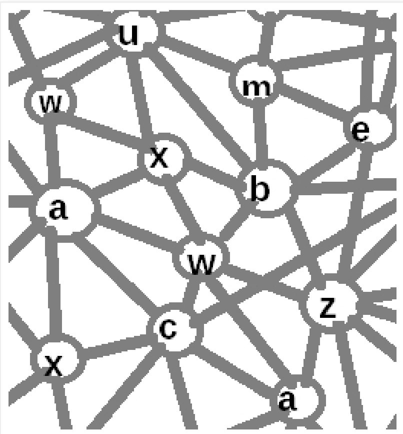
Or consider the DNA molecule. The DNA molecule is structured in a way that allows for a sequential storage of information. A DNA molecule is rather like an incredibly long and thin rope, in which a sequence of letters is written on the rope. Within the genetic code used by DNA, there is a particular sequence that acts as a "stop" signal, rather like a period in a sentence. With this physical structure, DNA allows for both a sequential storage of information and a demarcation of information.

But consider the human brain. There seem to be no physical characteristics that might allow for sequential storage of information. It seems that if you try to store information in the brain, it should be like tossing a set of alphabet blocks onto a giant heap in a junkyard.

I could schematically depict a set of neurons with a visual like the one below. The little circles represent individual neurons. The diagram greatly understates the number of connections between individual neurons.



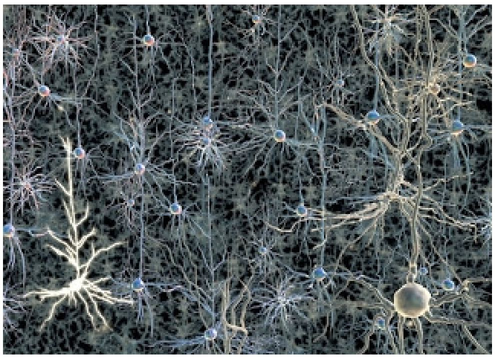
Consider the recall of sequential information. Imagine you are trying to recall a series of words. We might imagine that individual parts of the sequence are stored in individual neurons – perhaps something a little like the schematic visual below.



But how could you recall the sequence in its correct order? Nerve cells are scattered throughout three dimensional space, with each neuron having many connections to other neurons. If information is stored in nerve cells, there would seem to be no way for a sequence to be stored in a way that would allow a sequential recall involving a long series, such as happens when an actor playing Hamlet recalls all of his many lines in the correct order. We can't imagine the brain simply going from one neuron to the “next” neuron to retrieve a sequence of information. This is because neurons don't exist in chains in which a particular neuron has a “next” neuron. Each neuron is connected to many other neurons.

Below we see a map of Dupont Circle in Washington D.C.

Once your car gets on Dupont Circle, there is no “next” place to go. You've reached an interchange in which there are 10 roads feeding out of the circular interchange. Similarly, in the photo below we see neurons. Each one of the parts coming out of the nerve cell is a path that can be traversed from this nerve cell. Such an arrangement should not offer any support for storing a sequence of information such as the lines in a play or the notes in a song. There's no “next” route leading from one neuron to the next neuron. Every neuron is like Dupont Circle, except that there are even more paths leading out of the neuron.



Now let's consider another aspect of human sequential memory: the fact that it is insertable. What this means is when we memorize a sequence, it is very easy to insert anywhere a new item in the sequence.

You can demonstrate this by trying a test such as this. Most Americans know the beginning of the song “America the Beautiful”

O beautiful, for spacious skies
For amber waves of grain

But what if we try to recall this sequential data with an insertion? Try memorizing the following variation, and see how long it takes to recall it while looking away from this page:

O beautiful, for spacious skies
For amber waves of tasty grain

This task is extremely easy. We have no problem inserting an item in the middle of something we have memorized. Similarly, if you (like most Americans) have memorized the famous line “we hold these truths to be self-evident: that all men are created equal,” then it is very easy to change that memory into something a little different, such as: “we hold these truths to be self-evident: that all men are created pretty much equal.”

So evidently humans can remember sequences, and it is quite easy for us to make an insertion anywhere in the sequence. But from a neurological standpoint, such a thing should be impossible. For let us imagine that there is some sequence of neurons that stores a sequential memory, ignoring the difficulty that a neuron has no “next” and so neurons do not seem to be suitable for storing a sequence. Then let us imagine we are inserting an item somewhere in the middle of this sequence. This should be as physically difficult as inserting a new steel link in the middle of a steel chain (or in the middle of a chain link fence). We cannot imagine that a new neuron gets created (in the middle of the sequence) to store the new word or words that are being inserted, because new neurons are not created for each new item inserted into our memories.

There is still one other problem in postulating that sequential memory is stored in the brain. This is the “end of sequence” problem. Try recalling the song “America the beautiful.” Typically your recall will end nice and neatly with the line “From sea to shining sea.” When we remember a sequence of items such as the words in a song, we remember only up until the end point of the sequence. But how could we possibly do that, if memories are stored in neurons? Given the organization of neurons in the brain, storing a memory in neurons would seem to be like tossing a bucket of letter blocks on to a mountainous heap of blocks containing letters, words and image fragments – not at all an arrangement that allows you to tell where the end point of a particular sequential memory is to be found. Or if we imagine instead an analogy of writing on a few vines in a thick Amazon-type jungle of very densely packed vines, the “end of sequence” problem still is there.

In short, if long-term memory were stored in the brain, it seems we shouldn't be able to remember long sequential memories, we should not be able to remember where such sequences end, and we shouldn't be able to easily insert new items anywhere in such a sequence – all things we are actually very capable of doing.

The points discussed here constitute another argument for believing that our long-term memories are not actually stored in the brain, but are stored in some greater mental reality that is merely related to the brain.

at April 02, 2018 No comments:

Candid Confessions of the Cognitive Experts

To have some type of intellectual respectability, the person claiming that minds come from brains must have some type of semi-specific claim about where human memories are stored in the brain. It won't do for such a person to be totally vague about the topic. For example, the doctrine that minds come from brains would have little credibility if its advocates talked like this:

Your memories must be stored in your brain, although I haven't a clue as to where in the brain they are stored. Maybe they are in the middle of your neurons. Or maybe your memories are in the axons that connect nerve cells. Or maybe your memories are hiding out in your DNA. Or maybe your memories are in that watery liquid splashing around in the brain. Or maybe memories are stored in synapses. Or maybe memories are stored in the network of holes in the brain, kind of like data written in the holes of punch cards. Sheesh, I have no idea, but I know your memories must be stored SOMEWHERE in your head.

Of course, talk like that sounds quite scatterbrained, so it's better if a theorist has a more specific answer to the question of how a brain stored memories. For a few decades, a stock answer has been given by neuroscientists: they have generally claimed memories are stored in synapses. Synapses are junctions between nerve cells in the brain.

But there is a great problem with this stock answer. Human memories are known to last for more than 50 years, but synapses are not a stable platform for the storage of information. The standard tale told by neuroscientists has been that memories are stored as changes in the strengths of synapses, what are called synaptic weights. But the things that make up such synaptic weights are protein molecules that have a very short lifetime. The protein molecules in synapses have a lifetime of no longer than a few weeks (this paper finds that they turn over at a rate of about 17% per day).

Besides this very rapid molecular turnover, there are other types of structural turnover making synapses an unstable platform for long-term memory storage. What are called dendritic spines in synapses last no more than about a month in the hippocampus, and less than two years in the cortex. This study found that dendritic spines in the hippocampus last for only about 30 days. This study found that dendritic spines in the cortex of mice brains have a half-life of only 120 days. The research of Stettler suggests that synapses themselves have a half-life of only about 3 months.

In November 2016 there appeared a scientific paper that substantiates a good deal of my reasoning. The paper by Patrick C. Trettenbrein is entitled "The Demise of the Synapse As the Locus of Memory: A Looming Paradigm Shift?" It can be found here.

Below are some excerpts:

When we are looking for a mechanism that implements a read/write memory in the nervous system, looking at synaptic strength and connectivity patterns might be misleading for many reasons...Tentative evidence for the (classical) cognitive scientists' reservations toward the synapse as the locus of memory in the brain has accumulated....Changes in synaptic strength are not directly related to storage of new information in memory....The rate of synaptic turnover in absence of learning is actually so high that the newly formed connections (which supposedly encode the new memory) will have vanished in due time. It is worth noticing that these findings actually are to be expected when considering that synapses are made of proteins which are generally known to have a short lifetime...Synapses have been found to be constantly turning over in all parts of cortex that have been examined using two-photon microscopy so far...The synapse is probably an ill fit when looking for a basic memory mechanism in the nervous system.

So if memories are not stored in the synapses of your brains, where are they stored? Trettenbrein offers no answer. How can he, when there are no other places in the brain suitable for storing memories that could last for 50 years? I explained earlier why it is that other possibilities for memory storage such as DNA in neurons are not suitable explanations. We are familiar with cellular processes that read DNA during what is known as transcription, and we know that information from DNA is read many times too slow to account for the basically instantaneous speed with which humans retrieve memory.

Imagine a Broadway producer who discovers that his star cannot perform, but who has no understudy who can fill in. Such a producer is like a neuroscientist realizing that synapses aren't up to the job of explaining very long-term memories – there is no alternate part of the brain that can be called up to fill in the theoretical hole, like some understudy filling in the gap.

Trettenbrein gives this astonishingly frank and quite correct assessment: "To sum up, it can be said that when it comes to answering the question of how information is carried forward in time in the brain we remain largely clueless." Such intellectual candor in a scientist is a refreshing change of pace.

In this paper, neuroscientist Wayne Sossin also makes some candid confessions:

Most neuroscientists believe that memories are encoded by changing the strength of synaptic connections between neurons....Nevertheless, the question of whether memories are stored locally at synapses remains a point of contention. Some cognitive neuroscientists have argued that for the brain to work as a computational device, it must have the equivalent of a read/write memory and the synapse is far too complex to serve this purpose (Gaallistel and King, 2009; Trettenbrein, 2016). While it is conceptually simple for computers to store synaptic weights digitally using their read/write capabilities during deep learning, for biological systems no realistic biological mechanism has yet been proposed, or in my opinion could be envisioned, that would decode symbolic *information in a series of molecular switches (Gaallistel and King, 2009) and then transform this information into specific synaptic weights.*

After then piling up a whole bunch of speculations to try to save the synaptic storage of memory hypothesis he would prefer to keep, Sossin confesses, "the concept of a memory synapse remains an unproven hypothesis."

We get some similar candor in a new book *Why Only Us? Language and Evolution* by the leading linguist Noam Chomsky and Professor Robert C. Berwick. Here is an excerpt (pages 50-51):

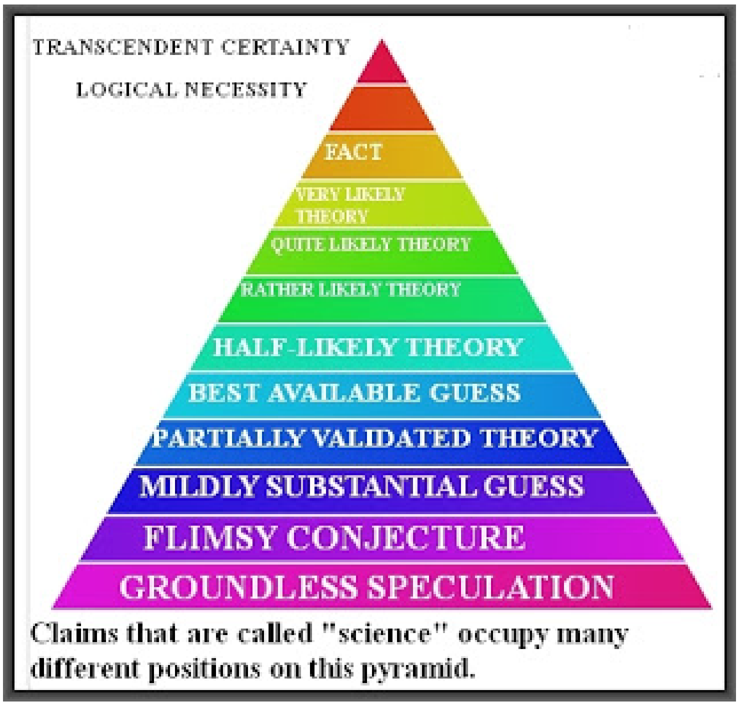
The very first thing that any computer scientist would want to know about a computer is how it writes to memory and reads from memory....Yet we do not really know how this most foundational element of computation is implemented in the brain.

The apparent impossibility of explaining how brains could store memories for 50 years is perhaps exceeded by the apparent impossibility of explaining how humans could instantly retrieve such memories. Neuroscientists don't even have any decent theory for this, and mainly just kind of shrug their shoulders when this puzzle is mentioned. The complete lack of any workable theory for how memory recall can occur so quickly is admitted by neuroscientist David Eagleman, who states:

Memory retrieval is even more mysterious than storage. When I ask if you know Alex Ritchie, the answer is immediately obvious to you, and there is no good theory to explain how memory retrieval can happen so quickly.

The 2017 paper here is entitled, "On the research of time past: the hunt for the substrate of memory." It is a portrait of memory theorists in disarray, presenting no one theory about how memory might be stored in a brain, and instead suggesting seven or more possibilities, none of which is plausible. The paper is all over the map in its speculations, like someone shooting a gun in all different directions. Such theoretical incoherence has no more weight than someone listing 7 possible theories of where angels live. We are told, "Synaptic weight changes can now be excluded as a means of information storage." That shoots down the main theory that neuroscientists have been pushing for decades. The paper then suggests speculation after speculation, without presenting any evidence for any of these speculations.

Whenever you hear someone try to describe as "science" the idea that minds come from brains or brains store your memories, remember that claims passed off as "science" may occupy any spot in the pyramid below.



at April 02, 2018 No comments:

Labels: synapse theory of memory

More Evidence of High Mental Function Despite Large Brain Damage

In another post on this site, I presented many cases showing that people can have very high mental function despite massive brain damage. In this post I will look some additional cases showing such a thing.

First let's look at some results concerning strokes. This article in US News and World Report says, "It's important to recognize that strokes do not cause a drop in overall intelligence." This paper refers to "the generally minor effect of stroke on IQ" in children.

A paper here noted a case of retrograde amnesia (failure to remember previous memories) that went across many domains of knowledge. But the paper noted, "Across all domains tested, LSJ showed losses of knowledge at a level of breadth and depth never before documented in retrograde amnesia." Note the "never before documented." If brains are storing our memories, you would think that many such cases would have been previously documented, because of all the people suffering brain jury from disease, cancer, or car accidents.

The recently published scientific paper here is entitled "A Lesion-Proof Brain? Multidimensional Sensorimotor, Cognitive, and Socio-Affective Preservation Despite Extensive Damage in a Stroke Patient." Here is an astonishing report from the paper's abstract, describing a patient who seems mentally undamaged despite massive brain injury:

At age 43, patient CG sustained a cerebral hemorrhage and a few months later, she suffered a second (ischemic) stroke. As a result, she exhibited extensive damage of the right hemisphere (including frontal, temporal, parietal, and occipital regions), left Sylvian and striatal areas, bilateral portions of the insula and the amygdala, and the splenium. However, against all probability, she was unimpaired across a host of cognitive domains, including executive functions, attention, memory, language, sensory perception (e.g., taste recognition and intensity discrimination), emotional processing (e.g., experiencing of positive and negative emotions), and social cognition *skills (prosody recognition, theory of mind, facial emotion recognition, and emotional evaluation).*

Below is the paper's startling discussion of the very well-preserved memory in this patient who had suffered heavy brain damage from two strokes:

Even more striking are her mnemonic skills: her procedural and semantic knowledge is fully preserved, as shown in her smooth execution of various action routines (e.g., handling her cell phone, tying her shoe laces) and her intact naming and classification skills (e.g., she could flawlessly denominate all the objects she had thematically organized in different sections of her purse); furthermore, her declarative memory is extremely detailed for events which happened weeks, months, and even years ago. She could describe scenes from her childhood and adolescence, she meticulously narrated episodes occurring immediately before and after her strokes, she remembered the names, specialties, and suggestions of all her doctors, and she could recount details of dozens of books she had read throughout her life.

We know that Alzheimer's disease can cause an inability to recall memories, although whether the memories are actually lost is debatable. What is remarkable is the fact that a large fraction of the brain can be ruined by Alzheimer's disease before a patient can become noticeably poor at remembering things. Here is a quote from an expert on the disease:

One of the big challenges we face with Alzheimer's is that brain cell destruction begins years or even decades before symptoms emerge. A person whose disease process starts at age 50 might have memory loss at 75, but by the time we see the signs, the patient has lost 40 to 50 percent of their brain cells.

The same very astonishing thing is said in this article, which quotes an expert saying the following:

In Alzheimer's, brain cells start to die 10, 15, or 20 years before symptoms appear. By the time we observe memory lapses, 40 percent to 50 percent of brain cells are gone, and it's too late to make a difference.

These statements are astonishing. If our memories are all stored in our brains, why would you have to lose 40 to 50 percent of your brain cells before people started noticing your memory loss? Again, this suggests merely a low correlation between brain health and mental function.

On this page we have the amazing story of an MIT student who helped doctors find a baseball-sized tumor in his brain. Doctors performed surgery and removed the tumor. Later, the student gave a presentation to cancer researchers. A video of the presentation is included on that page. Amazingly, the young man seems to show no sign whatsoever of a damaged mind. He walks and talks normally, and seems to have slick presentation skills sufficient to land him a job as a host on a morning TV show. The page tells us that this young man is now pursuing a PhD in mechanical engineering. In the presentation, the young man tells us that the doctors removed about 12 billion neurons in his brain.

The paper here studied memory effects in 63 patients who had undergone surgery for brain cancer, in addition to other patients who had undergone both brain surgery and radiotherapy. 91% of these 63 patients experienced "no deterioration" in immediate recall; 80% experienced "no deterioration" in delayed recall; and 77% experienced "no deterioration" in recognition. This is a relatively low correlation between brain damage and memory, particularly considering that about half of the patients had 2 or more brain metastases (areas in which the cancer was growing).

Figure 8 of this paper gives us a graph that compares verbal IQ with brain tumor size in a variety of brain cancer patients. Under materialist assumptions, we would expect that there should be a strong inverse correlation between something like verbal IQ and the size of a brain tumor; the bigger the brain tumor, the lower your verbal intelligence should be. But what we see is only a low correlation – a correlation of only .28. High correlations have values like .75 or .85. Astonishingly, the person with the highest verbal intelligence had the biggest brain tumor, and the person with the second highest intelligence also has a very large brain tumor. We can easily account for the slightly-below-average IQ scores of brain tumor patients by simply assuming that in these brain tumor patients there would often be visual perception problems, muscular coordination problems, psychological distress, and head pain problems, which would tend to slightly decrease scores in pencil-and-paper IQ tests, without there actually being a decrease in intelligence.

It is part of the dubious folklore of neuroscientists that the prefrontal cortex is some center of higher reasoning. But the scientific paper here tells us that patients with prefrontal damage "often have a remarkable absence of intellectual impairment, as measured by conventional IQ tests." The authors of the scientific tried an alternate approach, using a test of so-called "fluid" intelligence on 80 patients with prefrontal damage. They concluded "our findings do not support a connection between fluid intelligence and the frontal lobes." Table 7 of this study reveals that the average intelligence of the 80 patients with prefrontal brain damage was 99.5 – only a tiny bit lower than the average IQ of 100. Two of the brain-damage patients had genius IQs of higher than 140. This is not a result consistent with the claim that brains make minds.

In a similar vein, the paper here tested IQ for 156 Vietnam veterans who had undergone frontal lobe brain injury during combat. If you do the math using Figure 5 in this paper, you get an average IQ of 98 for these 156 brain-damaged veterans, only two points lower than average. You could plausibly explain that 2 point difference purely by assuming that those who got injured had a very slightly lower average intelligence before they were injured.

It also should be remembered that brain-damaged patients taking standard IQ tests may have higher intelligence than the test score suggests. A standard IQ test requires visual perception skill (to read the test book) and finger coordination (to fill in the right answers using a pencil). Brain damage might cause reduced finger coordination and reduced visual perception unrelated to intelligence; and such things might cause a subject to do below-average on a standard IQ test even if his intelligence is normal. And if you're a patient with a terminal brain tumor, you may have psychological distress and head pain that may cause a reduced score in your paper-and-pencil IQ test.

There is a type of surgery called a hemispherectomy, and is sometimes performed on children experiencing severe seizures. The operation involves surgically removing half of the brain. The surgery is described in a Scientific American article entitled Strange but True: When Half a Brain Is Better than a Whole One. The article states: “Unbelievably, the surgery has no apparent effect on personality or memory.”

According to this link, 70% of the children who had half of their brains removed were able to speak well, and 42% older than 6 were able to read well. Given that only about 60% of the American population can read well, this 42% figure is amazingly high. A paper here tracks the before and after IQ scores of 12 children who had a hemispherectomy operation to remove half of their brain (usually to treat severe seizures). Half of the children had higher IQ scores when tested two years after half of their brains were removed, compared to their scores before the operation.

When we consider sudden traumatic injury to the brain, we also find some cases where the correlation between brain health and mental function seems to be merely a low correlation. One astonishing case is that of Gabby Giffords, a US congress representative who was shot at point-blank range in the back of the head. Not only did she live, but she has recovered to a remarkable degree, to the point of being able to bike, and speak clearly (although in shorter sentences). A similar case was the famous case of Phineas Gage, a nineteenth century railroad worker who had a thick iron railroad spike accidentally drive through his skull, piercing his frontal lobes. A physician reported after examining Gage that he was "quite recovered in his faculties of body and mind." Gage seems to have had some personality changes later, which may or may not have been related to his injury. But such changes are trivial compared to what we would have expected from such an injury under materialistic assumptions about the brain. An expert on Gage has stated that the personality change "did not last much longer than about two to three years," but Gage lived for 12 years after the accident.

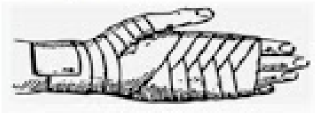
A Lancet study involving nearly three million people found only a small relation between traumatic brain injury and the risk of dementia. Those with severe traumatic brain injury were only 35 percent more likely to develop dementia. Since the lifetime risk of dementia is less than 20 percent, this means that 70 percent or more of people who suffer traumatic brain injury do not get dementia. With a correlation this small, we can't even be sure whether there is a causal relation. By comparison, you are 2300% more likely to develop lung cancer if you smoke.

It has been estimated that the cerebellum contains between 50 percent and 80 percent of the neurons in the brain. In China a woman was discovered to have no cerebellum at all. But her defects were relatively minor, such as slurred speech, a need to use something like a cane to walk, and a lack of athletic ability. The woman could understand speech well enough. According to a scientific paper describing her, she had merely "mild mental impairment." This is yet another case showing only a small correlation between brain health and intellectual ability.

These cases all tell us the same thing: that there is merely a low correlation between brain health and mental function, and that people can often have very high mental function even when their brains are greatly damaged. As a scientific paper says, "There does not appear to be a direct relationship between the degree of brain pathology or brain damage and the clinical manifestation of that damage."

Such cases are not at all compatible with the conventional thinking of neuroscientists that the human mind is merely the product of the brain. But such cases are compatible with the assumption that the human mind is mainly the product of some mysterious reality beyond our understanding: a soul or some cosmic consciousness infrastructure much greater than a human body.

But a mainstream might argue that we should believe our memories are all stored in our brains, on the grounds that brains are active when we are remembering, and very heavy brain damage may be associated with memory loss. The visual below illustrates why such reasoning is not convincing.

ARGUMENT THAT YOUR MEMORIES ARE STORED INSIDE YOUR BRAIN	ARGUMENT THAT YOUR TV SHOWS ARE STORED INSIDE YOUR FINGERS
Your brain is active when you retrieve memories.	Your fingers are active when you retrieve your TV shows. 
Plus, if your brain is badly damaged, it might be hard for you to retrieve your memories.	Plus, if your fingers are badly damaged, it might be hard for you to retrieve your TV shows. 
So your memories must be stored in your brain.	So your TV shows must be stored inside your fingers.
COUNTERARGUMENT:	**COUNTERARGUMENT:**
Synapses have rapid molecular turnover, so your brain doesn't seem right for storing memories that can last 50 years.	Fingers are made of muscles and bones, so your fingers are not right for storing TV shows.

at April 02, 2018 No comments:

Labels: brain injury, hemispherectomy, high mental function despite large brain damage, intelligence after brain injury

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Head Truth

The huge case for thinking minds do not come from brains

Tuesday, April 3, 2018

Synaptic Density Studies Contradict the Most Popular Memory Theory

The leading doctrine concerning how memory is stored is the doctrine that memory is stored by a process of the strengthening of synapses of brains. But what we know about the lifetimes of proteins and synapses contradicts this doctrine. The proteins in synapses have lifetimes no longer than a few weeks (this paper finds that they have turnover at a rate of about 17% per day). The synapses themselves are short-lived compared to the 50-year time span that human memories can last.

The two main structural components that can increase in size or number when a synapse is strengthened are called boutons and dendritic spines. Stettler and his colleagues found that the boutons of synapses turn over at a rate of about 7% per week. Dendritic spines last no more than about a month in the hippocampus, and less than two years in the cortex. This study found that dendritic spines in the hippocampus last for only about 30 days. This study found that dendritic spines in the hippocampus have a turnover of about 40% each 4 days. This study found that dendritic spines in the cortex of mice brains have a half-life of only 120 days. The wikipedia article on dendritic spines says, "Spine number is very variable and spines come and go; in a matter of hours, 10-20% of spines can spontaneously appear or disappear on the pyramidal cells of the cerebral cortex."

So what we know about the lifetime of synapse components and dendritic spines contradicts the claim that human memories (lasting as long as 50 years) are stored in synapses. There is another neuroscience finding that contradicts such a dogma: the finding that there is no increase in synaptic density corresponding to an increase in human knowledge.

What should we expect from the idea that our memories are stored in synapses? We would expect that the density of synapses in the brain would increase as more memories accumulated. But that is not what we observe. In 1979 a scientific paper by Huffenlocher reached these conclusions:

1. Synaptic density was constant throughout adult life (age 16 to 72 years), with a density of about 1100 million synapses per cubic millimeter.
2. There was only a slight decrease in old age, with density decreasing to about 900 million synapses per cubic millimeter.
3. “Synaptic density increased during infancy, reaching a maximum at age 1--2 years which was about 50% above the adult mean.”

So according to the paper, the density of synapses sharply *decreases* as you grow up. The following image from a US government web site tells essentially the same story. The red line shows dendritic spine density, roughly the same as synapse density, or something correlated with it. (The wikipedia.org article on dendritic spines says that "Dendritic spines serve as a storage site for synaptic strength.") We see this density declining after age 5.

Translate

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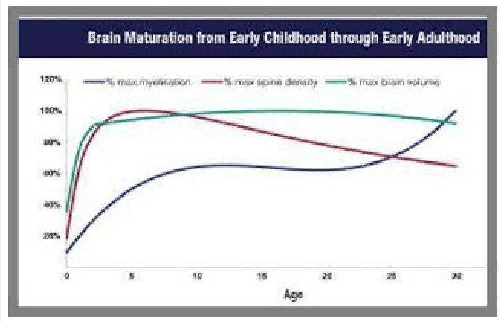
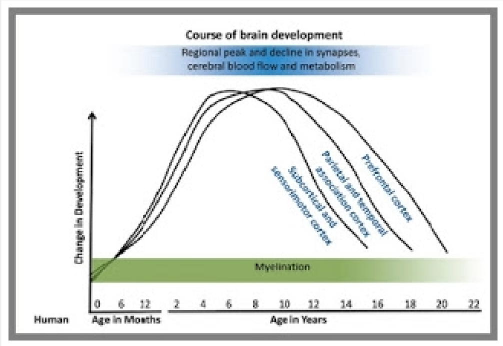
- Introduction to This Site
- Preservation of Mind and Memories After Removal of Half a Brain
- Why We Should Not Think the Human Brain Can Store Very Old Memories
- Why the Instantaneous Recall of Old Memories Should Be Impossible for a Brain
- Cases of High Mental Function Despite Large Brain Damage
- Reasons for Doubting a Brain Could Do the Super-Complex Encoding Needed to Neurally Store Episodic Memories or Concepts
- The Many Cases Showing a Person's Mind Can Operate When His Brain Has Shut Down
- Your Physical Structure Did Not Arise Bottom-Up, So Why Think Your Mind Did?
- The Brain Seems to Have No Mechanism for Reading or Writing Memories
- No One Understands How a Brain Could Generate Ideas
- 30 Reasons for Rejecting the Theory of Neural Memory Storage
- Groupthink and Peer Pressure Make It Taboo for Neuroscientists to Put Two and Two Together
- Synaptic Delays Mean Brain Signals Must Move at a Snail's Pace
- Brain Dogmas Versus Case Histories That Refute Them
- In Neuroscience Papers Bluffing Is More Common Than Candor
- Young Age of Languages Contradicts Claims of Neural Storage of Linguistic Information



Here is a comparable graph from a National Academies Press online book. We see synaptic densities declining after age 5:



This paper says, "We confirm that dendritic spine density in childhood exceeds adult values by two- to threefold and begins to decrease during puberty."

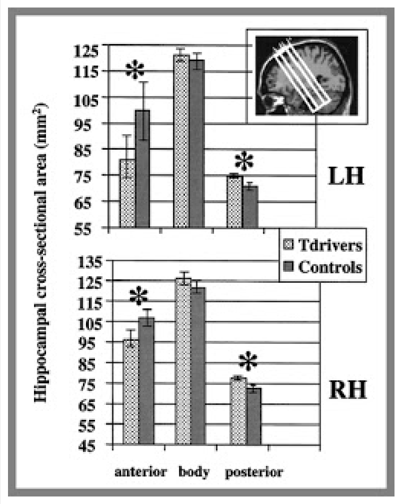
Why are such findings inconsistent with the idea that memories are stored in synapses? If our memories are stored in synapses, synaptic densities should increase as memories accumulate. A 40-year old has many more memories than a 5-year old. But instead of synaptic densities increasing between age 5 and 16, we see synaptic densities falling sharply.

But what about that study of London cab drivers, the one that supposedly showed they had “bigger brains” after learning lots of location information? To become a London cab driver, you have to memorize a great deal of geographical information. A study followed London cab drivers for 4 years, taking MRI scans of their brains.

But the study did not find that such cab drivers have bigger brains, or brains more dense with synapses. The study has been misrepresented in some leading press organs. The National Geographic misreported the findings in a post entitled “The Bigger Brains of London Cab Drivers.” Scientific American also inaccurately told us, “Taxi Drivers' Brains Grow to Navigate London's Streets.”

But when we actually look at a scientific paper stating the results, the paper says no such thing. The study (entitled “Navigation-related structural change in the hippocampi of taxi drivers”) found no notable difference outside of the hippocampus, a tiny region of the brain. Even in that area, the study says “the analysis revealed no difference in the overall volume of the hippocampi between taxi drivers and controls.” The study's unremarkable results are shown in the graph below.

- Vacillating Disarray of the Memory Trace Theorists
- Study Finds "Poor Overall Reliability" of Brain Scanning Studies
- "Brains Store Memories" Dogma Versus the Reality of Noisy Brains
- The Brain Has Nothing Like 7 Things a Computer Uses to Store and Retrieve Information
- Exhibit A Suggesting Scientists Don't Understand How a Brain Could Store a Memory
- The Dubious Dogma That Brains Make Decisions
- Long Article Tries to Show Neural Memory Storage, but Gives No Real Evidence for It
- How Evidence for ESP Undermines the “Minds Come From Brains” Dogma
- Gender Differences in Brains Help Discredit Prevailing Dogmas About Brains
- Study Finds Equal Brain Connectivity in All Mammals
- Some Reasons the Main Theory of Neural Memory Storage Is Unbelievable
- Scientists Can't Persuasively Explain How a Brain Could Instantly Retrieve a Memory
- The Lack of Evidence for Memory-Storage Engram Cells
- Candid Confessions of the Cognitive Experts
- Global Workspace Theory Sure Isn't an Explanation for Consciousness
- When Animals Cast Doubt on Dogmas About Brains
- Memories Can Form Many Times Faster Than the Speed of Synapse Strengthening
- The Guy with the Smallest Brain Had the Highest IQ
- He Had Half a Brain and Above Normal Intelligence
- The Truth About Neurons and Synapses
- A Diagram of Explanatory Dysfunction in Academia
- The Brain Shows No Sign of Working Harder During Thinking or Recall
- More Evidence of High Mental Function Despite Large Brain Damage
- The Lack of a Viable Theory of Neural Memory Encoding
- More Evidence That Neuron Loss Has Little Effect on Cognition
- Fraud and Misconduct Are Not Very Rare in Biology
- Reasons for Doubting Thought Comes from the Frontal Lobes or



The anterior part of the left half of the hippocampus was about 25% smaller for taxi drivers (100 versus 80), but the posterior part of the right half of the hippocampus was slightly larger (about 77 versus 67). Overall, the hippocampus of the taxi drivers was about the same as for the controls who were not taxi drivers, as we can see from the graph above, in which the dark bars have about the same area as the lighter bars. So clearly the paper provides no support for the claim that these London cab drivers had bigger brains, or brains more dense with synapses.

In this case, the carelessness of our major science news media is remarkable. They've created a "London cab drivers have bigger brains" myth that is not accurate.

The facts in this matter are completely at odds with the "synapses store memory" dogma that neuroscientists keep teaching (like theologians promulgating some tenet in their creed). The structural materials in synapses are way too short-lived for synapses to be a plausible place where 50-year-old memories could be stored. And instead of our synapses growing denser and denser as we accumulate memories, we have synapses much denser when we are very young with few memories than when we are adults with many times more memories. Why do our neuroscientists keep advancing an unproven theory inconsistent with the facts? Perhaps because otherwise they might have to concede that memory must involve some spiritual or inorganic component that cannot be explained through neuroscience.

But despite the lack of any solid neurological theory of memory and consciousness, those who have been indoctrinated in the dogmas of modern academia will continue to speak as they have been conditioned, and will mostly speak like Twin 1 in the imaginary dialog below between two yet-to-be born twins in the womb.

Twin 1: It looks like our happy time here in the wet womb is almost over. It's almost time for that fatal event known as "birth."
Twin 2: I don't believe that birth will be our end. I believe in what I call "life after birth."
Twin 1: *Life after birth*? Preposterous! When birth occurs, we will be severed from the umbilical cord that is the sole source of our nourishment. Death must soon follow.
Twin 2: I'm not so sure. Maybe there's some way we can survive. Somehow I think there is some mysterious reality beyond this familiar womb we have known all our existence.
Twin 1: A reality *beyond the womb*? What could possibly make you think of such extravagant nonsense?
Twin 2: I sometimes seem to get faint, irregular signals. It's as if I could occasionally hear faint voices coming from beyond the womb we live in.

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Mark Mahin
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Twin 1: Oh, so you think you've picked up paranormal signals? It's all just in your mind.

The faint voices occasionally heard by Twin 2 (the voice of parents) may be analogous to the irregular indications humans seem to get of a reality beyond our physical reality, through things such as medium activity, apparition sightings, deathbed visions, near-death experiences and the appearance of mysterious orbs in photos, as shown at my web site www.orbpro.blogspot.com.

at April 03, 2018 No comments:

Why Darwinism Fails to Explain the Human Mind

Faced with the evidence and arguments that our brains cannot be the source of our minds, some will fall back on a kind of Darwinian defense. They will appeal to the legend that Darwin's ideas explained all of biology. They will say that we must believe that minds are produced by brains, for otherwise we can have no natural explanation for why minds arose through Darwinian evolution.

In a later post I will explain why the claim that Darwinism explains biological innovations is not well founded, and why Darwinism does not actually explain a biological system such as the vision system found in animals. But before doing that, let me address whether Darwinism explains the human mind.

At the core of Darwinism is the idea of natural selection. Darwinism attempts to explain biological features by saying that they provided a greater survival value for the species in which they appeared. In this post I will examine some aspects of the human mind, each some way in which the human mind differs from the mind of an ape. Then in regard to each of these aspects I will ask: can we explain this aspect of the mind by assuming that it was something that developed because it increased the reproductive likelihood of humans? If the answer is yes, then we might (conceivably) regard that aspect of the mind as something that might be explained through natural selection. If the answer is no, then we should regard that aspect of the mind as something that cannot be explained through natural selection.

Aspect #1: Man's Aesthetic Capabilities

The first aspect for consideration is the fact that human beings have the ability to appreciate beauty in the world, and the tendency to create new beauty by creating works of art. Can we explain this as something that developed because it made humans more likely to survive until they reproduced? It seems not. Compared to things such as speed, smell, sight, and strength, having the ability to appreciate beauty or create beauty seems to be of no value in increasing an organism's likelihood of having offspring.

In fact, it is easy to think of some reasons why having aesthetic capabilities might be disadvantageous from the standpoint of surviving until reproduction. Show me a caveman who tends to spend time enjoying the beauty of clouds, flowers, sunsets, and starry skies, and I will show you a caveman more likely to be attacked by a predator while he is absorbed in such pursuits – and also a caveman who is probably devoting less time to things like food gathering, which improves his survival chances.

So it seems that we cannot explain this aspect of our humanity using natural selection.

Aspect #2: Man's Ethical Tendencies

Blog Archive

Labels

The second aspect for consideration is the human tendency to follow codes of ethics. Is this something we can explain through natural selection? One could argue that developing an ethical sense would have made primitive man more likely to survive. For example, if one band of cavemen came into contact with another band of caveman, and both had some kind of ethic of peace and cooperation, it might have been more likely that they would survive.

But you can counteract this argument with another argument just as powerful arguing the opposite. The argument is that a primitive human developing an ethical sense would be less likely to spread his genes about, because he now would feel an inhibition against raping whoever he pleased. Consider a caveman with no sense of morals. He may have felt free to rape whoever he wanted, and that type of conduct is a bonanza from the Darwinian standpoint of spreading your genes around. Make that cavemen a moral person who will not rape, and he will be much less likely to spread his genes about.

So it seems that there is no clear advantage (from a Darwinian natural selection standpoint) to becoming moral. We cannot explain the origin of man's moral sense through natural selection.

Aspect #3: Man's Spiritual Tendencies

The third aspect for consideration is man's spiritual tendencies, his tendency to believe in some higher power. Can we explain this through natural selection? Certainly not. A caveman that develops some spiritual tendency will be no more likely to survive until reproduction than one who has no such tendencies.

Attempts to explain the origin of spirituality through natural selection are typically no better than one in which an author argues that spirituality gave birth to "rules of behavior" that are "necessary to maintain social peace and allow a complex unit consisting of individuals of both sexes and all ages to function in a way ensuring their reproductive success and thus survival." Not convincing at all, since we don't know whether similar rules of behavior would have arisen without spirituality, and since it is not at all clear that spirituality leads to "social peace" (in the modern Middle East, it seems to be doing no such thing). Also it is not clear that "rules of behavior" will improve reproductive success, because a lawless situation where men rape freely is one where men have a high chance of reproductive success. The author used the dubious concept called group selection, which many evolutionary biologists say is invalid.

There is no clear and convincing case that can be made that spirituality has any benefit from the Darwinian standpoint of natural selection and survival of the fittest.

Aspect #4: Man's Mathematical Abilities

The fourth aspect for consideration is man's mathematical abilities. Can we explain these through natural selection? Not at all. Having the ability to do math is something that comes in handy when you are a member of a civilization, but is of no significant value to somebody like a cavemen.

Some of the attempts to explain the origin of mathematical abilities through natural selection are empty "just so" stories typically no better than idle speculation. One such attempt is in the book *Radical Evolution* by Joel Garreau, where the author speculates that man developed advanced math capabilities because it was helpful when hunting rabbits by throwing rocks. As someone who has actually tried to catch a rabbit in a field, I find such a speculation to be absurd. Rabbits move in unpredictable directions at high speeds, and if early men hunted rabbits with stones, we can presume that they attacked stationary animals – not by calculating the future position of a

- memory recall
- memory storage
- morphogenesis
- natural selection
- near death experiences
- neural noise
- non-local consciousness
- nonneuralism
- optogenetics
- panpsychism
- precognition
- prefrontal cortex
- remote viewing
- savants
- scientist misconduct
- source of thoughts
- split-brain operation
- synapse theory of memory
- top-down theory of mind
- visual recognition

running rabbit. Throwing ability is something very different from mathematical ability. Early man was not doing math when he threw rocks at things, any more than you are doing math when you shoot some zombies in a video game.

Aspect #5: Man's Musical Abilities

The fifth aspect for consideration is man's musical abilities. Can we explain these through natural selection? Not at all. Musical abilities have no relevance at all to an organism's chance of surviving until reproduction.

Aspect #6: Imagination

The next aspect for consideration is imagination. In this case one could make a case that imagination does have some value from a natural selection standpoint, on the grounds that an imaginative caveman or man-ape would be more likely to imagine his way to the invention of new tools or techniques with a survival value. For example, an imaginative human predecessor would be more likely to first conceive of rubbing sticks to create fire, or to conceive of attaching a sharp rock to a stick to create a spear.

But when we look at the matter deeper, this case weakens. Consider how innovation might have occurred before civilization arose. One individual might have introduced the innovation, which then would have been adopted by the others in the local group. We have an example of such thing in the first scenes of *2001: A Space Odyssey*, where one imaginative man-ape figures out how to use a bone as a weapon, and the innovation is then picked by all of the local group. But if we assume that such innovations are passed on from generation to generation, it may be a case where you have only innovator for every 100 or 1000 adopters of the innovation. So it's not clear at all that natural selection can be used here to explain some general increase in imagination.

Let's consider a hypothetical case. Man-ape “Harry” has a chance mutation that gives him more imagination. He then invents some new technique or tool that is picked up by his local group, and maybe passed on to subsequent generations. Harry then flourishes, but he's only one person, and there's only a 50 % chance he will pass on this mutation to his descendants. The fact that Harry's innovation is picked up by lots of others does not mean that they will be more likely to be more imaginative themselves. So scenarios such as this aren't very useful in explaining how imagination could become a general human characteristic (and the very idea of an “imagination mutation” is hard to believe in).

Aspect #7: Insight

One could argue that the development of insight can be explained on a basis of natural selection. One might give a case such as this: if some caveman develops insight that some particular hunting technique isn't working, and the reasons why it isn't working, he may be more likely to switch to some new technique that will be more successful.

But such reasoning isn't convincing. Here is how organisms typically operate when trying to get some result. They try something to achieve some desired result. If what they are doing works, they will stick with that technique. If it doesn't work, they will try something else. This usually works, even though the animal never has any insight into why the unsuccessful attempt doesn't work. For example, a gorilla trying to get a fruit on a tree may try jumping to get it, and if that fails, the gorilla may try shaking the tree branch. The animal never gets, and does not need to get, any insight as to why jumping didn't work.

So it seems that insight doesn't give any tangible advantage that organisms need to survive. We therefore cannot explain the origin of human insight by using natural selection.

Aspect #8: Intellectual Curiosity

Nowadays people display intellectual curiosity by doing things such as reading books, doing web searches, and doing experiments. But how would some caveman have displayed intellectual curiosity? He typically would have displayed intellectual curiosity by physical exploration. But would such exploration have increased the likelihood of reproductive success? Probably not, because before the rise of civilization, physical exploration was extremely dangerous. There are all kinds of ways in which some exploring cave man could die from exploring – dying from the cold, dying from animal attacks, dying from a fall, or dying from exploring some place with too little available water or food. So no clear case can be made that we can explain intellectual curiosity on any grounds of natural selection. Intellectual curiosity is not a biological adaption that helped an organism flourish in its environment, and it is only such adaptions that can be explained through natural selection.

Aspect #9: Language

There is an additional aspect of our humanity that natural selection cannot explain: our language ability. While one might be able to explain a tiny-vocabulary language through natural selection, it's hard to explain the development of language with such rich grammar and vocabulary. For a caveman, it's quite sufficient to be able to grunt a few words such as some word meaning "bear." A caveman doesn't need to make statements like, "Heads up, my friends, I think I see a great big bear approaching on the horizon."

Below is the beginning of a relevant blog post by Terrence W. Deacon:

Since Darwin's time, the human language capacity has been a perennially cited paragon of extreme complexity that defies the explanatory powers of natural selection. And it is not just critics of Darwinism who have argued that this most distinctive human capacity is problematic. Alfred Russel Wallace—the co-discoverer of natural selection theory and in many ways more of an ultra-Darwinian than Darwin himself—famously argued that the human intellectual capacity which makes language possible, is developed to a level of complexity that far exceeds what is achievable through natural selection alone.

Conclusion on This Topic

When we look at the main ways in which the human mind differs from the minds of apes, we find that we cannot explain the characteristics of the human mind through natural selection. Evolutionary biologists will sometimes make statements that come very close to admitting such a thing. If you ask an evolutionary biologist whether Darwinian evolution and natural selection can explain the human mind, such a biologist will typically go into "Darwin defense mode" and claim that the human mind can be explained in such a way. But when writing about the likelihood of intelligence evolving on other planets, some of these biologists (such as Dobzhansky, Mayr and Simpson) said that we should not expect intelligence to evolve elsewhere in the galaxy. By making such statements, such biologists were inadvertently admitting that natural selection does a very poor job of explaining the human mind. If natural selection did a good job of explaining the human mind, we should expect no evolutionary biologists to say that intelligence is rare in the universe.

The origin of the human mind and human consciousness is one of the deepest mysteries of the universe. We could only explain something so deep by using some very deep principle or principles. But natural selection is not such a principle. Natural selection is instead a very shallow principle, a principle that can be stated in only a few words, words such as "fit stuff proliferates, unfit stuff doesn't." We should not expect to explain the deep mystery of the origin of the human mind through a principle so shallow, just as we should not expect to explain the deep mystery of the origin of the universe (the Big Bang) by using some shallow principle such as "stuff happens."

Over 900 scientists and PhD's have signed the "Dissent from Darwinism" statement that states exactly the following:

We are skeptical of claims for the ability of random mutation and natural selection to account for the complexity of life. Careful examination of the evidence for Darwinian theory should be encouraged.

at April 03, 2018 No comments:

Labels: evolution, natural selection

No One Understands How a Brain Could Generate Ideas

Although neuroscientists are very bad at explaining how a brain could store or instantly retrieve memories lasting for decades, neuroscientists are even worse at explaining how brains could possibly be generating ideas and abstract thought.

If you look up the topic "How does the brain form new ideas" on the "Expert answers" site quora.com, you will be treated to a page with some answers illustrating the utter failure of modern neuroscience on how a brain could possibly generate new ideas. The page gives some answers to the question, "How does our brain form new ideas?"

The first and top-rated answer on this "expert answers" site is given by one Phil Macquire, an individual who has no listed scientific credentials, and who has primarily answered movie questions on this site. Phil gives an answer that shows some literary skill but provides no real insight at all as to how a brain could generate ideas. He says, "How the subconscious mind performs this incredible feat is such a mystery."

The second answer by Tanush Jagdish begins by saying, "We don't know," but then suggests "synaptogenesis," the creation of new synapses. This is not a plausible idea. Some text such as "tall blue cold triangle" can instantly create an idea in your head that you have never had before, and you certainly did not have to wait for new synapses in your brain to form before you had such an idea.

The next answer by Jeff Nosanov is a circuitous answer that explains nothing, while claiming incorrectly that "ideas cannot be made to happen." Nosanov ends by saying "that was not a physiological explanation." Then the page has some answers by non-scientists which are not illuminating.

A similar page on the "Ask science" sub-reddit at www.reddit.com offers equally little illumination. A Google search for "how the brain generates ideas" will result in a vast wasteland of results failing to offer a single neuroscience study offering any real illumination on this topic. One of the items you will get is a Harvard news story with the title "How the brain builds new thoughts." But the story is discussing some research that does nothing to explain such a thing – just another one of those oh-so-dubious brain scanning studies in which some scientists scan brains and find trivial differences in blood flow. Ditto for this Science News story entitled "How does our brain form creative and original ideas?" We merely are told of some brain scanning study, and told that some scientists hypothesized that the brain uses "a number of different networks" to generate ideas. That's basically telling us nothing.

An article here is entitled "A Neuroscientist and a Composer on How the Brain Generates New Ideas." The neuroscientist talks on and one, but we get no actual insight from the neuroscientist on how neurons could possibly generate an idea. Try doing a Google search for "how the brain generates ideas." You will find no coherent answer discussing things on a neurological level.

In his book *The Consciousness Instinct* (which makes the absurd assertion that consciousness is an instinct), neuroscientist Michael Gazzaniga makes a clumsy attempt to explain how a brain might generate an idea. He states this on page 8 (repeating the analogy on other pages of his book):

It is as if our mind is a bubbling pot of water. Which bubble will make it to the top at any given moment is hard to predict. The top bubble ultimately bursts into an idea, only to be replaced by more bubbles. The surface is forever energized with activity, endless activity, until the bubbles go to sleep.

As an attempt to explain the origin of ideas, this is a complete flop. A bubble is a physical thing, not a mental thing. When someone creates the abstract idea (such as the idea of a Trumper after viewing various zealous Trump supporters), such an abstraction (a mental act) bears no resemblance to a bubble floating up from hot water, a physical event which does not involve any observations.

Water being heat up in a pot and producing bubbles is in several respects a very poor analogy for the creation of an idea. A human being will come up with a new idea only very slowly, and a human will only have one thought in his head at any single time. But in a heating pot of water, we see dozens of bubbles very quickly rising at the same time. When water starts to boil, it is a frothy chaos that bears no resemblance to the orderly thinking of a person trying to produce a new idea.

It may seem mysterious that bubbles pop up from water as it heats, but that's not an example of something appearing mysteriously. Water has some air trapped inside it, and the air just comes out as the water heats. The non-mysterious physical event by which a bubble comes from heating water does nothing to help us understand the mysterious non-physical event by which a mind produces an idea.

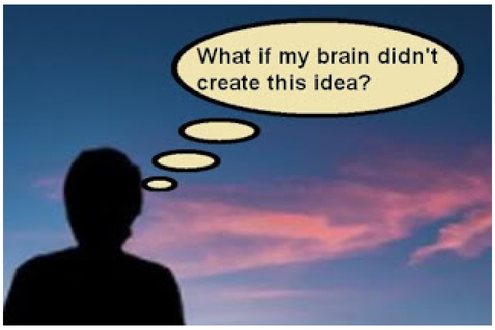
One idea that neuroscientists have to try to explain a mind creating ideas is some idea of combination, kind of the idea that you create a complex idea by combining simpler ideas. This does not explain the miracle of abstract thought (and begs the question by failing to explain simpler ideas). Let us imagine a savage who experiences 100 cold days, and who then reaches the abstract concept of coldness. This idea is not reached from any type of combination – it is reached by abstraction. Similarly, a person who sees 100 other humans may reach the abstract idea of a human being. But that idea is not reached by combination.

Computers offer not the slightest clue as to how abstract thinking can occur, because no computer has ever had a concept, an idea, or an abstract thought, something that requires a conscious mind. Don't be fooled by the type of computer program called an idea generator. Such programs are typically just programs for combining words into novel combinations. Until a human reads the output of such a program, an idea is not actually created.

The neurosurgeon Wilder Penfield once noted that no type of electrical stimulation of the brain ever causes someone to produce ideas. Penfield said the following:

But none of the actions we attribute to the mind has been initiated by electrode stimulation or epileptic discharge. If there were a mechanism in the brain that could do what the mind does, one might expect that the mechanism would betray its presence in a convincing manner by some better evidence of epileptic or electrode activations.

It might be claimed that ideas are somehow derived from sensory experience. Someone might claim that you get the idea of an apple after you have seen lots of apples. But that does not work as a general explanation for ideas. For example, a human may have the idea of the number a quadrillion, but no human has ever observed a quadrillion things. A science fiction writer may have some weird such idea such as a time machine, unlike anything humans have ever observed. Humans have come up with the idea of an immaterial spirit with infinite power. But they have no sensory experience of immaterial spirits, and have never observed anything infinite. So how could such ideas ever have arisen from a brain? There is no neurological answer to this question. Any attempt to explain how neurons or synapses can produce novel ideas will very quickly start sounding absurd or implausible.



A better account for ideas is that our minds are mental things, not arising from a physical source, and that mental things can naturally arise from other mental things. If our minds are a fundamentally non-physical reality that do not arise from our brains, we can understand how such a fundamentally spiritual or mental reality can generate an idea. It is always plausible to imagine mental things coming from other mental things, just as it is plausible to imagine physical things coming from other physical things. But it never rings true to imagine mental things popping out magically from merely physical things.

at April 03, 2018 No comments:

Labels: idea creation

Why Strokes, Alzheimer's Disease and Drunkenness Don't Prove the "Brains Make Minds" Dogma

A person believing that brains generate minds may refer us to cases of Alzheimer's disease, and say this proves this brains make minds and store memories. Or the person may make a similar argument when referring to strokes. Or the person may claim that drunkenness shows your brain makes your mind, because in that we see a physical liquid causing a judgment deterioration. In this post I will address these objections.

Alzheimer's disease could never prove that brains make minds, because we do not see in Alzheimer's disease an actual loss of the self or consciousness. A mind with very poor memory is still a mind.

In regard to Alzheimer's disease or strokes, we cannot actually tell whether a person has suffered a loss of memories. For it might be that such patients merely experience a difficulty in *retrieving* memories.

Imagine you are used to visiting cnn.com to get the news each morning. But one day you turn on your computer and find you can no longer access any information at cnn.com. Does this prove that the information stored at cnn.com has been lost? It certainly does not. The problem could merely be an inability for you to retrieve information at cnn.com, perhaps because of a bad internet connection. Similarly, if I write the story of my life, and place it on my bookshelf, I may one day go blind and be unable to access that information. But the information is still there on my bookshelf.

In the same vein, the memories of people with Alzheimer's may be perfectly intact, but such persons may be merely experiencing some difficulty in retrieving their memories. There are, in fact, reports of incidents called terminal lucidity, in which people suffering from memory loss or dementia suddenly regained their memories shortly before dying. Such reports tend to support the idea that memory problems such as Alzheimer's involve difficulties in retrieving memories rather than the actual destruction of memories stored in the brain.

There is actually a way in Alzheimer's may argue against the idea that your memories are all stored in your brain. A doctor reports the following:

One of the big challenges we face with Alzheimer's is that brain cell destruction begins years or even decades before symptoms emerge. A person whose disease process starts at age 50 might have memory loss at 75, but by the time we see the signs, the patient has lost 40 to 50 percent of their brain cells.

If your brain cells were the place your memories were stored, why would you not notice memory loss until 40% or 50% of your brain cells were gone?

The evidence in regard to the cause of Alzheimer's diseases is actually pretty baffling. The most common explanation is that the disease is caused by something called amyloid plaques. But the Chicago Tribune tells us, “Scientists have learned that about a third of people who appear to have Alzheimer's disease do *not* have high levels of amyloid in their brains.”

A brain study was made of nine very old people who scored particularly high on a memory test. After these people died, their brains were examined. Three of the nine very old “super memory” people were found to have brains filled with the plaques often seen in Alzheimer's patients. These “super memory” people had brains in much worse shape than a large fraction of Alzheimer's patients with very poor memories.

In 2017 there was a news story entitled, "New Discovery Suggests Neuron Death Does Not Kickstart Dementia." The story reported this:

The leading theory in Alzheimer’s disease is that memory loss is the result of neuron death and nerve ending damage, which lead to memory loss, are caused by the formation of toxic protein clumps in the brain, called tau tangles and beta-amyloid plaques. But a new, small study challenges this theory, showing that the loss of neurons in brains of people with dementia is actually very small. What’s more, levels of neuron loss in patients did not indicate how far along the were in the disease, suggesting neuron death has little to do with the symptoms of dementia.

The news story quotes a scientist saying the following:

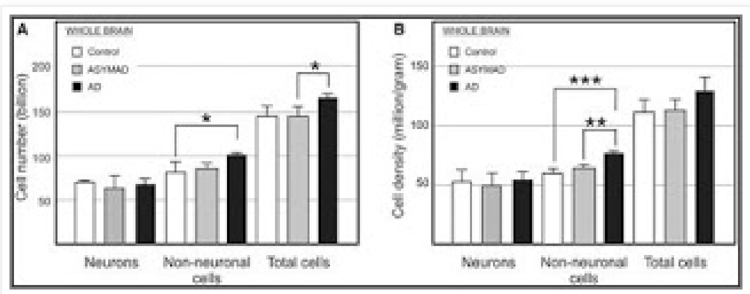
Much to our surprise, in studying the fate of eight neuronal and synaptic markers in our subjects' prefrontal cortices, we only observed very minor neuronal and synaptic losses. Our study therefore suggests that, contrary to what was believed, neuronal and synaptic loss is relatively limited in Alzheimer's disease.

A book on dementia says on page 34 that in the pioneering Blessed, Tomlinson and Roth study (1968) "there is only a rather low correlation between the brain plaque count and the test scores among the senile" -- not what we would expect if brain plaques were causing memory loss. There were four cases with a high plaque count and low dementia. The book tells us that in a well-known study involving nuns and Alzheimer's disease, one of the nuns had high cognitive scores despite having "abundant neurofibrillary tangles and senile plaques." The book tells us that "predicting backwards from autopsy to clinical diagnosis appears unreliable and poorly predictive," which is not what we would expect if dementia was really caused by brain states.

After telling us on page 35 that "there are many reports of people carefully diagnosed...as clearly having the clinical symptoms of dementia and yet showing no evidence of brain pathology," the book gives this quote from a neuroscientist named Robert Terry:

Over the years, investigators have sought assiduously for lesions or tissue alterations in the Alzheimer's brain which...might at least correlate with clinical determinants of the disease severity....Despite 30 years of such efforts, clinico-pathologic correlations have been so weak or entirely lacking that determination of the proximate, let alone the ultimate, cause of Alzheimer's disease (AD) has not been possible.

The scientific paper here made an examination of 14 brains of recently deceased people who had donated their brains to medical science. Four were controls, five were people with Alzheimer's disease but no dementia, and five were people with Alzheimer's and dementia. The paper made detailed comparisons of the number of neurons in the brains and the total number of cells in the brains as a whole. The "bottom line" of the study is in Figure 6, which is below. The white bars are the controls; the gray bars are those with asymptomatic Alzheimer's; the black bars are those with Alzheimer's and dementia.



We see here nothing to back up common claims that Alzheimer's is some disease that robs people of large number of neurons. The number of neurons is about the same for all three groups, and the total number of cells is greater for those with Alzheimer's. Such a study shows that a common visual (showing a normal brain side- by- side with a shrunken Alzheimer's brain) is misleading, and that the idea of very large neuron loss as a hallmark of Alzheimer's is incorrect.

Given these conflicting findings, it seems that the evidence is not telling us any clear tale in regard to what causes Alzheimer's. Very many of the people with Alzheimer's have amyloid plaques in the brains, but one third do not. And apparently lots of people with very good memories have amyloid plaques, and many do not. There is also no strong correlation between neuron loss and dementia. Such evidence gives us no clear signal as to whether our memories are stored in our brains.

As for strokes, they can damage an ability to move, speak or understand language. Understanding language is partially based on auditory processing, and speaking language is based on muscular finesse in the vicinity of the tongue and vocal chords. We know that the brain helps the senses do their work, and is involved in muscular control. But an article in US News and World Report says, "It's important to recognize that strokes do not cause a drop in overall intelligence." On quora.com, someone states, "My speech therapist was pretty adamant that having a stroke does NOT, in any way, affect your intelligence." That's something we would not expect under the theory that the brain generates the mind. Under that theory, we might expect that people would lose half or more of their intelligence after a stroke.

If our memories were stored in our brains, what we would expect is that people would often get amnesia after a stroke. But such a thing seems to happen only very rarely. A scientific paper says, "Reports of amnesic syndrome due to unilateral stroke have appeared infrequently." The paper lists some new cases which it claims are new examples, but when we read the examples we find typically only mild things like an inability to recall a daughter's phone number. Speaking of strokes, the paper says, "There have been two reported cases of persistent amnesia following unlitateral infarctions in which there were no other neurological deficits," indicating the rarity of such a thing. The paper also says that of a group of 68 patients who had brain infarctions, there were no cases of amnesia. Talking about strokes, this paper says, "Amnesia as the main symptom of acute ischemic cerebral events is rare, mostly transient, and easily mistaken for TGA [transient global amnesia]."

What about drunkenness? Does drinking alcohol really cause you to "lose your mind"? Not really.

Consider the case of the drunk asked to walk a straight or to touch his finger to his nose. If such a person really had his mind dulled by the alcohol, he would be unable to interpret the police officer's language. But instead such a drunk will normally understand the command just fine, and attempt to follow it.

What we mainly see in drunkenness is a kind of overconfidence and loss of inhibition, along with mood changes and a deterioration of muscle skills. You don't really see people losing their minds or memories while they are drunk. If they did, they would probably forget how to start up their cars (or do something like putting their combs or their fingers in the ignition slot rather than their keys).

A CBS New story says that people who consumed alcohol were actually better at certain creative problems.

In fact, there is no such thing as a "temporary stupid potion" that will cause an intelligent person to regress to the intelligence level of a small child, nor is there any such thing as a "temporary amnesia potion" that will cause you to forget where you grew up or where you live or what your mother's name is. Wikipedia.org has an article on "drug induced amnesia," but gives us no examples of any such drug other than benzodiazepines (which do not produce retrograde amnesia, the inability to recall old memories) but only help produce antograde amnesia (the inability to make new memories).

But if your memories do actually come from your brain, and your intelligence comes from your brain, we would think that such potions should have been invented already. If your memories do actually come from your brain, and your intelligence comes from your brain, it should have been easy for scientists to create some potion that would temporarily disrupt the chemistry supposedly needed for memory recall and thinking. The nonexistence of any such potion is actually further evidence against the claim that your brain is the source of your thoughts and the storage place of your memories.

at April 03, 2018   No comments:

Why Brain Scans Don't Show Brains Make Minds

A very interesting question relevant to the thesis of this site is whether there are particular parts of the brain that are strongly associated with particular facets of human mental functionality. Are there, for example, regions of the brain that work much harder when you learn something, or remember something, or feel something? The idea that there are such areas is a hypothesis called localization**.**

If there is very strong evidence for localization, this may support the idea that your brain generates your mind; but if there is no such strong evidence, that would tend to support the idea that your brain is not the source of your mind.

Some claim that this idea of localization is supported by brain imaging studies. It is claimed that quite a few studies tell us about the neural correlates of conscious experiences. In a typical study of this type, people will have their brains scanned by some instrument such as an MRI machine. Then scientists will look for certain parts of the brain which showed more activity (such as blood flow) when some particular type of mental activity was occurring.

But there are reasons for thinking that such studies tell us very little. For one thing, brain imaging studies on the neural correlates of consciousness typically involve only small numbers of participants (often fewer than 25). Making generalizations from such small samples is dubious.

Also, claims that particular regions of the brain show larger activity during certain mental activities are typically not well-replicated in followup studies. A book by a cognitive scientist states this (page 174-175):

The empirical literature on brain correlates of emotion is wildly inconsistent, with every part of the brain showing some activity correlated with some aspect of emotional behavior. Those experiments that do report a few limited areas are usually in conflict with each other....There is little consensus about what is the actual role of a particular region. It is likely that the entire brain operates in a coordinated fashion, complexly interconnected, so that much of the research on individual components is misleading and inconclusive.

An article on neursosciencenews.com states the following:

Small sample sizes in studies using functional MRI to investigate brain connectivity and function are common in neuroscience, despite years of warnings that such studies likely lack sufficient statistical power. A new analysis reveals that task-based fMRI experiments involving typical sample sizes of about 30 participants are only modestly replicable. This means that independent efforts to repeat the experiments are as likely to challenge as to confirm the original results.

There have been statistical critiques of brain imaging studies. One critique found a common statistical error that “inflates correlations.” The paper stated, “The underlying problems described here appear to be common in fMRI research of many kinds—not just in studies of emotion, personality, and social cognition.”

Another critique of neuroimaging found a "double dipping" statistical error that was very common. *New Scientist* reported a software problem, saying "Thousands of fMRI brain studies in doubt due to software flaws."

Flaws in brain imaging studies were highlighted by a study that found "correlations of consciousness" by using an fMRI brain scan on a dead salmon. See here for an image summarizing the study. The dead salmon study highlighted a problem called the multiple comparisons problem. This is the problem that the more comparisons you make between some region of the brain and an average, the more likely you will be to find a false positive, simply because of chance variations. A typical brain scan study will make many such comparisons, and in such a study there is a high chance of false positives.

Considering the question of "How Much of the Neuroimaging Literature Should We Discard?" a PhD and lab director states, "Personally I'd say I don't really believe about 95% of what gets published...I think claims of 'selective' activation are almost without exception completely baseless" This link says that a study, "published open-access in the *Proceedings of the National Academy of Sciences*, suggests that the methods used in fMRI research can create the illusion of brain activity where there is none—up to 70% of the time."

Instead of it being the case that only some particular parts of the brain activate when a certain task is performed, it is instead true that if you keep taking brain scans of the same task being performed, you will see almost all regions of the brain activate. As one scientific study concludes, "fMRI activations extend well beyond areas of primary relationship to the task; and blood-oxygen level-dependent signal changes correlated with task-timing appear in over 95% of the brain for a simple visual stimulation plus attention control task."

Another huge reason for being skeptical about brain imaging studies is that such studies very often use very misleading visual presentations, creating false impressions. What very frequently goes on is something like this. A series of brain scans will show a very small difference between brain activity in different parts of the brain – typically only 1%. A Stanford scientific paper on fMRI uses this 1% figure, making an exception only for small parts of the brain ("visual and auditory cortices") associated with seeing and hearing. The paper makes this generalization: "While cognitive effects give signal changes on the order of 1% (and larger in the visual and auditory cortices), signal variations of over 10% may arise from motion and other artifacts in the data." In other words, people moving their heads (and other misleading signals) may create the impression that there is a higher variation in the non-sensory parts of the brain, but the real variation in the signal changes is only something like 1%. A similar generalization is made in this scientific discussion, where we are told the following:

For example, most cognitive experiments should show maximal contrasts of about 1% (except in visual cortex), hence, if estimates for a single subject are much larger than that, then the estimates are likely to be bad. Poor estimates can arise from head motion, or sporadic breathing patterns by the subject, or sometimes from a poor design matrix that is ill-conditioned.

And again on this technical message board, a brain scan analyst tells us the following:

At a group level, I believe that average percent signal change extracted from an fMRI analysis would be reasonable if < 1%. Usually, I actually see values on average < 0.5% or even lower.

But again and again studies on neural correlations will produce a visual which grossly exaggerates this very small difference of 1% or less, making it look like a great big difference. This is *lying with colors*.

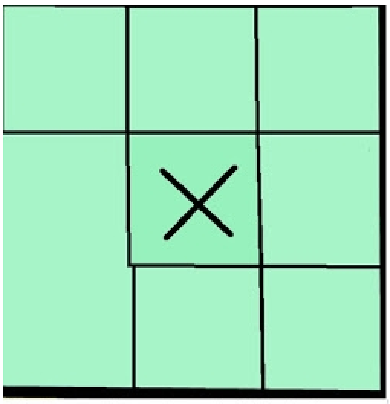
To explain why this is highly deceptive, let's consider some examples of displaying visual information: an honest presentation and a misleading presentation. Imagine you have a home for sale, and you are preparing a web page or brochure that describes your house's selling points. One of the key factors in selling houses is the quality of the local school district. Anyone with children will want to buy a house in a neighborhood with better schools.

Imagine you've got the average school stores for your home's school district, and the data looks like this:

District	**Average Reading Score**
District 1	80
District 2	80
District 3	80
District 4 (yours)	81
District 5	80
District 6	80
District 7	80
District 8	80

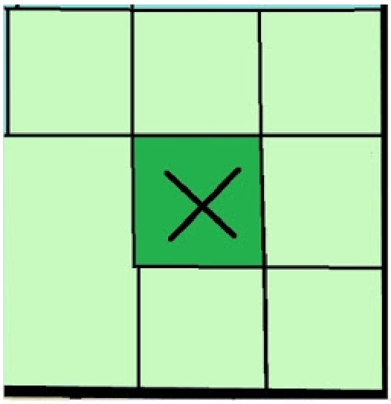
Now imagine you wanted to present a school district map highlighting the higher score of your home's school district. For you to honestly present such information, you would have to follow this rule: the difference in the color shade should be no different than the differences in the data that you have.

So if you were to present an honest school district map, color-coded school scores, it would have to look something like this:



My home's school district (better schools shown in darker green)

This would be an honest map. It honestly indicates only a very slight difference between the school scores in your home's school district and the nearby districts. But you might be tempted to present the data differently. You might present it like the map below.

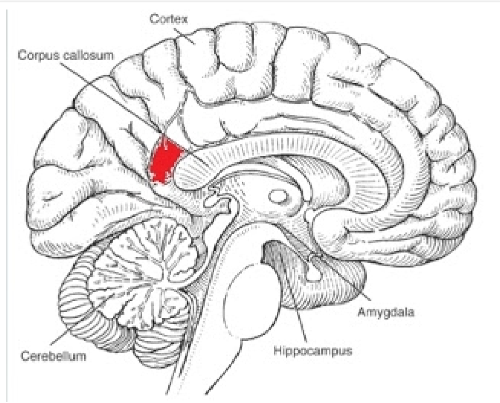


My home's school district (better schools shown in darker green)

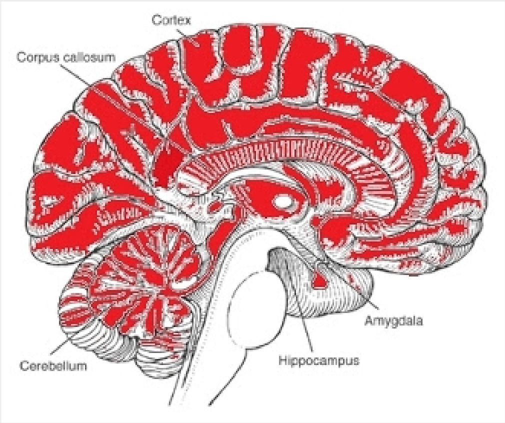
This map would be better from the standpoint of selling your house, since it would leave someone with the impression that your house's school district has much higher scores than the nearby districts. But given the actual data showing only a 1% difference, it would be utterly misleading to present a map like this. The map would incorrectly give someone the idea that your home's school district had scores maybe 30% better than surrounding districts. Presenting a map like this would be an example of *lying with colors.*

It is exactly such lying with colors that goes on again and again in brain imaging studies on the neural correlates of consciousness. Again and again, such studies will show visuals that depict differences of only 1% or less between blood flow in different regions of the brain. But such regions will be shown as red regions in brain images, with all of the other areas having a grayish "black and white" color. When you see such an image, you inevitably get the impression that the highlighted part of the brain has much higher activity than other regions. But such a conclusion is not what the data is showing.

So, for example, a study finding 1% higher brain activity in a region near the corpus callosum (under some activity that we may call Activity X) might release a very misleading image looking like the image below, in which the area of 1% greater activity is colored in red.

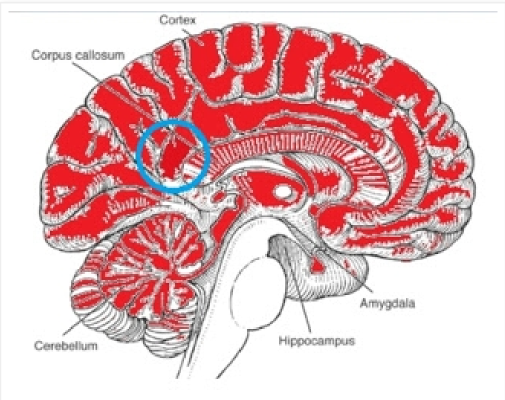


But such an image is lying with colors. If there is only a 1% greater activity in this region, an honest diagram would look like the one below.



With this diagram, the same region shown in red in the first diagram is shown as only 1% darker. You can't actually tell by looking at the diagram which region has the 1% greater activity when Activity X occurs. But that's no problem. The diagram above leaves the reader with the correct story: none of the brain regions differ in activity by more than 1% when Activity X occurs. Contrast this with the first image, which creates the very misleading idea that one part of the brain is much more active than the others when Activity X occurs.

You might complain that with such a visual, you cannot tell which regions have the slightly greater activity. But there are various ways to highlight particular regions of a brain visual, such as circling, pointing arrows, outlining, and so forth. For example, the following shows a region of high activity without misleading the viewer by creating the impression of much higher activity:



The misleading diagrams of brain imaging studies seem all the more appalling when you consider that the images in such studies are typically the only thing that laymen use to form an opinion about localization in the brain. The text of brain imaging studies is typically written in thick jargon that only a neuroscientist can understand. Frustrated by this very hard-to-understand jargon and unclear writing, every layman reading these studies forms his opinions based on the visuals. When such visuals deceive us by lying with colors (as they so often do), the whole study ends up being something that has the effect of creating misleading ideas.

At 4:47 in this online course, we are told that the blood changes in the brain are quite small when observed with an MRI, between 0.1% and 5% (based on two previous comments I quoted, the higher value seems to be only found in the auditory cortex or the visual cortex). The speaker in this course tells us that if we were to just watch a movie of the fMRI scans, *we wouldn't be able to notice the change*s between different brain regions. But the visuals in neural correlation studies misrepresent this minimal change, making it look like a great big change. These cases of lying with colors give readers a very misleading impression that brain activity involving thinking and memory recall is very localized, and tightly correlated with mental activity.

A review of the book "Reliability in Cognitive Neuroscience" by William R. Uttal states the following:

William Uttal warns against these claims, arguing that, despite its utility in anatomic and physiological applications, brain imaging research has not provided consistent evidence for correlation with cognition....This inconsistency of results, he argues, has profound implications for the field, suggesting that cognitive neuroscientists have not yet proven their interpretations of the relation between brain activity captured by macroscopic imaging techniques and cognitive processes; what may have appeared to be correlations may have only been illusions of association.

How closely your brain is correlated with your mind is important from a philosophical standpoint. If different parts of our brains surge dramatically with blood when we think or recall memories, that is a point favoring the idea that your mind is just a product of your brain. But if different parts of your brain look pretty much the same when you think or recall memories, that's a point in favor of the idea that your mind and memories may involve something much more than your brain, perhaps some soul or some higher cosmic consciousness infrastructure. The actual data from brain imaging is the second of these cases: different parts of the brain show about the same activity when thinking or memory recall occurs. But by doing neural correlation studies that visually make tiny changes look like huge changes, our neuroscientists almost seem to be trying to fool us into thinking that a very different thing is going on, that particular parts of our brain light up dramatically when our higher mental functions are engaged. To such neuroscientists we should say: visually represent your own data honestly, and stop lying with colors.

Postscript: The scientific paper here makes a list of scientific phrases that people should stop using, and includes the phrase "brain region X lights up" in that list, a term frequently used in popular accounts of brain imaging studies.

The paper here ("Suspiciously high correlations in brain imaging research") discusses at length very severe problems in brain imaging studies. It states the following on page 2:

"By 2008, this analysis error had become prevalent not only in neuroimaging studies of individual differences in emotion, personality, and social cognition (Vul et al. 2009a), but seemed to occur in many other guises (Vul & Kanwisher, 2010), and was estimated to have played some role in 40-50% of high profile fMRI papers regardless if their substantive focus (Kriegeskorte et al. 2009)."

Below this we see an interesting graph showing many studies with only about 12 subjects indicating a strong brain/behavior correlation, but few very studies showing such a strong correlation when 25 or more subjects were used.

On page 23 the paper states the following:

"With a plausible population correlation of 0.5, a 1000-voxel whole-brain analysis would require 83 subjects to achieve 80% power. A sample size of 83 is five times greater than the average used in the studies we surveyed: collecting this much data in an fMRI experiment is an enormous expense that is not attempted by any except a few major collaborative networks."

In other words, brain imaging studies tend to use only a fraction of the sample size they need, given the techniques they typically use. It's possible to do a reliable study with a small sample size, if you limit the analysis to only one small tiny area of the brain. But that is almost never done.

On page 33 the paper above states the following, giving us a strong reason for skepticism about brain scanning studies:

"In short, our exploration of power suggests that across-subject whole-brain correlation experiments are generally impractical: without adequate multiple comparisons correction they will have false positive rates approaching 100%, with adequate multiple comparisons correction they require 5 times as many subjects than what the typical lab currently utilizes."

at April 03, 2018 No comments:

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Head Truth

The huge case for thinking minds do not come from brains

Tuesday, April 3, 2018

Physical Connections Do Nothing to Explain Cognition

Let us imagine a thought experiment. Imagine we have a large Olympic-sized swimming pool. Let's suppose we fill the swimming with a gel-like substance about the consistency of jelly that you might spread on your toast. Now let's also imagine that we pour a hundred billion little spheres into this swimming pool, and mix the contents of the swimming pool so that the spheres evenly spread out in the pool, with just as many spheres in any cubic meter of the pool.

Is there any reason at all why we should suspect that anything like a sense of self or a thought or consciousness would come out of this gel-filled swimming pool with all these spheres? Not at all, not unless a human were to jump into the pool.

Now, let's imagine something more complicated. Let's imagine that each of these tiny spheres that were poured into the swimming pool has a special power: the power to physically connect to thousands of other spheres. Let's suppose we activate this power in the spheres, causing thousands of tiny little wires to protrude out of each of these spheres; and let us suppose each of these thousands of wires ends up connecting with some other sphere other than the sphere from which the wire came. Let's imagine that after a week or two there is a situation in which each of the tiny spheres is directly wire-connected to each of thousands of other tiny spheres.

Is there any reason at all why we should suspect that anything like a sense of self or a thought or consciousness would come out of this gel-filled swimming pool with all these spheres, which were connected in such a way? Not at all, not unless a human were to jump into the pool. And if we were to ramp up this technology to another level, so that each of the hundred billion spheres became wire-connected to a million or a billion other spheres in the pool, this would still not give us the slightest reason for thinking that any such thing as a thought or self-hood or understanding would be coming out of this swimming pool, unless a human was in the pool.

So why, then, is it that we suppose that it is the connection of cells in the brain that is somehow able to give rise to our consciousness, our thinking, and our understanding? The swimming pool I have described here is similar to the human brain. The jelly-like gel has the same consistency as the human brain. The little spheres are like the neurons of the brain. The wire connections are like the connections that link neurons in the brain.

There is no reason at all to suspect that physical connection should act as some magic wand causing consciousness or understanding or self-hood to appear. Consider a crystal lattice. This is a regular structure in which all the atoms are connected by bonds. In a crystal lattice you could follow the bonds to trace a path from any one atom in the crystal to any other atom in the crystal. But no one that I know of has ever suspected that a crystal might be conscious

Translate

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- Introduction to This Site
- Preservation of Mind and Memories After Removal of Half a Brain
- Why We Should Not Think the Human Brain Can Store Very Old Memories
- Why the Instantaneous Recall of Old Memories Should Be Impossible for a Brain
- Cases of High Mental Function Despite Large Brain Damage
- Reasons for Doubting a Brain Could Do the Super-Complex Encoding Needed to Neurally Store Episodic Memories or Concepts
- The Many Cases Showing a Person's Mind Can Operate When His Brain Has Shut Down
- Your Physical Structure Did Not Arise Bottom-Up, So Why Think Your Mind Did?
- The Brain Seems to Have No Mechanism for Reading or Writing Memories
- No One Understands How a Brain Could Generate Ideas
- 30 Reasons for Rejecting the Theory of Neural Memory Storage
- Groupthink and Peer Pressure Make It Taboo for Neuroscientists to Put Two and Two Together
- Synaptic Delays Mean Brain Signals Must Move at a Snail's Pace
- Brain Dogmas Versus Case Histories That Refute Them
- In Neuroscience Papers Bluffing Is More Common Than Candor
- Young Age of Languages Contradicts Claims of Neural Storage of Linguistic Information

because of such an arrangement of atoms. Mere physical connection does nothing to explain consciousness or understanding or self-hood.

Consider the global telephone system. There are now almost as many cell phone subscribers as there are people. This means the global telephone system is a connected network of billions of nodes. Most of these nodes are smart phones or cell phones with capabilities greater than neurons. But while the idea of an intelligence arising from a phone network was once fancifully suggested by the science fiction writer Arthur C. Clarke in the story *Dial F for Frankenstein*, I know of no one who has seriously suggested that the global phone network may be conscious. Nor do I know of anyone who has seriously argued that the global computer network known as the Internet has achieved a kind of self-hood or consciousness or an understanding of itself.

Inside a heart or a liver of a large animal like a whale or an elephant, there are innumerable cells connected by tiny capillaries. Since there are 10 billion capillaries in the human body, we may presume there are billions of connecting capillaries in the organ systems of an elephant or a whale. But nobody ever thinks that such a high degree of connection causes an elephant or a whale to have some mind that is created from underneath its neck.

The human brain has an architecture in which connection is the most prominent feature. But there is no reason to think that such a high degree of connection should in any way be something that can explain the main characteristics of the human mind. A 2010 book by two neuroscientists states in its preface, "The neuroscience literature contains many speculations about how the brain computes, but none is well established."

Let me tell a little science fiction story. Once there was a planet on which most of a continent was covered by a densely packed jungle. The trees of this jungle had long thin branches and vines that could connect with many other trees. A particular tree might have branches and vines that stretched out for hundreds of meters, connecting with hundreds of other trees. But there was something very remarkable about this jungle. When most arrangements of these trees and branches and vines existed, the huge jungle was just an ordinary jungle, no more conscious than a stone. But when there got to be a sufficiently great density of these trees and branches and vines, the jungle became a self-conscious mind, and was capable of judgment, analysis, insight, imagination and self-conscious experience.

The story isn't very believable, is it? Why should a jungle become self-conscious merely because there was some particular arrangement of trees and branches and vines? But such a story is just like the story that our neurologists ask us to believe. We are told that we have consciousness merely because of a particular arrangement of densely packed nerve cells and dendrites connecting different cells – an arrangement quite like that of the jungle just described, except that instead of trees it is nerve cells, and instead of branches it is dendrites, and instead of vines it is axons.

Nor will it work to try to appeal to computers to justify the "connections lead to cognition" idea. It is true that if you open up a back of a supercomputer, you will see many wires connecting things. But there is no computer in the world that has any type of real understanding or cognition. Computers do processing

- Vacillating Disarray of the Memory Trace Theorists
- Study Finds "Poor Overall Reliability" of Brain Scanning Studies
- "Brains Store Memories" Dogma Versus the Reality of Noisy Brains
- The Brain Has Nothing Like 7 Things a Computer Uses to Store and Retrieve Information
- Exhibit A Suggesting Scientists Don't Understand How a Brain Could Store a Memory
- The Dubious Dogma That Brains Make Decisions
- Long Article Tries to Show Neural Memory Storage, but Gives No Real Evidence for It
- How Evidence for ESP Undermines the "Minds Come From Brains" Dogma
- Gender Differences in Brains Help Discredit Prevailing Dogmas About Brains
- Study Finds Equal Brain Connectivity in All Mammals
- Some Reasons the Main Theory of Neural Memory Storage Is Unbelievable
- Scientists Can't Persuasively Explain How a Brain Could Instantly Retrieve a Memory
- The Lack of Evidence for Memory-Storage Engram Cells
- Candid Confessions of the Cognitive Experts
- Global Workspace Theory Sure Isn't an Explanation for Consciousness
- When Animals Cast Doubt on Dogmas About Brains
- Memories Can Form Many Times Faster Than the Speed of Synapse Strengthening
- The Guy with the Smallest Brain Had the Highest IQ
- He Had Half a Brain and Above Normal Intelligence
- The Truth About Neurons and Synapses
- A Diagram of Explanatory Dysfunction in Academia
- The Brain Shows No Sign of Working Harder During Thinking or Recall
- More Evidence of High Mental Function Despite Large Brain Damage
- The Lack of a Viable Theory of Neural Memory Encoding
- More Evidence That Neuron Loss Has Little Effect on Cognition
- Fraud and Misconduct Are Not Very Rare in Biology
- Reasons for Doubting Thought Comes from the Frontal Lobes or

and information crunching, but there is no computer with the slightest understanding of any abstract concept. Understanding only occurs in minds, and computers don't have minds.

Some might try to use the "you shouldn't expect mind from neurons" situation to argumentative advantage by saying, "Yes, it's unexpected – it's an example of *emergence*." Here is how one William Hasker tries to do this on page 212 of a book called, "The Soul Hypothesis":

The general idea of emergence is that when one brings together elements of a certain sort, and arranges them in a proper way, something genuinely new appears, something that did not exist in the elements prior to their combination. The new thing isn't just a rearrangement of what was there before, but neither is it something dropped into the situation from outside. It "emerges," comes into being, through the operation of the constituent elements, yet the new thing is something different, and often surprising; we wouldn't have expected it before it appeared. Take a mathematical equation of a certain sort, plot it onto a set of coordinates, and a fractal pattern appears – complex, unexpected, and sometimes stunningly beautiful. Dissolve some chemicals in water, let the solution stand for a while under the right conditions, and regular, highly organized crystals are formed. When the right numbers and kinds of chemical molecules are arranged in a particular complex structure, we have something new – a living cell. And given a sufficient number of the right kinds of cells, properly organized, there is the wonder of awareness, involving sensation, emotion, and rational thought. In each case, what "emerges" is something qualitatively new – a fractal pattern, a crystalline structure, life consciousness.

Hasker's statement has a certain superficial appeal, but it does not stand up to close scrutiny. Let's look carefully at some of the examples he has provided.

A fractal pattern is a case in which a particular algorithm using what is called recursion is combined with some graphics software. What do we expect to get from this? We expect graphics output, and that's just what we get. With such output there is the property that you can zoom in, and keep continuing to get a certain type of detail. But given the recursive nature of the algorithm, that's just what should be expected. There's no wondrous "emergence" in this case; we expected some graphic output, and we got it. And even if the result was unexpected, you would hardly be justified in using such a feeble example (mere graphics output) as something that might justify conclusions about the almost infinitely more substantial effects of the human mind (such as consciousness, abstract thinking and memory).

As for Hasker's example involving a crystallization of water, there's no real emergence going on there. Such a crystallization is quite predictable, given the laws of chemistry and physics. Nothing unexpected has happened. The crystal pattern is nothing new that has emerged. We simply use the term "crystal pattern" to refer to a particular type of arrangement of molecules. Similarly, there is no non-trivial "emergence" going on when I arrange 12 pennies into a circle; in no non-trivial sense does circularity emerge if I do that.

Hasker then says, "When the right numbers and kinds of chemical molecules are arranged in a particular complex structure, we have something new – a living cell." This is an invalid example, because no one has ever observed any such thing occurring. Scientists absolutely are not able to make living cells come into existence by combining mere chemical molecules. Many scientists assume that the first living cell arose from a mere chance combination of chemicals, but that assumption is unproven and very dubious, because the chance of such a combination producing life seems fantastically unlikely.

Prefrontal Cortex
- Why Most Animal Memory Experiments Tell Us Nothing About Human Memory
- Other Evidence of Human Paranormal Abilities
- Why Brains Are Not Suitable for Storing Long Sequences Like Humans Remember
- Why Brain Scans Don't Show Brains Make Minds
- Why Strokes, Alzheimer's Disease and Drunkenness Don't Prove the "Brains Make Minds" Dogma
- Synaptic Density Studies Contradict the Most Popular Memory Theory
- The Rare "Total Recall" Effect That Conflicts with Brain Dogmas
- Physical Connections Do Nothing to Explain Cognition
- The Sociological Reasons Why Bad Explanations Persist in Academia
- Split-Brain Cases Conflict with "Brains Make Minds" Dogma
- Why So Much of Neuroscience News Is Unreliable
- An Analogy Clarifying Why the "Brain Stores All Your Memories" Dogma Is Untenable
- Why Darwinism Fails to Explain the Human Mind
- What Is It That a Brain Does?
- Cloud Computing and a Non-Local Model of Consciousness
- Why We Do Not Understand the Origin of Complex Biological Innovations
- Our Minds May Arrive Top-Down Not Bottom-Up
- Fancy New Technology Fails to Prove Memory Dogmas
- The Argument for Determinism Collapses Once We Discard the "Minds Come from Brains" Dogma
- Animal Experiments Conflicting with the Dogma That the Brain Stores All Memories

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In short, Hasker has not given us any examples that justify the "mind from mere cells" thinking of his claim that "given a sufficient number of the right kinds of cells, properly organized, there is the wonder of awareness, involving sensation, emotion, and rational thought." None of his previous examples justify thinking that the wonder of rational thought and awareness is something that we should expect to jump out from "a sufficient number of the right kinds of cells, properly organized."

Another example sometimes given to justify philosophical notions of emergence is the fact that when hydrogen and oxygen combine to become water, a novel property of "wetness" emerges. But in one sense such a thing is not unexpected. The general rule in chemistry is: combine two elements to make a compound, and you will get something new with its own chemical properties different from those of any of its constituents. That's exactly what happens when hydrogen and oxygen combine to make water. So in one major sense it's not at all unexpected that we would see some new property or characteristic.

All such examples of "emergence" fail to justify "mind from brain matter" assumptions, for the general reason that they are all cases of one thing physical producing something else physical. Even in the fractal example, we are dealing with something physical, as the fractal pattern is produced on some computer hardware that uses software. Even if you could establish that novel physical characteristics arise unpredictably from physical things, this would not justify the very different conclusion that mental capabilities arise from mere cells.

at April 03, 2018 No comments:

Labels: emergence

What Is It That a Brain Does?

On this site I have advanced the claim that brains do not make minds. One question that is raised by such a claim is: if brains do not create minds, what is it that brains do? I believe the best answer we can give to this question is: the brain is an organ that helps other parts of the body outside of the skull do their jobs.

Let's consider how the brain helps other parts of the body do their jobs. By controlling autonomic functions, the brain helps keep the heart and the lungs doing their jobs. By being a terminus point and coordinator for nerves throughout the body, the brain helps those nerves do their job. So, for example, the brain helps the touch-sensitive nerves at the tip of your fingers do their jobs.

The brain also helps the senses do their jobs. Much of the brain is involved in helping eyes do their job, by helping sensory inputs form into an image you see in your mind's eye. Some of the brain is involved in helping ears do their job, by helping you decipher auditory inputs that would be unintelligible without a brain. Some of the brain is involved in helping your lips and tongue do the job that they do in speaking. Because of all of the subtle requirements of speech, speaking requires quite a bit of brain involvement. If humans had full-blast telepathic powers as good as speech, we might require a much smaller brain.

The brain also helps muscles and bones do their job, by helping to provide the coordination needed for complex muscular movements such as walking. It could be that the brain is a kind of storehouse for learned complex muscle movements. Accounting for such a kind of "muscle memory" is much easier than accounting for episodic memory.

The brain also has some involvement in sexual function, things such as erections and orgasms. The brain also has some involvement in the endocrine system, maintaining balance and maintaining body temperature and homeostasis. So in all these things we have a large variety of jobs that the brain does. We can combine these examples to form a “lean and mean” concept of what the brain does, by saying: *the brain is an organ that helps other parts of the body outside the brain do their jobs*.

This is the core of what we know about what brains do. Our scientists should have stuck with such a empirically well-founded core, and been extremely wary about adding a great mass of other unwarranted ideas, such as the idea that the brain stores episodic memories or conceptual learning, or that brains creates abstract ideas, or that the brain creates your self or consciousness.

Given all the different roles the brain has for helping other parts of the body, we have no problem along the lines of “the brain is bigger than it should be if it doesn't make your mind.”

at April 03, 2018 No comments:

Why So Much of Neuroscience News Is Unreliable

After a reader finishes reading this site's posts, he or she will return to his regular web browsing habits, which may include periodic visits to science web sites such as LiveScience.com or RealClearScience.com. Such sites may periodically have stories that seem to contradict this site's assertions. But there are reasons why you might take such stories with a grain of salt.

The first reason has to do with the runaway hype and exaggeration that is currently going on in regard to Internet sites reporting scientific research. Major websites have learned the following fundamental formula:

Clicks= Cash Income

The reason for this is that major websites make money from online ads. So the more people click on a link to some science story, the more money the website makes. This means that science reporting sites have a tremendous financial incentive to hype and exaggerate science stories. If they have a link saying, “Borderline results from new neuron study,” they may make only five dollars from that story. But if they have a story saying, “Astonishing breakthrough unveils the brain secret of memory,” they may make five hundred dollars from that story. With such a situation, it is no wonder that the hyping and exaggeration of scientific research is at epidemic levels.

Part of the problem is university press offices, which nowadays are shameless in exaggerating the importance of research done at their university. They know the more some scientific research is hyped, the more glory and attendees will flow to their university.

A scientific paper reached the following conclusions, indicating a huge hype and exaggeration crisis both among the authors of scientific papers and the media that reports on such papers:

Thirty-four percent of academic studies and 48% of media articles used language that reviewers considered too strong for their strength of causal inference....Fifty-eight percent of media articles were found to have inaccurately reported the question, results, intervention, or population of the academic study.

Another huge problem involves what is called the Replication Crisis. This is the fact that a very large fraction of scientific research results are never replicated. The problem was highlighted in a widely cited 2005 paper by John Ioannidis entitled, “Why Most Published Research Studies Are False.”

A scientist named C. Glenn Begley and his colleagues tried to reproduce 53 published studies called “ground-breaking.” He asked the scientists who wrote the papers to help, by providing the exact materials to publish the results. Begley and his colleagues were only able to reproduce 6 of the 53 experiments. In 2011 Bayer reported similar results. They tried to reproduce 67 medical studies, and were only able to reproduce them 25 percent of the time.

So that “breakthrough” story on your science news site has a large chance of being just some fluke that no other researcher will ever reproduce. And if some other researcher tries to reproduce the study, and fails, you will probably never hear about it (because replication failures have a hard time getting published, and get little press).

Then there's the fact that our science journalists typically act as kind of cheerleaders, as kind of “pom-pom journalists” rather than people applying critical scrutiny to the claims of scientists.

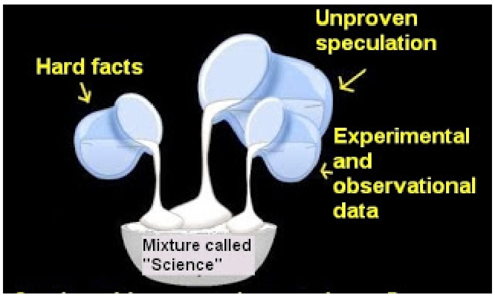
Let us imagine a country in which the press reported uncritically the assertions of the government. In this country, each time the leader of a country stated something, it would be reported as gospel truth by the press. In this country when some group of government officials such as a Senate committee came to a decision, the journalists would report that decision as if it were something that could scarcely be doubted. And whenever a president wanted to start a war, the press would publish the White House spin without criticism. Now clearly in such a country the press would not be doing its proper job. The proper job of the press is to not to just report what authorities in power are saying, but to subject such claims to critical scrutiny.

Thankfully we do not live in a country with a press that is a lap-dog to authorities in government. But we do live in a country where the press is pretty much a lap-dog to authorities in academia. Our science writers typically treat the pronouncements of professors with kind of the same reverence that North Korean journalists treat the utterances of government officials.

When a US president or senator makes a dubious claim, the press are very good about quoting people with alternate viewpoints who dispute such claims. When a scientist makes a dubious claim, our science journalists will typically uncritically repeat such a claim, without citing someone else who disputes it.

When quoting people, science journalists virtually always stay strictly within the community of mainstream scientists. If there are 50 known knowledgeable online critics who have vigorously disputed some type of claim that a scientist makes, none of them will be quoted the next time a scientist makes such a claim. If political reporters operated in a similar way, the rule would be that you can't quote anyone except anyone except a Republican to talk about a Republican's statement, and you can't quote anyone except a Democrat to talk about a Democrat's statement.

Another reason why you may get many poor quality stories on science web sites is that scientists often mix up facts, experimental results, speculations and doubtful assumptions, without being careful to label their speculations as speculations, and without being careful to note their unproven assumptions are unproven.   It's all poured together into a mixture labeled as "science," making it very hard for readers to sort out what part of a study is hard fact and which part may be the author's dubious interpretation or spin on what he or she observed.



Another reason why you may get lots of poor quality stories on science web sites has to do with the rather perverse incentive system that exists for scientists to "tow the party line," and produce papers that reflect existing ideas rather than challenge them. Consider the process of peer review, whereby each paper submitted to a journal is reviewed by several scientists in the same field. A paper won't get published if the reviewers give it a negative rating. A paper may get a bad rating if it has obvious errors or math errors, but it may also get a bad rating if it challenges or seems to defy prevailing assumptions. What this means is that peer review tends to act like a censorship racket, preventing journals from publishing results that might be deemed as controversial.

Two emeritus professors state it this way:

Peer review is self-evidently useful in protecting established paradigms and disadvantaging challenges to entrenched scientific authority. Second, peer review, by controlling access to publication in the most prestigious journals helps to maintain the clearly recognised hierarchies of journals, of researchers, and of universities and research institutes. Peer reviewers should be experts in their field and will therefore have allegiances to leaders in their field and to their shared scientific consensus; conversely, there will be a natural hostility to challenges to the consensus, and peer reviewers have substantial power of influence (extending virtually to censorship) over publication in elite (and even not-so-elite) journals.

So imagine you're a scientist doing research on memory, consciousness, or cognition. You know that your chance of getting your paper published may be low if it challenges prevailing assumptions. So what do you? You crank out papers and studies that conform with prevailing dogmas, such as the dogma that the brain generates the mind. And you know that you have to pile up lots of such papers, because the more papers you write, the better your chance of becoming a tenured professor. The result is a great number of poorly designed studies with dubious methodology, and a great number of studies drawing dubious conclusions that conform with prevailing dogmas.

A scientific paper analyzed 128 other scientific papers, looking for cases of spin (doubtful or debatable interpretation in the paper). The paper said the following:

Among the 128 assessed articles assessed, 107 (84 %) had at least one example of spin in their abstract. The most prevalent strategy of spin was the use of causal language, identified in 68 (53 %) abstracts.

So in more than half of the scientific papers the authors were making statements suggesting a causal relation that was "spin," and not directly implied by the data collected. This type of thing goes on all the time in neuroscience papers, where authors routinely draw causal conclusions or causal suggestions that are not justified by the observational data found in the paper.

Many neuroscience studies follow this formula:

(1) A scientist will monitor the brain with something like a brain wave reader or an MRI scanner, while a subject is doing some activity such as thinking, imagining or remembering.
(2) The scientist will do some write-up based on the assumption that the brain was producing whatever the person was doing.
(3) The research will get reported with some headline such as "New Insight as to How the Brain Thinks," or "What Your Brain Does to Produce Ideas," or "Scientists Shed Light on How Brains Remember Things."

The fact that such studies show very little may be realized if you consider that exactly the same approach could be used by monitoring liver activity during a person's mental activities; and headlines could then be written up such as "How Your Liver Thinks" or "New Clues As to How the Liver Remembers Things." Monitoring the activity of Item X during Activity Y does nothing to prove that Item X is actually producing Activity Y.

Very often, we will have news reports that do not involve any type of neuroscience research or any type of brain research, but which are represented as findings about the brain. For example, a study may be done testing the memories or creativity of some people, without involving any type of brain scan. We may then see research presented with a headline such as "Study Shows Your Brain Remembers More If You Listen to Bach" or "Study Shows Your Brain Has More Ideas If You Use Google." What is going on here? It's simply that the author assumed that memory is stored in the brain, and that your brain is what is producing ideas. So we have "brain" used in the headline even though no research was done on the brain. Such an approach to headline writing can be very misleading.

An example of this ever-so-common sloppy reporting is a story published by the British Psychological Society with the title, "Our brains rapidly and automatically process opinions we agree with as if they are facts." The story was coverage of research that did nothing to study the brain, and which merely studied performance on a special test. The author has simply assumed that processing of opinions is something that is done by the brain -- something which we have no evidence of. We know that minds process opinions, but do not know that brains process them.

Scientific studies that use small sample sizes are often reliable, and often present false alarms, suggesting a causal relation when there is none. Such small sample sizes are particularly common in neuroscience studies, which often require expensive brain scans, not the type of thing that can be inexpensively done with many subjects. In 2013 the leading science journal Nature published a paper entitled "Power failure: why small sample size undermines the reliability of neuroscience." There is something called statistical power that is related to the chance of a study producing a false alarm. The Nature paper found that the statistical power of the average neuroscience study is between 8% and 31%. With such a low statistical power, false alarms and false causal suggestions will be very common. The Nature paper said, "It is possible that false positives heavily contaminate the neuroscience literature."

An article on this important Nature paper states the following:

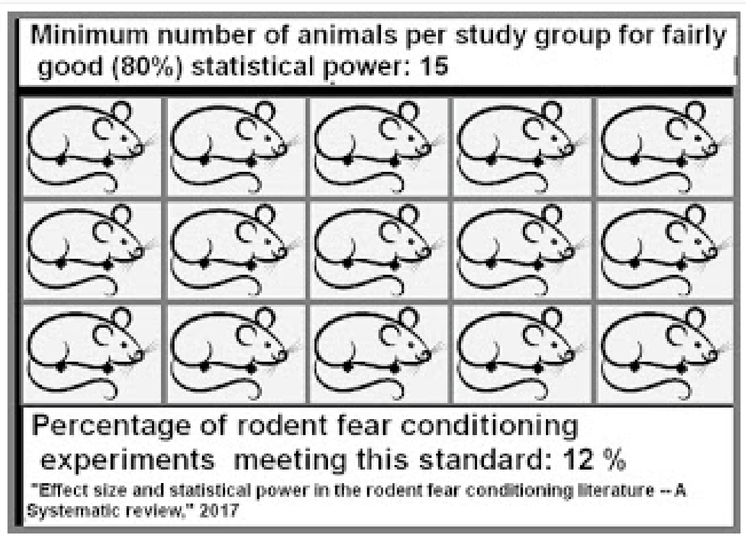
The group discovered that neuroscience as a field is tremendously underpowered, meaning that most experiments are too small to be likely to find the subtle effects being looked for and the effects that are found are far more likely to be false positives than previously thought. It is likely that many *theories that were previously thought to be robust might be far weaker than previously imagined*

Scientific American reported on the paper with a headline of "New Study: Neuroscience Gets an 'F' for Reliability."

So, for example, when some neuroscience paper suggests that some part of your brain controls or mediates some mental activity, there is a large chance that may simply be a false positive. As this paper makes clear, the more comparisons a study makes, the larger a chance for a false positive. The study has an example: if you test whether jelly beans cause acne, you'll probably get a negative result, but if your sample size is small, and you test 30 different colors of jelly bean, you'll probably be able to say something like "there's a possible link between green jelly beans and acne" -- simply because the more comparisons, the larger the chance of a false positive. So when a neuroscientist tries to look for some part of your brain that causes some mental activity, and makes 30 different comparisons using different brain regions, in a small sample size, he'll probably come up with some link he can report as "such and such a region of the brain is related to this activity." But there will be a high chance this is simply a false positive.

The 2013 "Power Failure" paper discussed above was widely discussed in the neuroscience field, but a 2017 paper indicated that little or nothing had been done to fix the problem. Referring to an issue of the Nature Neuroscience journal, the author states, "Here I reproduce the statements regarding sample size from all 15 papers published in the August 2016 issue, and find that all of them except one essentially confess they are probably statistically underpowered," which is what happens when too small a sample size is used.

A 2017 study entitled "Effect size and statistical power in the rodent fear conditioning literature -- A systematic review" looked at what percentage of 410 experiments used the standard of 15 animals per study group (needed for a moderately compelling statistical power of 80 percent). The study found that only 12 percent of the experiments met such a standard. What this basically means is that 88 percent of the experiments had low statistical power, and are not compelling evidence for anything.



The 2017 scientific paper "Empirical assessment of published effect sizes and power in the recent cognitive neuroscience and psychology literature" contains some analysis and graphs suggesting that neuroscience is less reliable than psychology. Below is a quote from the paper:

With specific respect to functional magnetic resonance imaging (fMRI), a recent analysis of 1,484 resting state fMRI data sets have shown empirically *that the most popular statistical analysis methods for group analysis are inadequate and may generate up to 70% false positive results in null data. This result alone questions the published outcomes and interpretations of thousands of fMRI papers. Similar conclusions have been reached by the analysis of the outcome of an open international tractography challenge, which found that diffusion-weighted magnetic resonance imaging reconstructions of white matter pathways are dominated by false positive outcomes Hence, provided that here we conclude that FRP [false report probability] is very high even when only considering low power and a general bias parameter (i.e., assuming that the statistical procedures used were computationally optimal and correct), FRP is actually likely to be even higher in cognitive neuroscience than our formal analyses suggest.*

The paper draws a shocking conclusion that most published neuroscience results are false. The paper states the following: "In all, the combination of low power, selective reporting, and other biases and errors that have been well documented suggest that high FRP [false report probability] can be expected in cognitive neuroscience and psychology. For example, if we consider the recent estimate of 13:1 H_0:H_1 odds, then FRP [false report probability] exceeds 50% even in the absence of bias." The paper says of the neuroscience literature, "False report probability is likely to exceed 50% for the whole literature."

A scientific paper states the following:

In this article, we show that despite the nominal endorsement of a maximum false-positive rate of 5% (i.e., $p \leq .05$), current standards for disclosing details of data collection and analyses make false positives vastly more likely. In fact, it is unacceptably easy to publish "statistically significant" evidence consistent with any hypothesis. The culprit is a construct we refer to as researcher degrees of freedom.

We can imagine how such "degrees of freedom" come into play for a neuroscience researcher. If you have brain scan data that you are trying to correlate with some behavior or mental phenomenon, you can pick hundreds of different areas of the brain for a comparison. Since each such area can be compared in several different ways, you have a choice of more than 1000 different things you might check to find some correlation. But the correlation found through such a fishing expedition will probably not be good evidence of anything. Similarly, if I have the freedom to check any of 1000 different sections of Central Park flowers looking for a correlation between flower wilting and the New York Yankees losing, it won't be too hard to find one section which seems to show such a correlation.

Given all these problems, reading a science news site requires a lot of critical judgment. The statements from such a source should be viewed with as much scrutiny as you would view statements from a politician. Whenever you read a report on a scientific experiment, always ask, "Did they really prove anything?"

But what about peer-reviewed review papers discussing some topic in neuroscience -- are these free from the problems we see in popular news stories about neuroscience? Not at all. Such papers will often contain many references to small-sample studies with inadequate statistical power, citing their findings as if they were reliable, which they are not. Almost never will such papers point out when a study had a too-small sample size. So many a study that uses a too-small sample size creates a kind of "double radiation" of error. Such a study may spur a dozen popular press accounts reporting an untrue result, and also a dozen mentions of the study in other scientific papers, reporting the same untrue result.

Postscript: In my original post I used an assumption that 15 research animals per study group are needed for a moderately persuasive result. It seems that this assumption may have been too generous. In her post "Why Most Published Neuroscience Findings Are False," Kelly Zalocusky PhD calculates (using Ioannidis's data) that the median effect size of neuroscience studies is about .51. She then states the following, talking about statistical power:

To get a power of 0.2, with an effect size of 0.51, the sample size needs to be 12 per group. This fits well with my intuition of sample sizes in (behavioral) neuroscience, and might actually be a little generous. To bump our power up to 0.5, we would need an n of 31 per group. A power of 0.8 would require 60 per group.

If we describe a power of .5 as being moderately convincing, it therefore seems that 31 animals per study group is needed for a neuroscience study to be moderately convincing. But most experimental neuroscience studies involving rodents and memory use far fewer than 15 animals per study group. Zalocusky states the following:

If our intuitions about our research are true, fellow graduate students, then fully 70% of published positive findings are "false positives".This result furthermore assumes no bias, perfect use of statistics, and a complete lack of "many groups" effect. (The "many groups" effect means that many groups might work on the same question. 19 out of 20 find nothing, and the 1 "lucky" group that finds something actually publishes). Meaning—this estimate is likely to be hugely optimistic.

See my post "The Building Blocks of Bad Science Literature" in which I discuss 17 ways in which science literature might create misleading impressions and ideas. See this post for a discussion of evidence indicating that a signficant minority (at least 4% to 6%) of biology papers have evidence of possible researcher misconduct in their images or graphs. In April 2020 a university press release told us, "An examination of nearly 350 published psychological experiments found that nearly half failed to show that they were based on a valid foundation of empirical evidence, suggesting that a wide swath of psychological science is based on an 'untested foundation.' "

at April 03, 2018 No comments:

The Sociological Reasons Why Bad Explanations Persist in Academia

A person wishing to convince you that brains make minds may fall back on a kind of argument from authority. He will point out that most neuroscientists maintain that brains make minds, and ask: how could all of these revered authorities be so wrong?

Such an argument will have little weight to the person who studies either of these things: the history of highly erroneous teachings made by esteemed authorities, and the sociology of groupthink and social conformity. Let's look at the first of these things. It is a fact that during the past 100 years there have been some important cases of expert opinion that was not only wrong, but wrong with disastrous consequences.

Here are a few examples:

- Before the Bay of Pigs invasion in 1961, almost of all his advisers told John Kennedy the invasion would succeed; but it failed miserably, and helped sow the seeds of the Cuban Missile Crisis that put the world on the brink of nuclear war.

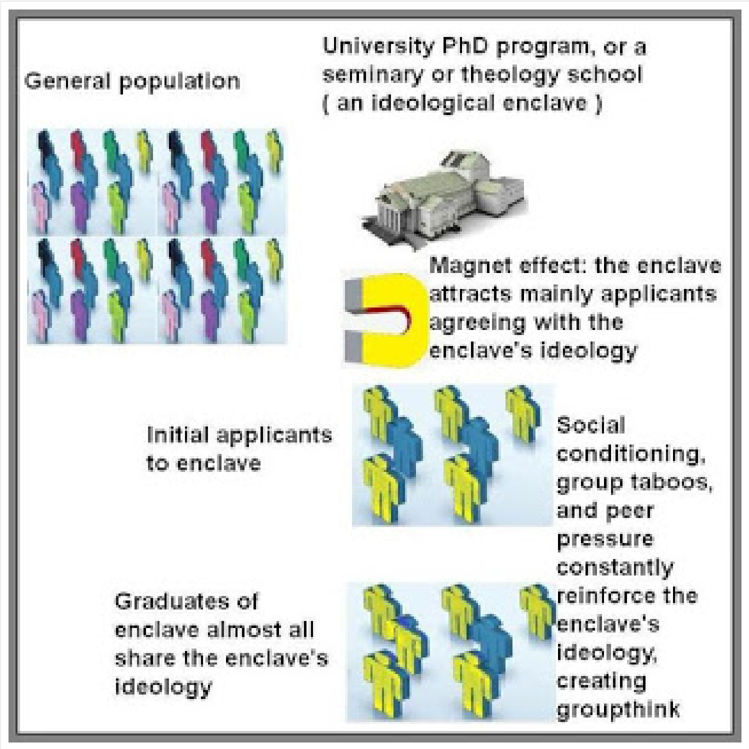
- President Lyndon Johnson's brainy Ivy League advisers kept telling him to pursue the Vietnam War full-blast; but the war ended in defeat for America, with a gigantic unnecessary loss of life for both the US and the Vietnamese.
- For decades before World War II, eugenics was all the rage at American universities, all of which taught eugenics courses; but eugenics fell out of favor after the Nazis used eugenics to justify their horrific exterminations.
- For years before the Housing Bubble burst at about 2006, the financial experts assured us it was no problem, and the most respected Wall Street experts assured us it would not cause much trouble; but the Housing Bubble led to the Great Recession of 2008, with millions losing their homes, and the stock market plunging.
- For decades in the 20th century, psychiatry was dominated by the strange ideas of Sigmund Freud, which included the idea that much of mental illness was caused by sexual conflicts in childhood; but Freud's ideas are now generally dismissed by psychologists, who regard them as largely nonsensical and unscientific.
- The military experts and foreign policy experts in high positions mostly supported the idea in 2003 that it was good idea to invade Iraq to get rid of its "weapons of mass destruction"; but no such weapons were found, and the resulting futile war was a disaster which plunged Iraq into many years of chaos, cost America more than 2 trillion dollars, and resulted in perhaps a million Iraqi deaths.
- Experts at the US government signed off on a medicine called Vioxx, which was then prescribed by countless doctors, until it was found that it had caused many thousands of unnecessary deaths by creating heart problems.
- Countless doctors wrote prescriptions for opioid medications so casually and frequently that "from 2000 to 2015 more than half a million people died from drug overdoses" according to the CDC; and the resulting opioid addiction and overdose problem is currently one of the worst problems facing the US.

From all of these examples we can make the general conclusion that expert opinion is very often wrong, and not just wrong in some small way, but wrong in a very big way.

Is there some general reason why experts often get things wrong? There seems to be such a reason. It is the fact that experts often are trained in ideological enclaves. An expert typically becomes an expert by volunteering for some particular graduate or specialized training program at a university or in the military. These graduate programs are often ideological enclaves, places where there predominates some particular ideology not embraced by most people. The ideology that predominates at neuroscience departments of universities is a materialist ideology based on dogmas such as the dogma that minds are made by brains.

The fact that the graduates of such programs are volunteers creates the opportunity for sociological selection effects. Let's imagine an extreme example. Let's imagine there arises some new discipline called tricostics. It might be the opinion of 90% of those who have read about tricostics that tricostics is pure nonsense. But tricostics might be "all the rage" at some Graduate Program in Tricostics Studies at a particular university, or some

Pentagon training program specialized in tricostics. The people who sign up for such a program might almost all be from the tiny fraction of the population that believes in tricostics. At this particular program there might then be tremendous sociological pressure for students to embrace tricostics. So 90% of the graduates of this tricostics program might be believers in tricostics, even though a randomly selected jury from the general population would probably conclude tricostics is worthless nonsense.



An expert existing in some ideological enclave may get be filled with dogmatic overconfidence about some opinion that is popular within his little ideological enclave. He may think something along the lines of: “No doubt it is true, because almost all my peers and teachers agree that it is true.” But the idea may seem senseless to someone who has not been conditioned inside this ideological enclave, this sheltered thought bubble.

A good rule is: decide based on the facts, and not merely because there is some consensus of experts.

Departments of neuroscience in our universities are ideological enclaves, as are departments of evolutionary biology. Anyone signing up for a PhD program in neuroscience is someone who has signed up to be conditioned in the dogmas of an ideological enclave, as is anyone who signs up for a PhD program in evolutionary biology, as is anyone who signs up for a 2-year minister education program or a priesthood training program. Like a rubber stamp stamping out the same ink pattern, these ideological enclaves tend to create people who all mouth the same dogmas. We should not be particularly impressed by a uniformity or near-uniformity of opinion coming out of such ideological enclaves.

The fact that 99% of the graduates of fundamentalist theology schools believe in fundamentalist theology is not a very powerful argument for fundamentalist theology. The fact that 99% of the graduates of Catholic seminary schools believe in Catholic theology is not a very powerful argument for Catholic theology. And the fact that 90% of the graduates of neuroscience PhD programs may adhere to the prevailing dogmas of neuroscientists is not a very powerful argument that such dogmas are correct. All such things can be explained as examples of the power of groupthink and social conformity.

Besides these sociological factors, it is easy to think of psychological and financial factors why experts may tend to come to wrong conclusions in matters of neuroscience and evolutionary biology.

Exercise 1: Imagine you have just spent five long hard years and $100,000 in cash to get a PhD in neuroscience. Now you can believe one of two things:

1. The mind is a great mystery, and you have learned a lot about the brain, but very little as to why humans actually have mind, consciousness or memory.
2. You are a great knowledge master on the topics of the mind and the brain, and you know the answers to all the main questions involving where minds come from and how memory works.

Which of these two opinions will you tend to favor after having spent five long years and $100,000 of your money to get a PhD in neuroscience? Of course, there are psychological reasons why you will tend to favor the second opinion, which bolsters your prestige and self-esteem. Similarly, a person who spends five years getting a PhD in evolutionary biology (spending $100,000 on graduate school) will have a very strong tendency to think that he has become a great knowledge master who can now explain how biological innovations arose and how species appeared, an opinion that bolsters his own self-esteem and prestige.

In both of these cases a person who has no vested interest may tend to come to a vastly different conclusion than the person who has a vested interest in the matter. When we also consider that the newly minted neuroscience PhD or evolutionary biologist PhD has a vast financial incentive to parrot the party line (which will make him more likely to get appointed as a tenured professor and more likely to get his papers published), it is rather easy to understand the persistence of unfounded but popular dogmas in these fields.

Below are some cases of social groups in which all members were conditioned to believe certain dogmas, with various forms of sanctions for any deviation from the group orthodoxy.

Social Group	**Dogma Mandated by Social Group**
Ancient Roman senators	The belief that Rome is destined to rule the world, and that local rebellions must be quickly crushed.
Medieval clergymen	The belief that the Church is the supreme holder of truth, and that heretics must be destroyed.
Southern US slaveholders, circa 1830	The belief that people with dark skin are fit only to serve as slaves.
German officials, World War II	The belief that Germans are destined to rule as the master race.
Soviet Union officials, circa 1950	The belief that history is essentially a class struggle that is reaching its climax in the creation of communist

	worker's paradises such as the Soviet Union.
American government and military officials, circa 1965	The belief that much of Vietnam must be thoroughly bombed to prevent Communist expansion.
Modern biology professors	The belief that biological innovations have appeared merely because of random mutations and natural selection, and that the brain is the sole source of the human mind and self.

In each of these groups there is or was relentless peer pressure to conform to the doctrine in the second column. A person outside the group may regard such a doctrine as absurd, but to the group member bound by the iron chains of social conformity, such a doctrine may have been deemed as unquestionable wisdom.

People will think and do things merely because it is customary to think and do such things. Consider male New York City office workers in the 1950's. Almost every one of them went to work wearing a tie. But wearing a tie is a silly custom. A man's neck will be more comfortable if he doesn't wear a tie. So why did office workers in the 1950's all wear ties? It was the power of social conformity effects. No one wanted to be the "oddball" who did not wear a tie in his office. Belief customs and dress customs may persist for decades or centuries mainly because of the power of peer pressure and social conformity effects. A conformist social group (whether it be a tribe of academics or a high school cafeteria table) compels us to dress or speak in some way, and we conform, wanting above all to fit in to whatever little social group we are part of.

at April 03, 2018 No comments:

Labels: groupthink

The Rare "Total Recall" Effect That Conflicts with Brain Dogmas

In the Guardian this year, there was a long and very fascinating article entitled “Total Recall: The People Who Never Forget.” The article discusses very rare cases of people with what what is called hyperthymesia or Highly Superior Autobiographical Memory, a topic that the *60 Minutes* TV program had covered in 2010.

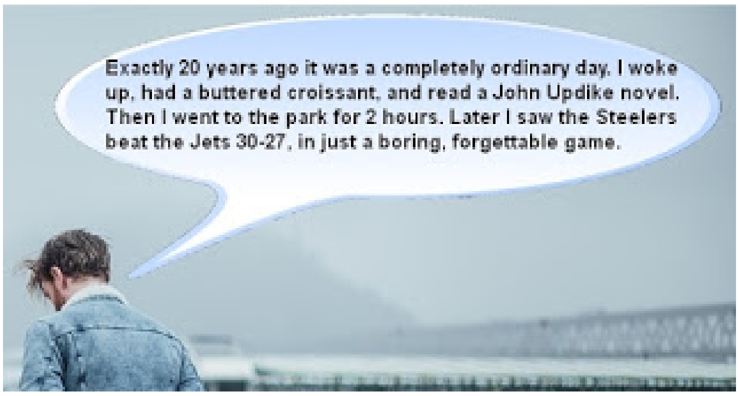
Fewer than 100 such people have been identified. They have the uncanny ability to remember in great detail every single day of past years of their lives, sometimes stretching back for decades.

The article discusses Jill Price, and says this about her:

Price was the first person ever to be diagnosed with what is now known as highly superior autobiographical memory, or HSAM, a condition she shares with around 60 other known people. She can remember most of the days of her life as clearly as the rest of us remember the recent past, with a mixture of broad strokes and sharp detail. Now 51, Price remembers the day of the week for every date since 1980; she remembers what she was doing, who she was with, where she was on each of these days. She can actively recall a memory of

20 years ago as easily as a memory of two days ago, but her memories are also triggered involuntarily.

A memory researcher named James McGaugh has verified the accuracy of Price's recollections. One way to do this is simply to ask her questions about what happened on a particular day that something notable happened. For example, if asked on what day Rodney King was beaten, or what day Bing Crosby died, she can quickly recall the exact date. Of if asked the significance of some particular date, she can tell you some famous person died on that day. McGaugh also verified the accuracy of Price's recollections by checking her diary. He and his colleagues wrote up the case in a scientific paper.



Another scientific paper (which can be read in full here) describes the case of HK, which the 2012 paper describes as a 20-year old person with "near-perfect" autobiographic memory. HK is described as blind and having been born at 27 weeks, 13 weeks early. The paper states:

As can be seen in Figure 1,for dates between this first memory until his 10th year of life, HK shows a relatively steady increase in accuracy for autobiographical events. Accuracy takes a noticeable jump to near 90% in 2001 at age 11. From that point forward, HK's recollection of autobiographical events is near perfect.

The paper also gives us insight as to what it is like to have such a memory:

He reports that he is able to relive memories in his mind as if they just happened. HK stated that everything about his memory, including sounds, smells, and emotions, are vividly re-experienced when he remembers a particular event in time...,He stated that there is no difference in the vividness of his recollection between events that occurred when he was five and events that he experienced within the past month.

The scientists did an MRI scan of the brain of this person with this near-flawless autobiographic memory. Did it show something like an abnormally big brain? No, something like the opposite was found. For the paper tells us that the volumetric analysis "reveals significantly reduced total tissue volume in HK" and that "a volumetric analysis of subcortical structures shows general reduction in subcortical volumes in HK (1019 mL) relative to controls (1249 ± 29 mL)." So the person with this miracle memory had a brain about 20% smaller. The only part of his brain that was larger was his amygdala, an almond-shaped part of the brain. HK's was 20% bigger, but that's only a flea-sized difference.

Cases such as Price and HK apparently date back to the nineteenth century, for an 1871 article describes a man named Daniel McCartney who, according to the Guardian article, "could remember the day of the week, the weather, what he was doing, and where he was for any date back to 1 January 1827, when he was nine years and four months old."

Something different from these cases of Highly Superior Autobiographic Memory or hyperthymesia are the cases of extraordinary memory in savants. Savants are individuals who have some mental disability but also have some extraordinary mental talents. An example of a savant is the late Kim Peek, who could accurately recall the details of 12,000 books he had read, despite having an IQ of only 87. Other examples are Tony DeBlois, who can play 8000 songs from memory, and Derek Paravicini who can play a piece after hearing it only once, despite having a severe learning disability.

So far researchers have failed to draw any noteworthy conclusions from these cases of extraordinary memory. But such cases may suggest that standard ideas about memory are wrong. The standard story is that memories are all stored in your brain. There are several reasons for rejecting this idea, such as the seeming impossibility of explaining how instantaneous recall of distant memories could occur (discussed here), and the reason (discussed here) that there is no workable theory of how brains could be storing memories for 50 years. The most popular theory is that memories are stored in synapses. But synapses are subject to a high rate of protein turnover and structural turnover which should make it impossible for synapses to be storing memories for longer than a year or two. The proteins in synapses are replaced within a few weeks. A recent scientific paper mentions an estimate that the rate of protein turnover in synapses is about 0.7% per hour, which is a rate of about 16% per day.

Under the assumption that memories are stored in brains, we would not by any means expect some people to remember their past experiences 800% better than an ordinary person can. Such a thing would seem to require a brain 800% bigger than the biggest brain that can fit into a human skull. And also under the assumption that memories are all stored in brains, we should not expect people with smaller brains or damaged brains (such as patient HK and Kim Peek) to have dramatically better memories.

But let's imagine a different scenario. Imagine if people's memories are not stored in brains, but are stored in some psychic or spiritual reality associated with a person. Your memories may be stored in something like your soul, not your brain. Under such a scenario, you might have complete memories for everything that happened to you. But your brain might act as a kind of valve, limiting your access to these memories. For some rare people, this normal blockage or limitation of access to biographical memory may not be occurring. Such people may have Highly Superior Autobiographic Memory.

Cases of Highly Superior Autobiographic Memory are easy to reconcile with such a theory. We simply imagine that in such people the brain's function as a kind of "blockage valve" for our memories is not working normally, so the blockage does not occur as it normally does. But cases of Highly Superior Autobiographic Memory are hard to reconcile with standard claims that the brain is where all your memories are stored. Under such claims, it is unthinkable that anyone should have memories such as Jill Price's, which would seem to require a brain the size of an elephant's.

Another interesting mind anomaly is the rare anomaly of acquired savants. A person may acquire extraordinary mental abilities after some accident. One such case is Orlando Serrell, who acquired extraordinary calculation and memory skills after being hit by a baseball when he was 10, in 1979. According to his web site, "He can recall the weather, where he was, and what he was doing for every day since the accident." Again, we have something that does not fit in with conventional dogmas about the brain, but which is compatible with very different ideas about memory. If your brain acts as a kind of faucet or valve for your memories, rather than a storehouse of such memories, it might be that a head injury might reset that valve so that memory is dramatically enhanced.

Similar cases that conflict with existing dogmas about memory are cases such as that of a man who memorized a shuffled deck of cards in only 18 seconds (reported here), and the case of Solomon Shereshevsky, who could do things like listening to someone read at length from a newspaper, and then recite every word the person had read.

Stephen Wiltshire is a person who has the astonishing ability to accurately draw landscape scenes that he has only seen once. He has drawn incredibly detailed and accurate murals depicting cities such as Rome and London, after taking a single helicopter ride over the city. One site describes how Wiltshire spent less than an hour viewing the cities of Barcelona, Palma de Mallorca and Marseille from a cruise ship, and then a month later he drew "highly accurate depictions" of them with "impressive detail." Wiltshire has sometimes drawn these murals before spectators, which excludes the possibility of fraud.

We have in such cases examples of memories being produced with a very-high bandwidth, with tons of details being remembered after a single sensory experience. Such cases debunk prevailing theories of the brain storage of memory, which maintain that a stable new memory does not form until new proteins are synthesized to make synapses stronger. We know that protein synthesis requires minutes. If protein synthesis were required for memories to form, we would form new memories way too slowly. If protein synthesis were required for memories to form, not only would an ordinary person's rate of memory acquisition be impossible, but the formation of new memories would occur at a rate a hundred times too slow to explain cases of Highly Superior Autobiographical Memory (hyperthymesia), or cases such as the case of Stephen Wiltshire or Solomon Shershevsky.

The preprint paper here discusses both cases of Highly Superior Autobiographical Memory and a rare opposite syndrome it calls Severely Deficient Autobiographical Memory (SDAM). Speadking of SDAM cases, the paper says, "These are individuals who are unable to vividly recollect autobiographical experiences from their past, in the absence of detectable neural pathology or deficits in functional living." If our memories are stored in our brains, why would some people have such a problem "in the absence of detectable neural pathology"?

at April 03, 2018 No comments:

Labels: hyperthymesia

Head Truth

The huge case for thinking minds do not come from brains

Wednesday, April 4, 2018

Why We Do Not Understand the Origin of Complex Biological Innovations

Darwinism is the “this explains it all” dogma that enjoys a smug reign in modern biology. A Darwinist will try to explain every organism's capabilities as being due to random mutations and natural selection, just like a dogmatic Marxist will try to explain every major historical event as being an example of class struggle. Without offering any firm answer as to what causes biological innovations, in this post I will take a candid look at why Darwinism fails as an explanation for the origin of species and the origin of biological complexity. I may note that the points below are not by any means crucial to the issue of whether minds are produced by brains. The idea that minds do not come from brains can be held without contradiction by both those who follow Darwinism and those who are skeptical about it.

There are three aspects of Darwinism: (1) common descent, the idea that all life is descended from a common ancestor ; (2) gradualism, the idea that species gradually change over eons into very different species; (3) the idea that biological innovations occur because of a combination of natural selection and random mutations. None of these claims has been proven.

We have no proof of the doctrine of common descent. The fact that all life uses the same genetic code is not at all proof that all life descended from the same ancestor. If some divine creator or series of extraterrestrial expeditions to Earth had decided to populate our planets with organisms, such a force might well have chosen to introduce organisms with a common genetic code, so that a harmonious ecosystem could develop, without organisms getting poisoned because they fed on some other organism with a different genetic code.

To try to support the doctrine of common descent, scientists use what is called phylogenetics, which attempts to create “trees of life” showing how species evolved from a common ancestor. But phylogenetics is very much guesswork. We have almost no DNA from species that lived very long ago, because DNA decays fairly quickly. The half-life of DNA is 521 years, meaning every 521 years half of the DNA in a dead organism will decay.

What happens is that speculative “trees of life” are generated using computer programs run by phylogenetics experts. Such computer programs use massive amounts of guesswork all over the place. They do not arrive at likely solutions, but merely at estimates that are “most likely” given the inputs and given a starting assumption of common descent. Here “most likely” does not mean probable, but simply “more likely than any other guess.” You can make a “most likely” estimate that is very probably wrong. If I ask you to pick a word at random from a book, then the word “the” is the “most likely” answer, but it is not a likely answer (the word you picked will probably be some other word).

The doctrine of common descent (that all organisms descend from a common ancestor) is also not proven by the fossil record. Because of events such as the Cambrian Explosion, the fossil record is actually very much at odds with the

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predictions of Darwinism. The largest classification of species (below a kingdom) is called a phylum. According to Darwinism, we should have seen animal phyla appear very gradually. But instead the fossil record shows almost all animal phyla appearing in a relatively short period of time, about 530 million years ago, in the event called the Cambrian Explosion. Such a dramatic appearance of almost all the animal phyla is incompatible with Darwinism. Darwinists have done nothing to plausibly explain how the Cambrian Explosion could have occurred under their assumptions.

Darwinists will often use the rhetorical trick of saying "evolution is fact." But it is only microevolution that is fact. Microevolution is relatively minor changes in a species caused by some trait already existing in a population become more common in a gene pool or less common in a gene pool. We have no proof of macroevolution, that complex biological innovations appear in a species through a gradual process. Referring to speciation (the origin of new species) in an interview, the distinguished biologist Denis Noble states, "So I go along with the view that there has been no really clear proof that speciation occurred via gradual mutation followed by selection."

Shockingly, the fossil record supplies relatively little support for the idea that species gradually evolve into different species. By far the most common pattern in the fossil record looks like this:

1. A species will suddenly appear in the fossil record, with no obvious ancestor.
2. The species persists in the fossil record for a certain length, perhaps many millions of years.
3. The species then disappears from the fossil record, for no obvious reason.

Now it is true that Darwinists have been able to come up with a few cases of what are called fossil series, in which you can line up a series of fossils, order them by age, and have something that may suggest an evolutionary progression between forms. But the number of such series is actually much less than we would expect if Darwinian evolution had been occurring constantly during the past billion years. If Darwinian evolution had been occurring constantly during the past billion years, we should see such fossil series all over the fossil record. Instead they seem to occur only here and there, in relatively small numbers.

What we also must remember is that in a random fossil record in which no Darwinian evolution occurred, we should actually expect to see (purely by chance) some cases in which fossils coincidentally can be arranged in a “fossil series” suggesting evolution. We must remember that for decades our paleontologists have been diligently combing through the fossil record, looking for series of fossils that can be grouped together in a line suggesting a Darwinian progression. We would expect that purely by chance quite a few such series could be found, even if Darwinian evolution had not occurred.

The alleged transitional series found in the fossil record could be the result of a kind of “paleontology pareidolia,” in which people find a few patterns they are hoping to find after spending great lengths of time scanning a large data collection, rather like people who spend countless hours scanning Mars photos and who occasionally find things on the surface they claim are evidence of ancient Mars civilizations. Dictionary.com defines pareidolia as “the imagined perception of a pattern or meaning where it does not actually exist.” The scientist who spends decades searching for transitional series of fossils (and who eventually finds one or two series that seem to please him) may be like some person who for 40 years carefully checks his toast for dark spots that look like the face of Jesus, and who eventually finds something that pleases him.

Imagine I go into the Yankee Stadium parking lot during many different baseball games. If I am determined to find evidence that one car has evolved into another car, I will probably be able to take car photos that I can arrange in a line, and offer as evidence of "car evolution." I might for example have a series that first shows a dark blue convertible, then a dark blue car with a roof, and then a dark blue van. I might cite these as proof that one type of vehicle is evolving into another, but it's merely me finding a pattern I was hoping to find, in a way that is not surprising given a large data set to comb through. The few "transitional fossil series" presented by paleontologists may be the same type of thing – examples of pareidolia.

In the case of the human species, paleontologists produce "transitional fossil series" supposedly showing a transition leading ape-like ancestors to humans. But such series involve guesswork. We do not have the DNA needed to put such guesses on a firm basis. The half-life of DNA is 521 years, meaning there is very little DNA for any organisms older than 100,000 years. Attempts to use mitochondrial DNA derived from fossils are very dubious indeed, since less than one percent of an organism's DNA is mitochondrial DNA.

It is dogmatically claimed that humans and chimpanzees had a common ancestor. But no such common ancestor has been found in the fossil record. In 2017 BBC.com had a long article entitled, "We have still not found the missing link between us and apes." The article notes a disagreement over whether chimpanzees or orangutans are the "sister species" of humans. A scientific article tells us, "Few fields of research are subject to so many competing hypotheses, as illustrated by the variable number of ancestral species assigned to the human lineage by different authors, ranging from four to a maximum of 25." In recent decades a bewildering variety of hominid fossils have been found, making it harder and harder to extract any clear tale of human ancestry.

A study based on fossil teeth is described in the science story here, which is entitled, "No known hominin is common ancestor of Neanderthals and modern humans, study suggests." Although it is often claimed that humans and chimpanzees have a common ancestor, the wikipedia.org article on "Chimpanzee-human last common ancestor" (CHLCA) confesses, "no fossil has yet been identified as a probable candidate for the CHLCA."

To back up their claim that humans and chimpanzees share a common ancestor, Darwinists are very fond of citing the similarity of human DNA and chimpanzee DNA. But we are not built from the linear chains of amino acids found in DNA – we are built from the three-dimensional proteins that mysteriously arise from such linear chains. When we compare chimpanzees and humans on a protein basis, taking into account the shapes of the proteins, it is found that 80 percent of the proteins in humans differ from those of chimpanzees. See the scientific paper entitled "Eighty percent of proteins are different between humans and chimpanzees" at this URL.

The most plausible fossil candidate for a human ancestor is not the Neanderthals (who lived at the same time as early humans) but a species referred to as *Homo heidelbergensis*. But the wikipedia.org article on *Homo heidelbergensis* tells us that the case for such an ancestry is far from clear. It states that "there is no direct evidence that suggest the *Homo heidelbergensis* is related to modern-day humans."

Such a statement should shock every person who believes that humans are descended from more ape-like ancestors. The statement tells us that there is

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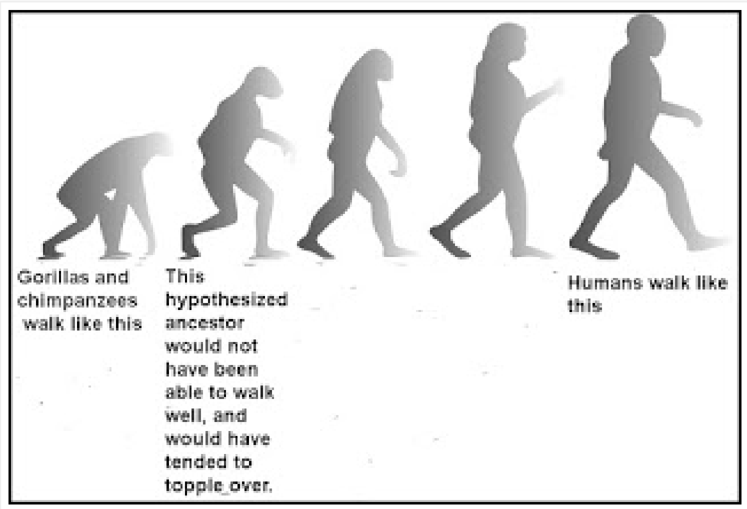
"no direct evidence" that this best candidate for a human ancestor is related to modern-day humans.

We are told that men and chimpanzees have a common ancestor. But chimpanzees use knuckle-walking, which involves four limbs. In order to believe that humans and chimpanzees arose from a common ancestor, we have to believe in a progression like this occurring over many thousands or millions of years:

4-limb walking (works well) → Intermediate stage (works poorly) → Bipedal walking (works well)

The problem is that this progression is unbelievable under a theory of natural selection, which should stop any progression that works against survival value.



Anthropology professor Henry M. McHenry stated this on page 270 of the book *Evolution: The First Four Billion Years*: "The published hominin fossil record does not yet have a true intermediate stage between an apelike and a humanlike body."

Biological organisms show almost unfathomable complexity and coordination. The innovations we see in biological organisms are more impressive from an engineering standpoint than all of the works of man. How do Darwinists attempt to explain such marvels? They offer an explanation that is not at all a deep explanation, but merely a tissue-thin explanation. The explanation they offer is that all of the wonders of biology appeared because of random mutations and natural selection. The idea is that random mutations cause great innovations to appear once or twice in a population, and that natural selection then caused these innovations to spread through a gene pool, because the innovations increased the survival likelihood or reproduction likelihood of an organism.

This explanation entirely fails to be a credible explanation for biological innovations, because of a very simple reason. Natural selection cannot do anything to explain the first appearance of a biological innovation, because natural selection only starts working in regard to a biological innovation after that innovation has appeared. For example, imagine a species does not have any vision system. Once a vision system appears in one organism of that species, natural selection can start blessing that organism with a higher chance of survival and a higher chance of reproduction. But until the innovation of a vision system appears, natural selection will do nothing to make it more likely that a vision system will appear. And so it is in general for every type of biological innovation. Natural selection does nothing to explain the first appearance of any type of biological innovation. Natural selection involves the survival of the fittest, but does not explain the arrival of the fittest. The

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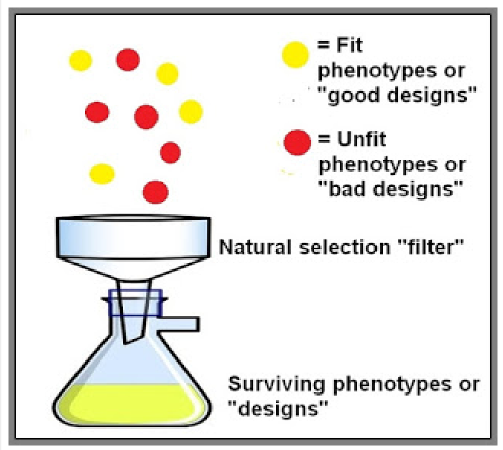
point is illustrated in the diagram below. How did those "good designs" of the yellow circles appear? Natural selection doesn't explain that.



We can compare natural selection to a sneeze. A sneeze is a proliferation agent that will help a virus spread once the virus already exists in a particular person. But a sneeze does absolutely nothing to explain how the virus appeared in the first person infected. And so it is with natural selection, which does nothing to explain the first appearance of any biological innovation.

Therefore the Darwinist's "explanation" of random mutations and natural selection ends up being an account that is really 99% an account of random mutations. And saying something was caused by random mutations is just a non-explanation, simply saying that it appeared by pure chance.

An MIT professor wrote a paper "Inadequacies of Neo-Darwinian Evolution as a Scientific Theory" in which he stated this:

The process of speciation by a process of random variation of properties in offspring is usually too imprecisely defined to be testable. When it is precisely defined it is highly implausible.

We know that for every random mutation that is helpful, there are very many that are harmful. A random mutation is like a typo, a random letter typed on a keyboard. The chance that a set of random mutations will produce something useful is as small as the chance that a monkey typing at a keyboard will produce a useful computer program or a story or poem good enough to get published in *The New Yorker.*

In a *New Scientist* article recently published, a biologist made a candid confession: that while most random mutations are neutral (having no effect), the number of random mutations that are harmful vastly outnumbers the number of mutations that are helpful. I'll quote from the article (and note carefully the use of "extremely"):

"*The vast majority of mutations don't matter, says* Leo Schalk *at the University of Essex. "There might be the occasional mutation that is deleterious, or the extremely occasional mutation that is beneficial." He compares the impact of mutations to swinging a hammer at a car engine. "There's a chance that you will improve its function, but it's much more likely that the hammer will either just bounce off or break something."*

A recent scientific paper cites multiple sources that assert harmful mutations are vastly more common than helpful ones:

*The predominance of deleterious mutations over beneficial ones is well established. James Crow in (*1997*) stated, "Since most mutations, if they have*

- memory recall
- memory storage
- morphogenesis
- natural selection
- near death experiences
- neural noise
- non-local consciousness
- nonneuralism
- optogenetics
- panpsychism
- precognition
- prefrontal cortex
- remote viewing
- savants
- scientist misconduct
- source of thoughts
- split-brain operation
- synapse theory of memory
- top-down theory of mind
- visual recognition

any effect at all, are harmful, the overall impact of the mutation process must be deleterious". Keightley and Lynch (2003) given an excellent overview of mutation accumulation experiments and conclude that "...the vast majority of mutations are deleterious. This is one of the most well-established principles of evolutionary genetics, supported by both molecular and quantitative-genetic data. This provides an explanation for many key genetic properties of natural and laboratory populations". In (1995), Lande concluded that 90% of new mutations are deleterious and, the rest are "quasineutral" (Also see Franklin and Frankham (1998)). Gerrish and Lenski estimate the ratio of deleterious to beneficial mutations at a million to one (Gerrish and Lenski 1998b), while other estimates indicate that the number of beneficial mutations is too low to be measured statistically (Ohta 1977; Kimura 1979; Elena et al. 1998; Gerrish and Lenski 1998a).

The paper can found at the link here.

In one scientific paper, some scientists say, **"**We predict 27–29% of amino acid changing (nonsynonymous) mutations are neutral or nearly neutral ($|s| <0.01\%$), 30–42% are moderately deleterious ($0.01\%<|s|<1\%$), and nearly all the remainder are highly deleterious or lethal ($|s|>1\%$)." The authors give us no estimate for the number for beneficial mutations, as such things are apparently so improbable that they can be ignored.

Very clearly, beneficial mutations are so improbable that the dogma of biological innovations by random mutations is utterly implausible. When a Darwinist tells us that something like the vast complexity of a vision system appeared from random mutations, he is telling us a modern-day miracle story.

In the book *Evolution and Ecology: The Pace of Life* by Cambridge University biology professor K. D. Bennett, this mainstream authority comments on speciation (the origin of species). He says on page 175, "Natural selection has been shown to have occurred (for example, among populations of Darwin's finches), but there is no evidence that it accumulates over longer periods of time to produce speciation in the Darwinian sense."

Let us imagine there is a parent who doesn't want to believe that his toddler son is smart. One day he comes into the nursery and finds a beautiful house of cards next to the child on the floor. If the parent tried to explain this by saying that the child merely threw a deck of cards into the air, and that the house of cards was created by "random spatial positioning and friction" this would be pure nonsense. Friction would not help cards form such an arrangement, but merely help to preserve such an arrangement if (by a 1 in 1,000,000,000,000,000,000,000,000 coincidence) such an arrangement happened to appear by chance.

The Darwinist who tries to explain fantastically coordinated arrangements of matter by saying they are caused by "random mutations and natural selection" is really offering an explanation as implausible as this parent's explanation. Just as friction does nothing to explain the original appearance of the fantastically unlikely arrangement of cards, natural selection does nothing to explain the first appearance of any biological innovation in a gene pool. In both of these cases, we have explanations that are 99% just appeals to blind chance. And whenever you have any very complex arrangement fantastically unlikely to appear by chance, you never have a decent explanation if you are mainly just appealing to blind chance.

When trying to show how natural selection and random mutations might create a biological innovation, an evolutionary biologist might reason light this:

Let's imagine some biological innovation requires 7 parts. The first part might appear because of a random mutation. That part might supply a survival benefit, and therefore spread though out the population of organisms. We call this a "classic sweep." Then some other random mutation might produce the second part needed for the biological innovation. By then all of the organisms would have the first part, because of the previous "classic sweep." This second mutation might also produce a benefit, producing another "classic sweep." We need merely imagine this happening about five more times, and then the biological innovation would have been produced.

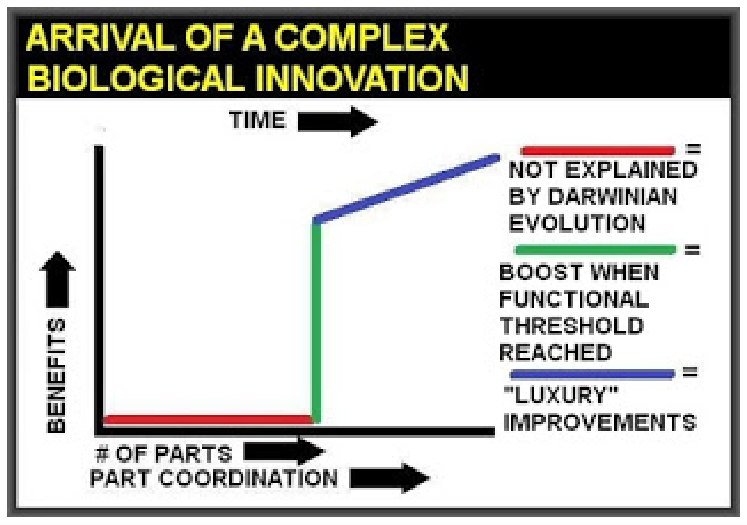
While this scenario may sound reasonable, it actually is not. For one thing, the scenario ignores the very careful placement and fitting together of parts that must occur for a biological innovation to occur. It seems that there is only a microscopic chance that random mutations would produce parts that fit together in just the right way to make a functional whole. But the main reason why the scenario is not reasonable is the fact that the first parts of an implementation (whether biological or non-biological) are almost never useful. So the "classic sweeps" imagined in this scenario would not be occurring until all of the parts needed for the biological innovation had occurred.

By considering a few cases outside of the world of biology, you can realize the general principle that the first stages of an implementation are not useful. No benefit arises from building one tenth of a suspension bridge, or one third of a television set, or one seventh of a rocket. Or consider the case of an ice cream shop, which requires all of these things for it to produce any benefit to its owner: (1) the physical shop; (2) either a delivery system for receiving ice cream deliveries or machines for making ice cream; (3) a refrigerator; (4) at least one employee; (5) cups or cones which ice cream can be put in. If any of these five things are missing, there is no way for the shop to make money.

The general principle that the first stages of an implementation are not beneficial can be stated as the principle of preliminary implementations. We can state this principle like this:

The principle of preliminary implementations: in almost all cases, with few exceptions, preliminary or fragmentary implementations by themselves yield no benefits or rewards.

This principle holds true in general life (as the examples above show), and also in regard to biological implementations. So if we are speaking of some biological implementation requiring a certain number of parts, we should not at all assume that the first stages of such an implementation will provide a benefit. A benefit will occur only when a certain degree of complexity and functional coherence has been achieved. In other words, no benefit will come unless some functional threshold has been reached. Such a functional threshold will typically require that several or many parts are arranged in the right way. The diagram below illustrates the point.



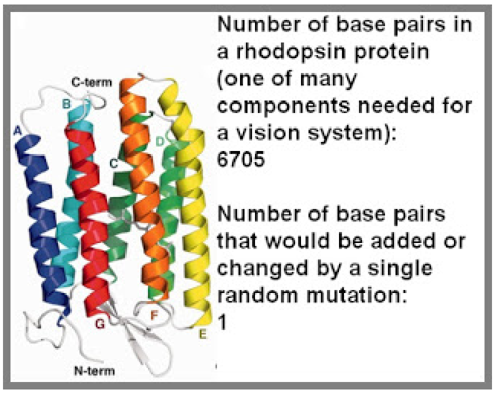
In general Darwinism fails to explain the first stages of useful structures. This was pointed out very clearly in Darwin's time by the biologist Mivart, who wrote the following at the beginning of Chapter II of his book *On the Genesis of Species*: "Natural Selection utterly fails to account for the conservation and development of the minute and rudimentary beginnings, the slight and infinitesimal commencements of structures, however useful those structures may later become." Mivart devoted Chapter II of that book to many examples of "incipient stages" that Darwinism could not explain well, including the first small part of any limb such as an arm or leg or the first small part of a wing or the first small part of a mammary gland.

Darwinists have told many a tall tale to try to account for such things, such as suggesting that maybe wings grew out of wing stumps that were used to catch insects. Such tales are typically unbelievable. Two of the attempts that Darwin made to suggest such stories are now believed to be erroneous (biologists now reject his "maybe mammals come from marsupials" explanation for the incipient stages of mammary glands, and also reject his "lungs come from swim bladders" explanation for the incipient stages of lungs).

Consider the case of the biological implementation needed to produce vision. We can call this a vision system, and it requires much more than just an eye. Below are 4 requirements of a vision system.

1. Some type of eye.
2. An optic nerve leading from the eye to the brain.
3. Extremely complicated proteins used to capture light, such as rhodopsin.
4. Very complex brain changes need to interpret inputs from the eye.

Now if an organism had only or two of these things, it would receive no benefit. For example, merely having an eye and an optic nerve would not be useful unless the eye had the proteins needed to capture vision, and unless the eye also connected to changes in a brain needed to make use of visual inputs. And if there were only such proteins and such brain changes, and no eye and no optic nerve, that would not be beneficial.



Here is a very simplified “back of the envelope” calculation to calculate the probability of a minimally functional vision system arising by chance during a 100-million-year period in a population of a million organisms without any such system. Very greatly oversimplifying, we can imagine the visual system as requiring 8 separate mutations: two for the eye, one for the optic nerve, two to have a protein used by vision, and two for the brain changes needed to process vision. (In all probability, many more mutations than these would be required, and the required number of mutations might be in the hundreds or thousands.) Since some of these mutations would have to require things incredibly improbable to happen, particularly the incredibly improbable mutations needed for proteins necessary to capture light, the average chance of any one of these mutations occurring during the 100 million year period would be no more than 1 in 10.

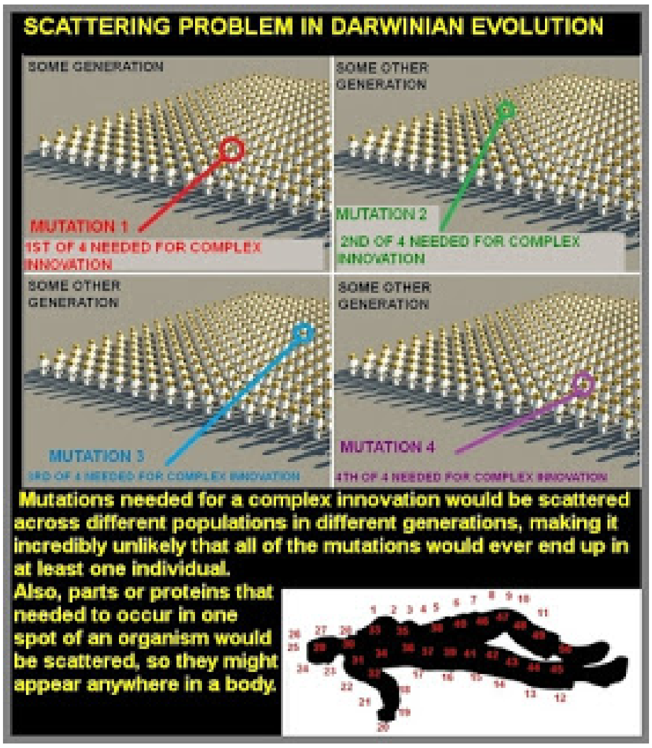
But (and this is a crucial point) once a mutation occurred, it would not immediately tend to become more common in the population, because it would be merely a part of a complex system needed for vision, and the other parts would not yet exist. So, for example, a mutation merely causing an optic nerve (leading from the brain to the exterior of an organism) would not be rewarded and would not tend to spread in the population unless the other required parts were in place. And a mutation merely causing half of an eye would not be rewarded and would not tend to spread in the population unless the other required mutations had occurred.

So each mutation that was not the first of these mutation would have no more than 1 chance in 1 million of occurring in an organism in which the previous lucky mutation occurred (because the population consists of a million organisms). The odds would actually be worse than that, because a mutation that didn't prove useful would tend to die out entirely in the population. Based on the population size (1 million) and the average chance of getting the mutation during the period (less than 1 in 10), the odds of one of these mutations occurring (not the first) in an organism that already had one of the previous mutations can be roughly calculated as less than 1 in 10 million. So you would have math like this:

Chance of mutation 1: 1 in 10
Chance of mutation 2 in organism with mutation 1: < 1 in 10,000,000
Chance of mutation 3 in organism with mutations 1 and 2: < 1 in 10,000,000
Chance of mutation 4 in organism with mutations 1,2 and 3: < 1 in 10,000,000
Chance of mutation 5 in organism with mutations 1,2, 3, and 4: < 1 in 10,000,000
Chance of mutation 6 in organism with mutations 1,2, 3, 4, and 5: < 1 in 10,000,000
Chance of mutation 7 in organism with mutations 1,2, 3, 4, 5, and 6: < 1 in 10,000,000
Chance of mutation 8 in organism with mutations 1,2,3,4,5,6, and 7: < 1 in 10,000,000

The probability of all 8 of these mutations ending up in a single organism, and finally giving that organism vision, would be these probabilities multiplied together, which gives a number much less than 1 in 10 million to the seventh power, or 1 in 10^{49}. We would not expect such a thing to ever happen by chance in the history of the galaxy, even if life had arisen on a billion planets in our galaxy.

I call this type of difficulty “the scattering problem.” It is the problem that when we consider how the mutations needed for a complex innovation would be scattered across populations occurring over multiple generations, it is exceptionally unlikely that all of the required mutations would ever end up in a single individual.



I can illustrate this scattering problem through an analogy. Let's imagine you're some genius who invented the first home computer in 1960. Suppose that this consisted of 7 key parts: a motherboard, a CPU, a memory unit, a keyboard, a monitor, a disk drive, and an operating system disk. If you were to mail one of these parts on 7 different days, sending a different part each day to the same person, there might be a reasonable chance that the person might put them all together to make a home computer. But imagine you did something very different. Imagine you mailed each part in a different year, sending out the parts gradually between 1960 and 1967. Imagine also that each part was mailed to a person you selected through some random process (such as picking a random street and a random time, and asking the name and address of the first person you saw walking down that street) – a process that might give you any of a million people in the city you lived. What would be the chance that the parts you had mailed through such a process would ever be assembled into a single computer? Basically no chance.

It is exactly such odds that a Darwinian process of random mutations and natural selection would constantly be facing in order to explain innovations consisting of multiple complex parts, none by itself causing a survival benefit. If it luckily happened that there somehow occurred all of the random mutations needed for such a biological innovation, such gifts would be scattered so randomly across the population and across some vast length of time that there would be less than 1 chance in 1,000,000,000,000,000,000 that they would ever come together in a single individual, allowing the biological innovation to occur for the first time. What good is “survival of the fittest,” when it is so hard by chance to get some new piece of fitness (a complex biological innovation) in the first place?

The previous analogy involving computer parts serves well as a rough analogy of the scattering problem. To make a more exact analogy, we would have to imagine some parts distribution organization that persisted for many generations. Such an organization might send out one part of a complex machine in one generation, to a randomly chosen person in a city, and then several generations later send out another part of the machine to some other randomly chosen person in the city (who would be very unlikely to be related to the previous person); and then several generations later send out another part of the machine to some other randomly chosen person in the city; and then several generations later send out another part of the machine to some other randomly chosen person in the city. The overall likelihood of the parts ever becoming assembled into a machine with all the required parts would be some incredibly tiny, microscopic probability. This more exact analogy better simulates the scenario in which favorable mutations supposedly accumulated over multiple generations.

Is there any way to reduce the scattering problem when considering the odds of complex biological innovations occurring by Darwinian evolution? You might try to do that by assuming a smaller population size. However, assuming a smaller population size is very much a case of “robbing Peter to pay Paul.” The reason is this: the smaller the population size, the smaller the the chance that some particular favorable random mutation will occur. So any reduction in the assumed population size should involve a corresponding reduction in the average chance of one of the favorable mutations occurring. The result will be that the incredibly low probability of the biological innovation will not be increased.

Here is a quick example to show the point. Let us imagine 100,000 generations of a population of 1,000,000 organisms, and calculate the chance of a particular biological innovation occurring in it. Let's suppose the biological innovation requires seven random mutations, and the average chance of one of these mutations occurring is 1 in 10 during this 100,000 year period. Since all of the mutations are needed for the biological innovation, the math looks like this:

Chance of mutation 1: 1 in 10
Chance of mutation 2 in organism with mutation 1: < 1 in 10,000,000
Chance of mutation 3 in organism with mutations 1 and 2: < 1 in 10,000,000
Chance of mutation 4 in organism with mutations 1,2 and 3: < 1 in 10,000,000
Chance of mutation 5 in organism with mutations 1,2, 3, and 4: < 1 in 10,000,000
Chance of mutation 6 in organism with mutations 1,2, 3, 4, and 5: < 1 in 10,000,000
Chance of mutation 7 in organism with mutations 1,2, 3, 4, 5 and 6: < 1 in 10,000,000

The overall probability is therefore less than 1 in 10 to the 42^{th} power, or less than 1 in 1,000,000,000,000,000,000,000,000,000,000,000,000,000,000. But what if we assume the population is ten times smaller? Since the population is ten times smaller, the average chance of each mutation occurring should undergo a corresponding reduction, and become 1 in 100 rather than 1 in 10. Now the chance of mutation 2 occurring in an organism with mutation 1 is less than 1 in 100 multiplied by 1 in 100,000 (the population size). But that still gives you a probability of less than 1 in a 10 million. So now the math looks a tiny bit different, but the final probability of all seven mutations is no greater than it was before. Here is the new math.

Chance of mutation 1: 1 in 100
Chance of mutation 2 in organism with mutation 1: < 1 in 10,000,000
Chance of mutation 3 in organism with mutations 1 and 2: < 1 in 10,000,000
Chance of mutation 4 in organism with mutations 1,2 and 3: < 1 in 10,000,000
Chance of mutation 5 in organism with mutations 1,2, 3, and 4: < 1 in 10,000,000
Chance of mutation 6 in organism with mutations 1,2, 3, 4, and 5: < 1 in 10,000,000
Chance of mutation 7 in organism with mutations 1,2, 3, 4, 5, and 6: < 1 in 10,000,000

The overall probability is therefore less than 1 in 10 to the 42^{th} power, or less than 1 in 1,000,000,000,000,000,000,000,000,000,000,000,000,000,000. This is no better than before.

The scattering problem is a show-stopper for evolution by random mutations and natural selection. The scattering problem shows that there is virtually no chance that any complex biological innovation would ever appear by such means, and that the odds against such a thing are utterly prohibitive.

We cannot say that such a calculation conflicts with calculations made by Darwin, because Darwin (who confessed that math was repugnant to him) never made any population-based calculations on the likelihood of any biological innovation occurring. He tried to get through by skipping the math.

The previous calculations involved the probability of only one organism in a population ending up with some biological innovation. The probability of such a biological innovation becoming common throughout the population (so that many organisms in the population have the innovation) is exponentially smaller. Evolution experts say that a particular mutation will need to occur an average of about 100 times before it becomes fixated in a population. I didn't even factor in such a consideration in making the calculations above. When such a consideration is added to the calculation, we would end up with some probability many, many times smaller than the microscopic probability already calculated. Instead of a probability such as 1 in 10^{42} we might have a probability such as 1 in 10^{70} or 1 in 10^{100}.

Probability 1: Probability that the gene pool of some particular species will ever experience (possibly scattered in different generations and individuals) each of the random mutations needed for a complex biological innovation, in which there is no benefit until multiple required components exist arranged in a way providing functional coherence.	Some particular probability
Probability 2: Probability that all of these mutations will exist in the gene pool during one particular generation (possibly scattered among different individuals)	Some probability only a tiny fraction of Probability 1
Probability 3: Probability that all of these mutations will ever end up in one particular individual, arranged in the right way and with the right positions, allowing the biological innovation to occur	Some probability only a microscopic fraction of Probability 1-- perhaps a million trillion quadrillion times smaller.
Probability 4: Probability that all of these mutations will ever end up in most of the	Some probability many times smaller than Probability 3, and

organisms in the population	perhaps billions of times smaller.

These considerations help show that the odds against biological innovations appearing by chance are absolutely prohibitive. Darwinists have not at all identified a mechanism by which nature could produce impressive biological innovations by chance. Their claim to have identified such a mechanism is a bogus brag. An article quotes the well-known philosopher and cognitive scientist Jerry Fodor as saying, "Natural selection can't be the mechanism of evolution."

I may note that there is no proof that a single complex biological innovation has ever appeared because of the so-called Darwinian "mechanism" of random mutations and natural selection. Our Darwinists want us to believe that all complex biological innovations have occurred through this process, but have yet to prove that even one complex biological innovation ever appeared for such a reason. For an in-depth examination of the logical fallacies employed by one famous Darwinist arguing for Darwinian orthodoxy, see this lengthy post.

When we dive down into the micro-world, we find that proteins are the basic building blocks of organisms. We are made of thousands of proteins, and each protein is like a fine-tuned machine. An analysis of a functional protein will typically show that with a few changes here and there, its function will be broken. Scientists have no plausible tale to tell explaining how all these fine-tuned proteins could have originated. A scientific paper says, "A wide variety of proteins structures exist in nature, however the evolutionary origins of this panoply of proteins remain unknown." Protein expert Douglas Axe PhD has argued vigorously that we cannot explain proteins through Darwinian evolution. He has estimated in a scientific paper that the likelihood of getting a protein with the folds needed to perform a specific function may be as low 1 in 10 to the seventy-seventh power. There is no real origins answer offered by this long recent review of the topic of protein evolution, which states this near its end (referring to protein folds):

It is not clear how natural selection can operate in the origin of folds or active site architecture. It is equally unclear how either micromutations or macromutations could repeatedly and reliably lead to large evolutionary transitions. What remains is a deep, tantalizing, perhaps immovable mystery.

When it comes to explaining the origin of humanity, Darwinists have not overcome some gigantic difficulties. One difficulty is that it is believed that the human population was very small at a time such as 100,000 years ago or 200,000 years ago. It is believed that at such a time the human population was no more than about 10,000 or 20,000. The problem is that the smaller the population, the less likely that it will be blessed by some fantastically lucky series of random mutations needed for a biological innovation (just as the smaller the pool of lottery ticket buyers, the lower the chance that it will win the grand jackpot). When you have a very small population, it becomes fantastically unlikely that a series of mutations needed for a biological innovation will occur. So how could there have occurred all the helpful random mutations needed for *Homo sapiens* to appear about 100,000 years ago? The likelihood of such a development seems microscopic.

Two scientists (one from Cornell University) published a scientific paper entitled "The Waiting Time Problem in a Model Hominem Population," which was published in the journal Theoretical Biology and Medical Modelling. Using a computer simulation, they "simulated a classic pre-human hominin population of at least 10,000 individuals, with a generation time of 20 years, and with very strong selection (50 % selective elimination)." They were basically trying to see how long it would take before you got a mutation consisting of two nucleotides (which is a fairly minor mutation, only some tiny fraction of the mutations needed for the evolution of human intelligence). This is called the "waiting time problem." The authors summarize their results as follows:

Biologically realistic numerical simulations revealed that a population of this type required inordinately long waiting times to establish even the shortest nucleotide strings. To establish a string of two nucleotides required on average 84 million years. To establish a string of five nucleotides required on average 2 billion years. We found that waiting times were reduced by higher mutation rates, stronger fitness benefits, and larger population sizes. However, even using the most generous feasible parameters settings, the waiting time required to establish any specific nucleotide string within this type of population was consistently prohibitive.

Their paper show a "waiting time" of some 5 billion years to get a crummy little six-nucleotide mutation. But the mutations needed for man would have required many times more than six nucleotides – and our Darwinists ask us to believe that they occurred not in 5 billion years but in a span of time less than a thousandth of that. The chance of that seems less than the chance of you winning a hundred million dollars from the Powerball lottery on each of three consecutive drawings.

According to Darwinist dogma, lucky random mutations occur and cause "classic sweeps" or "classic selective sweeps" in which some new trait becomes more and more common in the gene pool, eventually so common that most organisms in the population have that trait. This dogma has recently struck out at the plate, as more sensitive scans of the human genome have found little evidence of such classic sweeps. A recent scientific paper was entitled "Classic Selective Sweeps Were Rare in Recent Human Evolution." By "recent human evolution" the paper meant the past 250,000 years.

A more recent scientific study in 2014 found there was virtually no sign of adaptive evolution in the human genome. The paper published in a mainstream science journal looked for traces of natural selection by looking for something called "fixed adaptive substitutions" in human DNA. The paper stated, "Our overall estimate of the fraction of fixed adaptive substitutions (α) in the human lineage is very low, approximately 0.2%, which is consistent with previous studies." It's hard to imagine a bigger fail or flop for Darwinian explanations. If such explanations were correct, we would have expected to find such signs of adaptive evolution in a large fraction of the human genome, not a fifth of one percent.

In the 2018 book *Who We Are and How We Got Here* by David Reich, a professor of genetics at Harvard Medical School, the author makes this revealing confession on page 9: "The sad truth is that it is possible to count on the fingers of two hands the examples like FOXP2 of mutations that increased in frequency in human ancestors under the pressure of natural selection and whose functions we partly understand." Judging from this statement, there are merely 10 or fewer cases where we know of some mutation that increased in the human population because of natural selection. The scientific paper "The Genomic Rate of Adaptive Evolution" tells us "there is little evidence of widespread adaptive evolution in our own species."

In the study here, an initial analysis found 154 positively selected genes in the human genome -- genes that seemed to show signs of being promoted by natural selection. But then the authors applied something they called "the Bonferroni correction" to get a more accurate number, and were left with only 2 genes in the human genome showing signs of positive selection (promotion by natural selection). That's only 1 gene in 10,000. Call it the faintest whisper of a trace -- hardly something inspiring confidence in claims that we are mainly the product of natural selection.

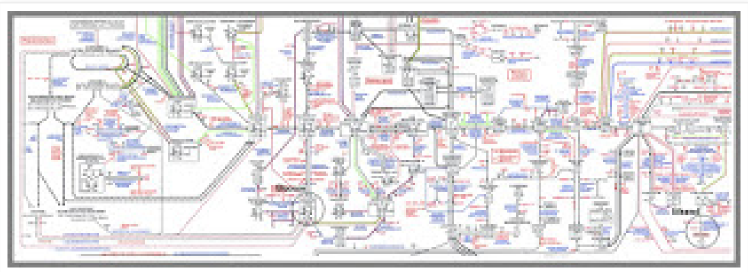
A 2018 paper published in the mainstream science journal Human Evolution found that "nine out of 10 species on Earth today, including humans, came into being 100,000 to 200,000 years ago," according to a press summary. The study is discussed in this post. Besides suggesting a rapidity of biological innovation impossible to account for by the snails pace process of Darwinian evolution, the paper reminded us of Lewintin's paradox. This is the fact that genetic diversity does not vary with population size. This is not at all what we would expect given Darwinian assumptions.

The number of humans that have lived has been estimated at 100 billion. But a web site discussing this issue tells us that 99% of these people have lived in the past 10,000 years. Since 8000 BC some 100 billion humans have lived, but in the period between about 400,000 BC and 8000 BC, the population of humans or pre-humans was no probably no greater than about a billion, and very probably less than 3 billion. But we know there has been very little evolution of humans since 8000 BC -- only a few minor things like better lactose digestion and better high-altitude breathing in some people.   So if you believe the conventional account, you must believe that a population of no more than 3 billion humans or pre-humans underwent enormous evolution (resulting in humans that had language and symbolic abilities), but that in 100 billion humans living since 8000 BC there has been almost no evolution. Such an idea is not very credible. Why would there be so much evolution during less than 3 billion lives, and so little during 100 billion lives?

Then we have the fact that humanity has many intellectual characteristics that cannot be explained as being due to natural selection, simply because they do not provide any survival value. See here for quite a few examples.

What we see in biological organisms all over the place is mountainous amounts of organization. Such gigantic levels of organization could only be explained by a real theory of organization. But Darwinism is not such a thing. It is merely something much less: a theory of accumulation. Accumulation was the word Darwin used again and again, not organization. Referring to the so-called "modern synthesis" or MS, a term meaning modern evolutionary theory, an evolutionary biologist recently confessed, "Indeed, the MS theory lacks a theory of organization that can account for the characteristic features of phenotypic evolution, such as novelty, modularity, homology, homoplasy or the origin of lineage-defining body plans."

To clarify the difference between the two (organization and accumulation), below we see a depiction of organization, the metabolic pathways in the human body:



Credit: US Department of Energy

And here is an example of accumulation:

This post is not intended as a complete repudiation of Darwinian claims. Of the three claims of Darwinism, the first two (common descent and gradualism) cannot be ruled out as possibilities, despite the weakness of the evidence for them. It is only the third claim of Darwinism (that biological innovations are mainly caused by random mutations and natural selection) that can be ruled out as both unproven and unreasonable. You might put it this way: if species have appeared through gradual evolution, we don't understand how that happens.

See here for a list of hundreds of PhD's who have signed a statement saying the following:

We are skeptical of claims for the ability of random mutation and natural selection to account for the complexity of life. Careful examination of the evidence for Darwinian theory should be encouraged.

See here for a separate list of scientists who "have, in one way or another, expressed their concerns regarding natural selection's scope and who believe that other mechanisms are essential for a comprehensive understanding of evolutionary processes."

What is the upshot of all the considerations in this post? The upshot is: the origin of species and the origin of mankind are profoundly mysterious. We do not yet have any convincing explanation for either of these things. So it is not at all true that we have to cling to some "minds come from brains" dogma out of a need to adhere to Darwinist orthodoxy. A kind of modern-day creation myth spread by a priesthood of academic apostles, the boastful claims of the Darwinist catechism are very shaky claims indeed that should not be some ball and chain attached to our feet, keeping us from adventurous thinking on the topic of what is the source of the human mind.

On this wikipedia page is a list of more than 100 of the most important scientific experiments ever done. None of the actual experiments listed are those that either prove Darwin's explanation for evolution, or the idea that minds come from brains. The page has a line saying, "Charles Darwin demonstrates evolution by natural selection using many examples (1859)." But there were no experiments showing any such thing, and the 1859 "demonstrations" referred to are merely Darwin's doubtful arguments in *The Origin of the Species* that natural selection had produced new species.

at April 04, 2018   No comments:

Labels: evolution, natural selection

Tuesday, April 3, 2018

Cloud Computing and a Non-Local Model of Consciousness

Here's an interesting puzzle. A man has a ball which he throws very hard, and the ball comes back to him. When he does this, the ball never bounces off of anything, and never touches anything. There is nothing special attached to the ball, nothing like strings or elastic bands. The ball has no kind of special flying ability. How does the ball keep coming back to the man? Think about this for a few seconds before reading further.

The answer is really quite simple. The man throws the ball straight up into the air, and gravity returns the ball to him. This is a classic example involving lateral thinking, also known as “outside the box” thinking. Many people are puzzled by this problem, because they confine their thoughts to a little “box” that limits their thinking. In this case the “box” is the assumption that the man must be throwing the ball in a roughly horizontal fashion, like some baseball pitcher.

Like people stumped by this “return of the ball” problem, the typical neuroscientist of today seems to be the prisoner of unwarranted assumptions. Faced with the problem of consciousness, and the problem of how our memories our stored, a typical neurologist confines himself to the “inside the box” assumption that the mind must somehow be generated by the brain. So he keeps thinking about some way that chemicals or neuron patterns or electricity might generate consciousness or store memories. This approach has been futile. After decades of knocking their head against this wall, scientists still have no evidence of physical memory traces inside the brain, nor do they have any real understanding of how things such as concepts can arise from the brain. As Rupert Sheldrake says on page 194 of his excellent book *Science Set Free*, “More than a century of intensive, well-funded research has failed to pin down memory traces in brains.”

The actual answer to the riddle of consciousness may lie in a non-local solution. Our consciousness might arise not from our brains, from some non-local source.

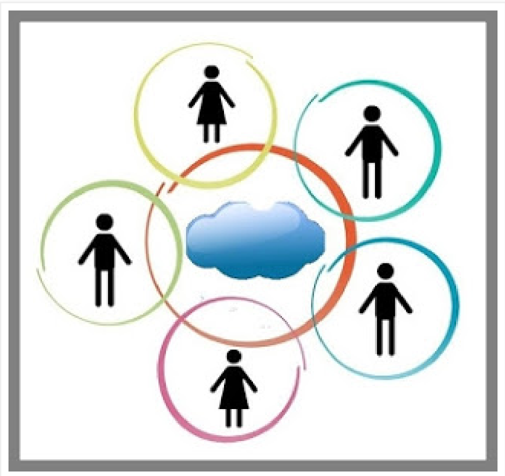
The idea of a non-local source of consciousness may be entirely baffling at first, but there is an analogy that may clarify the idea. The analogy involves cloud computing. Let's compare how computers worked during the 1980's and today. About 1985 if you had a computer, all of your computing and memory storage was done locally. If you did some computer work on some problem, the only thing working on it would be the CPU stored on your desktop computer. If you stored some photos on your computer, they would be stored on the hard drive of your computer.

But nowadays we have a very different situation. You may have some tiny hand-held device that does not even have a hard drive. The device may have little or no local memory. But you can still upload your photos and videos in a way that results in them being permanently stored. You also can do all kinds of computing, with the results permanently stored far away. How can this happen? You are interacting with what is nowadays called the Cloud.

I could start telling you the details of how the Cloud works, discussing external web sites and their sever farms, and so forth. But for the purposes of this discussion, it is much better if I don't get into such details. It is better to think of the Cloud abstractly, as a kind of ethereal amorphous mega-resource that enables non-local computing and non-local storage of information. After we conceive of the Cloud in such a way, a question arises. Could it be that our own memories are not locally stored, but somehow stored in some cosmic consciousness-generating reality, something a little comparable to the Cloud we are now using for our computing?

Rather than being stored inside our brains, our memories could be stored in a kind of consciousness infrastructure somewhat resembling the Cloud of the internet. Our personalities could also be stored in this nonlocal consciousness infrastructure. Under this model, the main purpose of the brain would be functions such as control of autonomic functions, control of muscles, and the processing of visual stimuli. The real core of our consciousness would be stored "in the cloud." Just as your photo collection may not exist on your handheld device, but "in the cloud," your memories may not exist in your brain but "in the cloud," with the latter cloud being a mysterious consciousness infrastructure servicing multiple bodies.

The concept discussed here is a kind of "client/server" concept. In abstract terms, Facebook.com can be thought of a server providing services to a vast horde of different clients, each a user who has a Facebook account. Similarly, it might be that human individuals are like clients who receive their consciousness from a mysterious consciousness infrastructure that acts as a kind of non-local "consciousness server" providing consciousness to many local clients.



Such a theoretical model does not actually require us to buy into a computational model of the mind, in which the mind is regarded as something like a computer output. The essence of this model is not a computational assumption, but a "client/server" concept. The essence of this model is that local entities (or clients) all are enabled by some external, non-local infrastructure which provides them with something that they could not get by themselves. Just as you cannot get Facebook functionality all by yourself (without internet access), it may be that the little mass of flesh between your ears is totally incapable of producing consciousness by itself, and that your consciousness comes from an external consciousness infrastructure that may be thought of as a kind of "consciousness server" serving multiple clients (different people).

Empirical support for such a model may come from a wide variety of paranormal and psychic phenomena which are inexplicable using the hypothesis that your mind is produced entirely by your brain, but which may be explicable through an alternate model in which your memories are stored non-locally, and your consciousness depends on interactions with some great external reality. Empirical support for such a model may also come from studies such as those done by John Lorber, which found astonishing cases of people who had good memories and good intellectual functioning, even though most of their brains were destroyed by diseases such as hydrocephalus.

I may note that some people talking about the idea of non-local consciousness will talk in grandiose metaphysical terms, speculating that consciousness may be in some sense "infinite" or "without beginning and without end." But the idea of non-local consciousness does not require such lofty notions. It simply requires the idea of an unknown external dependency upon which our consciousness depends.

The history of science has partially been a story of the discovery of previously unknown external dependencies upon which our existence depends. In ancient times people may have thought that the only external dependency that humans relied on was that of the sun. But scientists have gradually discovered more and more other external dependencies, some of them cosmic in scope. First they discovered that our existence depends on a cosmic gravitational force, which holds stars and planets together. Then scientists discovered how our existence depends on a cosmic electromagnetic force or field, which enables the chemistry on which life depend. Later scientists discovered a mysterious cosmic field called the Higgs field, which supposedly "gives mass to all particles." In light of such previous developments, would it be very surprising if we were to discover one day some "consciousness field" or some external consciousness-enabling infrastructure, acting on a cosmic level to enable memory and consciousness? No, such a discovery would just be another item in the same historical trend of humans discovering more and more external dependencies on which their existence depends.

Postscript: After writing this post, I discovered a 2013 scientific paper, "Long-Term Memory: Scaling of Information to Brain Size" by Donald R. Forsdyke of the Department of Biomedical and Molecular Sciences of Queens University in Canada. He quotes the physician John Lorber on an honors student with an IQ of 126 and a severe case of hydrocephaly that left him with almost no brain:

Instead of the normal 4.5 centimetre thickness of brain tissue between the ventricles and the cortical surface, there was just a thin layer of mantle measuring a millimeter or so. The cranium is filled mainly with cerebrospinal fluid. ... I can't say whether the mathematics student has a brain weighing 50 grams or 150 grams, but it's clear that it is nowhere near the normal 1.5 kilograms.

Forsdyke notes two similar cases in more recent years, one from France and another from Brazil. He then states the following, suggesting a "cloud computing" idea of the mind vastly different from the "brain makes your mind" idea, and rather similar to what I have mentioned here:

"For all these storage alternatives, the thinking is conventional in that long-term memory is held to be within the brain, and the hydrocephalic cases remain hard to explain. Yet currently most of us, including the present author, would prudently bet on one or more of the stand-alone forms. The unconventional alternatives are that the repository is external to the nervous system, either elsewhere within the body, or extra-corporeal. The former is unlikely since the functions of other body organs are well understood. Remarkably, the latter has been on the table since at least the time of Avicenna and hypothetical mechanisms have been advanced (Talbot 1991; Berkovich 1993; Forsdyke 2009; Doerfler 2010). Its modern metaphor is 'cloud computing.' "

at April 03, 2018 No comments:

Labels: non-local consciousness

Head Truth

The huge case for thinking minds do not come from brains

Sunday, April 8, 2018

The Argument for Determinism Collapses Once We Discard the "Minds Come from Brains" Dogma

In history organized religions have sometimes taught evil doctrines, such as the doctrine that heretics should be burned at the stake. Governments have sometimes taught evil doctrines, such as the idea that some particular people are subhuman, and deserving of death. And sometimes scientists can teach evil doctrines. There are two evil doctrines taught by a small minority of modern scientists, but not a majority of them. One is the "no free will" doctrine of determinism, and the other is the doctrine that there is an infinity of parallel worlds in which there are an infinite number of copies of each one of us, with every imaginable variation of events. I will explain in this post why both of these doctrines are evil, in the sense of being corrosive to the morality of people who adopt them. Neither of these doctrines is actually a scientific doctrine, as there is no evidence for either of them, and neither of them is capable of being verified. But in the 2017 collection of essays at edge.org entitled “What scientific term or concept ought to be more widely known?” there are two essays that attempt to spread one of these evil doctrines. The definition of "evil" I am using here is the definition of "harmful or tending to harm" given by several dictionaries when they define the word "evil." By "evil" I simply mean "pernicious."

The doctrine of the infinity of parallel universes, with an infinite number of copies of you and everyone else, is taught by physicist Frank Tipler in an essay in the 2017 edge.org collection. Tipler states the following:

That is, there has to be a person identical to you reading this identical article right now in a universe identical to ours. Further, there have to be an infinite number of universes, and thus an infinite number of people identical to you in them.

Tipler misinforms us and misleads us by claiming that most physicists believe in this doctrine, and by claiming that its originator Hugh Everett supplied a “proof” for it. Neither statement is true. The most popular interpretation of quantum mechanics is still the Copenhagen interpretation, not Everett's crazy interpretation. Everett supplied neither proof nor the slightest bit of evidence for this theory of parallel universes. And neither does Tipler, who also fails to supply any argument at all for believing in such a thing.

What is called the Everett "many worlds" theory is a theory supposedly based on quantum mechanics. The theory holds that every instant the universe is constantly splitting up into an infinite number of copies of itself, so that every possibility (no matter how unlikely) can be realized. The theory has a name that makes it sound not so unreasonable (with all the planets being discovered, the phrase “many worlds” doesn't sound too farfetched). But the name “many worlds” doesn't describe the nutty idea behind the theory. The theory would be more accurately described as the theory of infinite duplication, because the theory maintains the universe is duplicating itself every second. Or we might also call the theory “the theory of infinite absurdities,” since it imagines that

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all absurd possibilities (no matter how ridiculous) are constantly being actualized.

There is no evidence whatsoever for this theory, which is endorsed by only a minority of theoretical physicists. The Everett "many worlds" theory has been firmly rejected by physicists such as Adrian Kent, T. P. Singh (who says it has been falsified), and also Casey Blood, who calls it "fatally flawed." No one has ever observed a parallel universe. We also cannot plausibly imagine such a theory ever being verified. To verify the theory, you would need to travel to some other universe to verify its existence, which is, of course, impossible. Even if you did travel to such a universe, you could never verify the idea that every possibility is occurring in other parallel universes.

Why is the Everett "many worlds" theory an evil doctrine? It is because if a person seriously believed such a doctrine, such a belief would tend to undermine any moral inclinations he had. I will give a concrete example. Imagine you are driving in your car at 2:00 AM on a bitterly cold snowy night, and you see a scantily clad very young child walking alone far from anyone. If you don't believe in the Everett "many worlds" theory, you may stop your car and call the police to alert them of this situation, or do something like give your warm coat to the child to keep her warm. But if you believe in the Everett "many worlds" theory, you may reason like this: *regardless of what I do, there will be an infinite number of parallel universes in which the child freezes to death, and an infinite number of other parallel universes in which the child does not freeze to death; so there's really no point in doing anything.* So you may then drive on without stopping or doing anything, convinced that the multiverse would still be the same no matter how you acted.

Imagine any moral situation in which you should act in some moral way. In any such situation, your tendency to act morally will be dulled if you believe that there are an infinite number of copies of yourself, and that all possible outcomes will occur an infinite number of times. So the Everett "many worlds" theory is an evil doctrine, if we define an evil doctrine as one that tends to produce evil actions, or reduces the chance of moral behavior.

Another evil doctrine taught by some modern scientists is the doctrine of determinism, that free will doesn't exist. This doctrine has been taught by many believers in the dogma that minds come from brains, and is dependent on such a dogma. Determinism is taught by Jerry Coyne in a post in the 2017 edge.org collection of essays. Coyne states the following:

A concept that everyone should understand and appreciate is the idea of physical determinism*: that all matter and energy in the universe, including what's in our brain, obey the laws of physics. The most important implication is that is we have no "free will": At a given moment, all living creatures, including ourselves, are constrained by their genes and environment to behave in only one way—and could not have behaved differently. We feel like we make choices, but we don't. In that sense, "dualistic" free will is an illusion. This must be true from the first principles of physics. Our brain, after all, is simply a collection of molecules that follow the laws of physics; it's simply a computer made of meat. That in turn means that given the brain's constitution and inputs, its output—our thoughts, behaviors and "choices"—must obey those laws.*

Determinism is an evil doctrine, because it tends to weaken or destroy any sense of shame or guilt a person might have. Determinism offers an excuse (a kind of "get out of jail free" card) for any evil thing that you might do. If you believe that you have no free will, and that everything you do is completely mandated by the particles and electricity in your brain and the laws of physics, you may kill, maim or rape without feeling any sense of guilt at all. Why feel guilty about

- Vacillating Disarray of the Memory Trace Theorists
- Study Finds "Poor Overall Reliability" of Brain Scanning Studies
- "Brains Store Memories" Dogma Versus the Reality of Noisy Brains
- The Brain Has Nothing Like 7 Things a Computer Uses to Store and Retrieve Information
- Exhibit A Suggesting Scientists Don't Understand How a Brain Could Store a Memory
- The Dubious Dogma That Brains Make Decisions
- Long Article Tries to Show Neural Memory Storage, but Gives No Real Evidence for It
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- Gender Differences in Brains Help Discredit Prevailing Dogmas About Brains
- Study Finds Equal Brain Connectivity in All Mammals
- Some Reasons the Main Theory of Neural Memory Storage Is Unbelievable
- Scientists Can't Persuasively Explain How a Brain Could Instantly Retrieve a Memory
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- Candid Confessions of the Cognitive Experts
- Global Workspace Theory Sure Isn't an Explanation for Consciousness
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- Memories Can Form Many Times Faster Than the Speed of Synapse Strengthening
- The Guy with the Smallest Brain Had the Highest IQ
- He Had Half a Brain and Above Normal Intelligence
- The Truth About Neurons and Synapses
- A Diagram of Explanatory Dysfunction in Academia
- The Brain Shows No Sign of Working Harder During Thinking or Recall
- More Evidence of High Mental Function Despite Large Brain Damage
- The Lack of a Viable Theory of Neural Memory Encoding
- More Evidence That Neuron Loss Has Little Effect on Cognition
- Fraud and Misconduct Are Not Very Rare in Biology
- Reasons for Doubting Thought Comes from the Frontal Lobes or

your conduct, when your neurons and brain chemicals and brain electricity made you do it? A person should only feel guilty about anything if there is free will.

Thankfully, there is a way to completely undermine the evil doctrine of determinism, to make it melt into the ground like the Wicked Witch of the West after Dorothy threw a bucket of water on her. We can make determinism melt away by simply discarding the unwarranted doctrine that the human brain generates the human mind. Take a look at Coyne's argument for determinism in the quote above. It is entirely predicated on the dogma that the mind is generated by the brain. But if our minds are not generated by our brains, there is not the slightest reason to doubt our free will. If my mind is some spiritual reality or soul reality or some mental reality that is not generated by my brain, then if I do something wrong I can't blame my neurons or some chemical reactions or electricity in my head; I can only blame my self.

The fact that we can defeat the evil doctrine of determinism, and preserve a belief in free will, is a practical reason for believing that the brain does not make the mind. But such a practical reason is only one of many reasons for believing that minds do not come from brains. They include the following:

- the fact that there are many dramatic cases in the medical literature of people who had more or less normal minds even though large fractions of the brain (or most of their brains) were destroyed due to injury or disease, including super-dramatic cases of people with good minds but less than 15 percent of their brains;
- the fact that there is no scientific understanding at all of how brains or neurons could be producing consciousness, thought, understanding or abstract ideas (mental things that are very hard or impossible to explain as coming from physical things);
- the fact that there is no plausible account to be told of how brains could possibly be storing memories that last for fifty years, given the high protein turnover in synapses, where the average protein only lasts a few weeks;
- the fact that there is no understanding of how brains could achieve the instantaneous recall of distant, obscure memories that humans routinely show, given the lack of any coordinate system or indexing in a brain that might allow some exact position of a stored memory to be very quickly found;
- the fact that there is no understanding whatsoever of how concepts, visual information, long series of words, and episodic memories could ever be physically stored by a brain in any way that would translate all these diverse types of information into synapse states or neuron states;
- the fact that for more than 40 years numerous people have reported vivid near-death experiences occurring after their hearts stopped and their brains were inactive, during times when they had no brain waves, and they should have had no consciousness at all, with many of the medical details they reported during such experiences being independently verified (as described here).

So while there is a practical moral reason for believing that minds do not come from brains, what we may call a reason of convenience, there are many more evidence reasons and logic reasons for thinking such a thing, reasons that hold with equal strength even if we pay no attention to practical consequences.

Do not believe in the evil nonsense of determinism. You are a person with free will and moral responsibility. If you do some evil thing, you should feel guilt, because it is your self who made the bad decision, not your neurons.

About Me

Mark Mahin

www.markmahin.com

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As for Everett's "many worlds" theory, the fact that a small minority of physicists believe in such raving nonsense is simply something that exposes as false the myth that the modern scientist is necessarily a very logical thinker deciding on reasons of evidence. Clearly it is very possible for the modern scientist to believe something that is both absurd and unwarranted, whenever such a belief becomes fashionable in his or her little academic tribe. This is another reason why we should never be intimidated by people making arguments along the lines of "it must be true, because most of the scientists believe it."

at April 08, 2018   No comments:

Labels: free will

Saturday, April 7, 2018

Animal Experiments Conflicting with the Dogma That the Brain Stores All Memories

Scientists have long advanced the dogma that memories can only be stored in brains. But there is a line of experiments that challenge such a dogma. The experiments involve worms. The worms in question have an astonishing ability. You can cut off the head of one of these worms, and it will grow a new head.

In the 1950's the scientist James McConnell did astonishing experiments with flatworms. He trained flatworms (planaria) to respond to lighting cues. He then cut off the heads of the flatworms, leaving only half a worm. He was not surprised to see the tail of the worm regrow into a full worm that included a new brain. Such a thing had been observed long ago. But what was surprising was that the worms seemed to remember the learning that had previously been provided. Under the prevailing dogma of neuroscience – that all memories are stored in the brain – such a thing should have been impossible. The learning should have been lost when a worm's first brain was cut off. McConnell's research was published in a peer-reviewed scientific journal. The paper stated, " It was concluded that in planaria the rudimentary brain is necessary for learning to take place but not for retention of the learned response."

More recently, scientist Michael Levin of Tufts University has replicated McConnell's findings. Spending lots of money, Levin developed a fancy machine called the Automatic Training Apparatus, designed to test flatworms in a way that would be computer-assisted and involve less subjective interpretation by humans.

Levin's machine

Levin's results were similar to McConnell's. The sequence he documented over and over again was:

1. A worm was trained in some way.

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2. The worm had its head severed.
3. The worm regrew its body, growing a new brain.
4. The worm was then retested to see whether it remembered its previous learning.
5. It was found repeatedly that the worm seemed to remember what it had previously learned before decapitation.

Levin published his research in a peer-reviewed scientific journal. The paper was entitled, “An automated training paradigm reveals long-term memory in planarians and its persistence through head regeneration.”

It is impossible to explain these results under prevailing dogmas that memories are stored in brains. An article on Levin's research includes some weird speculation involving RNA molecules going from the head of the flatworm into the tail, and then migrating back into the head after the head had regenerated after decapitation. But the article concedes that this scenario is “imaginary,” and scientists haven't even maintained that memories are stored in RNA molecules.

But there is a scenario that can explain experimental results such as McConnell's and Levin's. Consider the following hypothetical scenario.

1. All animals with brains (include flatworms and humans) have something like a soul. In the case of a flatworm, we might call this a mini-soul.
2. Such animals store memories not mainly in brains, but mainly in souls.
3. When a flatworm is decapitated, its brain is lost, but its soul or mini-soul is preserved, and still holds the animal's previous memories.
4. When the decapitated flatworm grows a new brain, it is able to remember its previous learning, because it is retrieving memories not from its newly regenerated brain but from its soul or mini-soul that was never damaged.

The experimental results of McConnell and Levin are inconsistent with the idea that memories are stored only in brains, but are quite consistent with the scenario above. These experiments should come as no surprise to anyone who has studied the research of Karl Lashley. Lashley spent years doing experiments with a variety of animals to determine how much memory was affected by removal or damage to parts of the brains. He found many examples of animals remembering things well even after large parts of their brains had been removed. See the beginning of this post for some examples.

Are there any other experiments hinting at the existence of a soul? Yes, but they involve not animals but human beings. The experiments I refer to are experiments involving ESP and remote-viewing. Innumerable scientific papers have been published documenting positive results in such experiments. In the case of the Joseph Rhine experiments at Duke University, we have experiments showing spectacular results that we would not expect to see merely by chance even if everyone on the planet was tested for ESP.

What do such experiments have to do with the soul? Abilities such as ESP and remote viewing are utterly inexplicable under a neurological framework. Evidence for such abilities suggests very strongly that the human mind involves some paranormal or spiritual or transcendent component that goes beyond anything that can be explained by using the nervous system and the brain. The term “soul” can be used as a vague term for such a component.

Of course, you can deny all of this if you wish to cling to materialist dogmas about the brain, and maintain that the mind and memories are 100% brain effects. But life is going to be hard for you. You must explain away or deny the worm experiments done by multiple researchers. You must explain away or deny tons of experiments showing paranormal human abilities, experiments done for more than 100 years, including experiments done at leading universities and experiments long funded by the US government. You must deny all the evidence involving near-death experiences, suggesting that human consciousness can continue when the brain is inoperative, including many cases of people verifying details of their medical procedures when they should have been completely unconscious. You must claim that memories are all stored in brains, even though there is no plausible mechanism by which human brains could store memories for longer than a year or two, given all the structural and protein turnover occurring in synapses (discussed here). You must somehow claim that memory recall is purely neurological, even though no one has the slightest idea of how a brain or mind could ever know how to find the exact location in the brain where a memory was stored. You must also maintain that somehow all our abstract thoughts are made by neurons, although no one can explain how one neuron or a trillion neurons could combine to make an abstract concept such as “life,” “universe,” or “nation.” You must also maintain that somehow the brain is constantly using a vast wealth of encoding schemes and decoding schemes that allow it to translate concepts, episodic memories and visual memories into molecular storage, even though no one has ever found such an encoding scheme, no one has ever spelled out in detail how such encoding schemes could work, and if such encoding schemes existed they would require some insanely intricate design scheme almost infinitely more complicated than the design scheme behind DNA (creating a gigantic “intelligent design” issue materialists would prefer to avoid). You must also explain away cases such as John Lorber's and these cases, which suggest that minds can function very well even when a large fraction of the brain is damaged or a great majority of the brain is gone.

Good luck doing all that without tying your prose into knots.

at April 07, 2018 No comments:

Friday, April 6, 2018

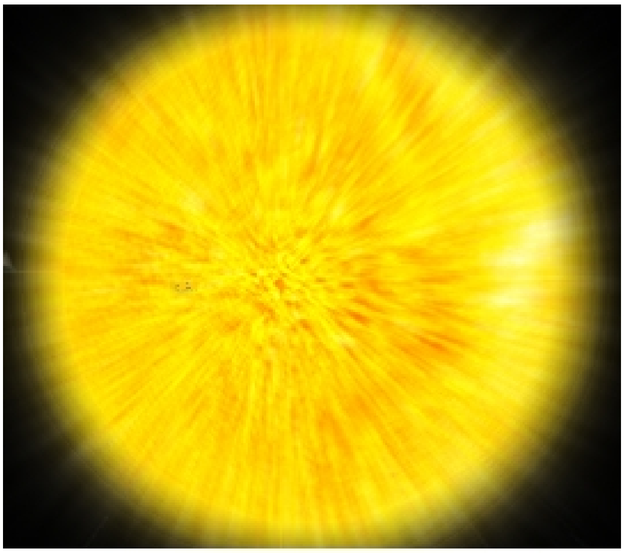
Our Minds May Arrive Top-Down Not Bottom-Up

Conventional thinking has been that the human mind is a bottom-up kind of thing. The idea is that your mind is produced solely by some combination of neurons in your brain -- that your consciousness and self somehow "bubble up" from these neurons. The thinking is kind of like this: your consciousness is like some juice, and your brain is the juice maker.

But there are some good reasons for thinking that this “bottom-up” assumption is quite false. For one thing, we have no understanding of how mere neurons (physical things) can produce the wonderful thing we call consciousness (a mental thing). Imagining that a mere grapefruit-sized blob like the brain can produce the human mind (a totally different type of thing) seems rather like imagining that a stone can be squeezed so that blood will drip out of it. We also have no understanding of how brains can store human memories that last for 50 years. As discussed here, rapid molecular and structural turnover in synapses should make it quite impossible for brains to be storing memories for longer than about a year. The speed with which we can recall memories seems inexplicable given any theory that memories are stored in brains, for reasons discussed here. Then there is the fact documented by the physician John Lorber that some humans can retain fairly normal minds and memory even though most of their brains have been destroyed by disease. Then there are near-death experiences, in which people undergoing cardiac arrest often report floating out of their bodies, sometimes reporting accurate details of the medical efforts going on while their heart was stopped. Such a thing should be impossible if the human mind is merely a bottom-up effect produced only by our brains.

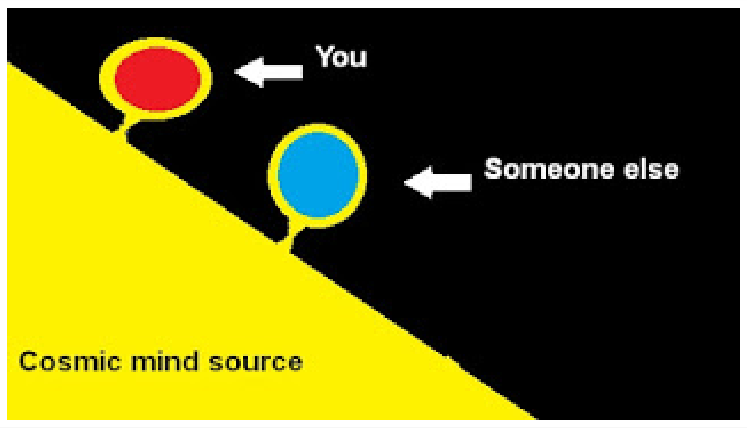
But if the human mind is not a bottom-up kind of thing, maybe it is a top-down kind of thing. Maybe the human mind is an effect produced by some cause outside of the human body. Maybe instead of something coming from inside our bodies, the human mind is instead coming mainly from *outside* of our bodies. Such an idea seems very abstract and philosophical, but perhaps we can take a stab at trying to make it more understandable, by the use of some imagery. The images I will offer are quite schematic and speculative, but they may at least serve as a kind of crude device to help clarify a particular philosophical possibility. To be visually displayed adequately, a model like the one I will present would require a sophisticated animation; but not being an animator, I'll have to make do with some rather crude diagrams.

Let us start by imagining that there might be some cosmic source of minds, which may be the source of human minds and other types of minds (possibly also minds on other planets). We can visualize this mind source as being rather like a giant balloon filled with either hot gas or a warm fluid.



Now let us imagine that your mind and the mind of each of us is like a little protrusion or bump on the surface of this giant balloon. We normally think of balloons as being spherical, but a balloon can have lots of little bumps and protrusions (for example, in one of the big balloons used in the Macy's Thanksgiving Day Parade, there may be little bumps corresponding to the nose or ears of some cartoon character). We can imagine that there might be billions or trillions of little bumps on the huge balloon of the cosmic mind source, and that each little bump might correspond to a particular person.

In the schematic diagram below, we see two little balloon bumps or protrusions corresponding to particular persons. They exist on the circumference of the great sphere of the cosmic mind source, and are some of billions of similar little bumps or protrusions on that sphere.

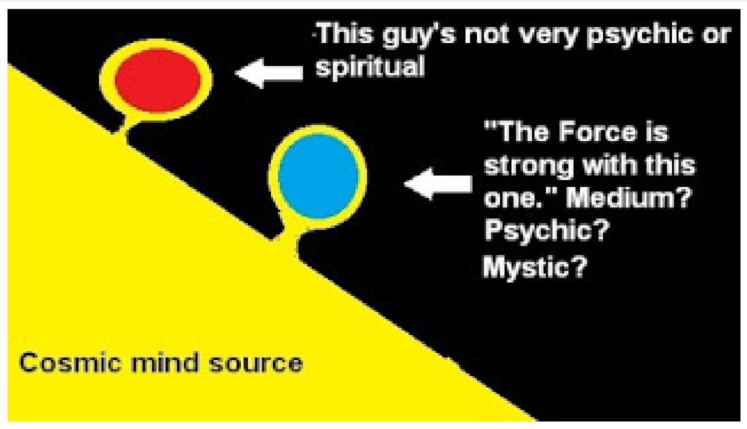


I use red and blue in this diagram simply to illustrate different persons. But the idea is that the mind substance or consciousness fluid inside your little balloon bump is very much the same mind substance or fluid that is flowing around inside the huge balloon of the cosmic mind source. The same mind substance or fluid is flowing around inside your mind and all other minds that exist as little bumps on the circumference of the balloon. Under this model your mind does not arise from your brain, but from the cosmic mind source. So instead of there being a million different mind sources for a million different humans (each being a brain), there is instead a single mind source for these million human minds.

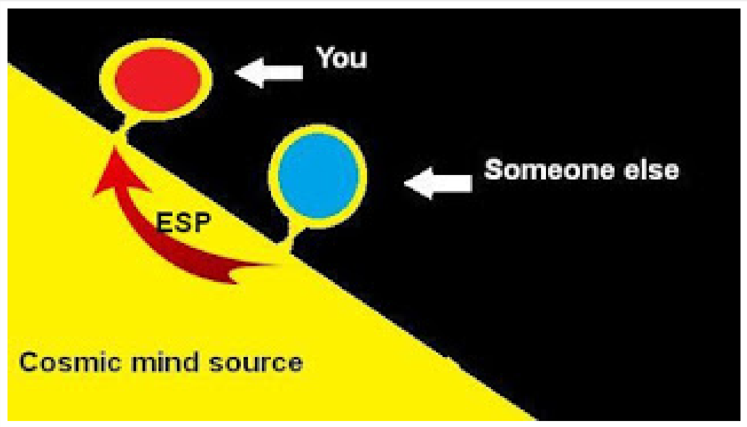
If you got your mind in such a way, by being a little protrusion off of the circumference of the huge balloon of the cosmic mind source, you might think of your mind as originating from inside your body. But in this model your mind does not at all originate from your body. It comes from the cosmic mind source. In fact, under this model the only way in which any mind can exist is by being inside the great balloon of the cosmic mind source, or as a kind of protrusion on the circumference of that balloon.

But notice that there is a little neck that connects your little bubble with the vastly greater bubble of the cosmic mind source. That little neck may be almost totally closed, or it may be more widely open. When that little neck is almost totally closed, you may feel no connection whatsoever with some great higher reality beyond yourself. But when that little neck is open wider, you may feel more of a sense of being in touch with some great reality beyond yourself. Perhaps mystical experiences or paranormal psychic experiences occur when this little neck opens much wider than normal. Under this model there is a direct line that can be traced between any one mind and any other mind, with no more than distance and bottlenecks inhibiting communication. So the potential for connectivity is almost limitless.

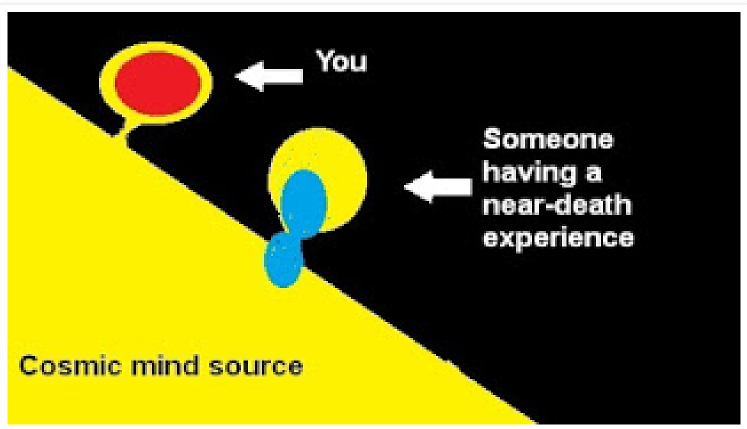
The diagram below illustrates this idea. The second person (shown in blue) is much more prone to spiritual or psychic or mystic experiences, because the neck-like opening at the base of his little bubble is much wider. In this model, all minds are inside the same vast balloon of mind-fluid. So when the neck like opening widens, a person may have greater connectivity with other minds, which may or may not correspond to minds inside bodies. In the visual below, I illustrate this idea, borrowing a line from one of the *Star Wars* movies.



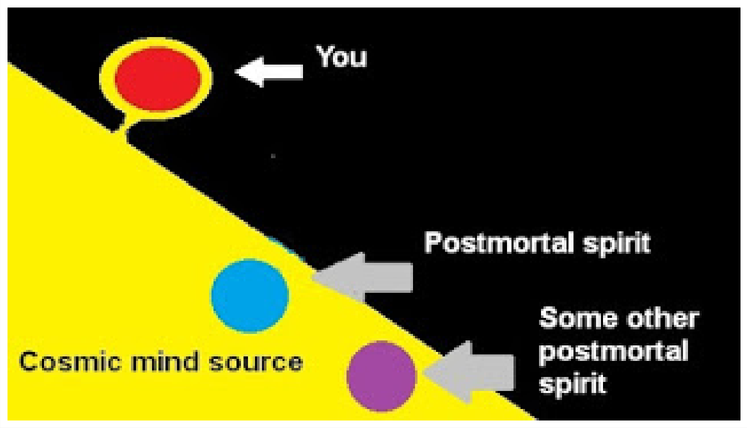
In conventional bottom-up models of the mind, ESP is impossible. But in this model something like ESP is quite possible. Below is a diagram illustrating what happens. There is a path that can be traced from any given mind to another, since no mind exists outside of the huge bubble of the cosmic mind source. In the diagram below, we see ESP occurring between two minds.



When a person undergoes a near-death experience, it may be a little like depicted in the visual below. Such a person may undergo transcendent experiences, as he starts to move outside of the little bubble like protrusion that he has been previously confined to.



And what about when a person dies? It may be like the diagram below. Inside the great cosmic mind balloon may be trillions of minds, some corresponding to what we may call "the living," and others corresponding to what we may call "the dead." The main difference between the living and the dead is simply when you are living, you are isolated in a little protrusion on the circumference of the great cosmic mind balloon. When you exist in such an isolated little protrusion, you have little feeling of connectivity with other minds. But when your mortal life ends, you are no longer in that protrusion. Then you may have a great connectivity with a horde of other minds floating around inside the huge cosmic mind balloon.



Now you may ask: in this model, what is outside this vast balloon of cosmic mind fluid? The answer is: no mind at all. In this model, there are no little bubbles at all floating outside of the great cosmic balloon of mind fluid. Every single mind exists as a protrusion on the circumference of this balloon, as shown in the diagrams below, or in a more central position inside the balloon. The result is that all minds in the universe have a real degree of connectivity. For minds that exist within the main part of the balloon, and not its outer circumference, there may seem to be a tremendous degree of connectivity. If you are such a mind, you might easily or instantly be able to connect with many other minds, perhaps in something like mind-reading or thought-reading.

The images I have presented here are extremely crude. Do things work exactly as I have diagrammed here? Probably not. What I have discussed is a kind of crude schematic visualization designed to make you think about radically different ways in which reality could work, rather than an attempt to describe exactly and literally some alternate way in which reality works. The visualizations I have presented are kind of metaphorical, but there may be strong similarities between these metaphors and the way in which consciousness works.

But what is fascinating here is how easy it is to create a top-down idea of mind, under which various types of anomalous phenomena fit in naturally. Under a bottom-up theory of mind, things such as ESP, apparitions sightings, mystical experiences, and near-death experiences may seem like unthinkable abominations. But such things fit in easily and naturally once we move to a top-down theory of mind.

The biggest failure of all bottom-up theories of human mentality is not their failure to account for fairly rare paranormal phenomena but their failure to adequately account for the everyday reality of the human mind. We cannot account for our minds or our very long-term memories neurologically. Brains seem to have no functionality that can account for either the storage or the instant retrieval of very old memories, for reasons discussed here and here and here. The idea that there is some special combination of cell connections that can cause something like the lofty thoughts of philosophy to emerge from mere neurons does not seem credible, and seems hardly more credible than the idea that some combination of vines, roots, and trees in a dense Amazon jungle would cause that jungle to become conscious. Nor can we account for the origin of our minds using Darwinian ideas. As argued here, the human mind has many “luxury item” characteristics (such as math abilities, musical abilities, artistic creativity, abstract reasoning, and spirituality) that are not things that increase an organism's chance of surviving in the wild, and which therefore cannot be accounted for by using the explanation of natural selection (which is merely the threadbare, thimble-sized idea that fit stuff prospers, and unfit stuff doesn't).

But if we develop a top-down theory of the mind's origin, then all of the marvels of the human mind may become easily explicable. If human minds come top-down from some cosmic mind source, we would indeed expect that our minds should have every wondrous ability they have ever displayed.

Let us imagine an extraterrestrial planet on which the skies were always covered with thick clouds. Imagine that on such a planet the clouds are so thick that you can never see the sun in the sky. Intelligent beings on such a planet might wonder: how is it that their planet is lit up with light during the day? Unaware of the sun above them, such beings might come up with a bottom-up theory of illumination: that the dirt and rocks and the trees give off light during the day, which keeps the land illuminated. Such beings might think that such a theory was a certainty, and say to themselves, “Of course, it *must* be true; where else could light be coming from?” But they should instead be considering a top-down theory of illumination – that the illumination of daylight comes from a great unseen source above them.

Similarly, the average scientist holds to a bottom-up theory of consciousness, that our consciousness bubbles up from little neurons in our head. He says to himself, “Of course, this theory *must* be true; where else could our consciousness be coming from?” But such a person should be considering a top-down theory of consciousness, that our minds come mainly from some great unseen source. Just as it seems far-fetched that rocks or dirt or trees could illuminate a planet, it seems far-fetched that the great universe-pondering effect of human mentality could possibly arise from a little blob of protoplasm inside our skulls.

Nowadays scientists advance the subtle doctrine that all material particles derive their mass from some cosmic reality called the Higgs Field. It may be that all conscious minds derive their consciousness from some cosmic consciousness field that can be roughly compared to the Higgs Field.

Postscript: Scientist Bernard Carr stated the following:

The existence of telepathy also suggests that our minds are part of a communal space rather than being wholly private. This "Universal Structure", as I term it, can be regarded as a higher dimensional information space which reconciles all our different experiences of the world. It necessarily incorporates physical space but it also includes non-physical realms which can only be accessed by mind.

at April 06, 2018 No comments:

Labels: top-down theory of mind

Thursday, April 5, 2018

Fancy New Technology Fails to Prove Memory Dogmas

If tortured sufficiently, data will confess to almost anything.
Fred Menger

Some will claim that fancy new technology such as optogenetics and alleged "mind-reading machines" help prove conventional dogmas about the brain, such as the dogma that your brain stores your memory, and the dogma that your brain generates your thoughts. I will explain in this post why such claims are unfounded.

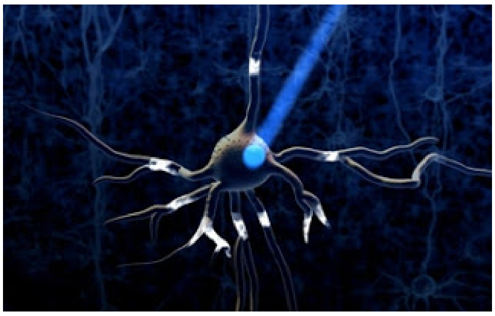
Memory Experiments with Optogenetics

Contrary to claims sometimes made, scientists have no solid evidence for any such thing as a memory trace (also called an engram), a physical change in a particular part of the brain that corresponds to the storage of a memory. How memory works is a great mystery. There are some scientists that have claimed to have learned or discovered something about memory traces or engrams, but such claims are not well founded. An engram is a hypothetical group of cells that might store a memory.

Some have claimed that optogenetics experiments prove something about memory. There is a general reason why such experiments prove nothing about human memory: all of the widely reported optogenetics memory experiments so far have only been done with animals. It is entirely possible that there is a fundamental difference between animal memory and human memory.

In 2013 we had an example of a very dubious scientific paper claiming to have found something relevant to this issue. Two scientists (Xu Liu and Steve Ramirez) claimed to have created a false memory in a mouse. Their paper was entitled "Inception of a false memory by optogenetic manipulation of a hippocampal memory engram." Their claim was picked up by countless mainstream news sources, which failed to apply critical scrutiny to the very dubious claim.

The experiment was done using some mice that were genetically engineered to be light sensitive. An optical device was connected to part of their brains. Mice were put into a box and given an electric shock. This, the scientists claimed, created a memory in part of the brains of the mice.



Then later, when the mice were in a different room, light was transmitted over the optical device, into the brains of the mice. This, the scientists claimed, activated the memory that had been stored in the brain of the mice – supposedly because the mice "froze." I may note that the use of the term "froze" and "freezing" in the study is kind of loaded terminology, a kind of non-objective "assuming what you are trying to prove" terminology. The correct objective way to describe a mouse that is not moving is to say the mouse was temporarily not moving. "Froze" is a loaded term specifically designed to get someone to think that a mouse stopped moving because of fear, but you can't tell how a mouse is feeling or what it is recalling merely by the fact that it stops moving.

We are told that this was an "implanted memory," because the original memory was created not in the second box but the first box. This term is inaccurate. If an experiment like this were ever done in a convincing manner, the most it would demonstrate is an electronic activation of a memory. It is also inaccurate to describe the result as an inception or implant of a false memory (as their scientists did in their scientific paper). If I have a memory of being punched on Fifth Avenue, and then I recall or relive that memory while on Lexington Avenue, that is not a false memory. It is a true memory of something that happened in a different place.

A more serious objection to the research is that is did not provide convincing evidence of a memory activation or any type of unusual memory effect at all in the mice being studied. There are three reasons why I make this claim.

The first reason is that the number of mice tested was very small. When you read the paper, you will find the number of mice used was only about 6. That's way too small a sample size to be drawing any reliable conclusions. With a sample size that small, the results could easily have been due to coincidence. An experimenter wishing to show some particular effect could just keep trying until some round of experiments showed the desired effect. That would be hard to do with a large sample size, but easy to do with a very small sample size such as only 6 or 8 mice. See this post for a discussion of five other optogenetic memory experiments that only used small sample sizes, less than the 15 animals per study group recommended for reliable experimental results.

The second reason is that the conclusion about whether the memory was being remembered was presumably based on an observer judging whether a mouse froze, or stopped moving. The authors did not explain how it was determined that particular mice had "frozen," and we can only assume that such a determination was reached from a subjective human judgment. Given the start-stop, helter-skelter way in which mice move, any judgment about whether a mouse froze is going to be a subjective judgment. So there is too much of a possibility of observational bias here, one in which an observer subjectively reports the effect he is hoping to find. Similarly, you might subjectively report that your goldfish in a goldfish bowl tends to move towards you when you are looking into the bowl, but that would probably tell us more about your desire to see something than about the goldfish.

The third reason is that the freezing effect could have been produced not by a recall of memories, but by the very fact that the energy was being transmitted into the brain of the mice. Imagine you are running along, and suddenly a scientist switches on some weird thing that causes some energy to pour into your brain. This all by itself might cause you to stop, even if it didn't cause you to recall some memory that caused you to stop. What could have been going on in the mice was just a kind of pausing effect caused by a novel stimulus rather than a recalled fear effect. A science paper says that it is possible to induce freezing in rodents by stimulating a wide variety of regions. It says, "It is possible to induce freezing by activating a variety of brain areas and projections, including the hippocampus (Liu et al., 2012), lateral, basal and central amygdala (Ciocchi et al., 2010); Johansen et al., 2010; Gore et al., 2015a), periaqueductal gray (Tovote et al., 2016), motor and primary sensory cortices (Kass et al., 2013), prefrontal projections (Rajasethupathy et al., 2015) and retrosplenial cortex (Cowansage et al., 2014)."

We have no idea what was going on in the minds of these mice. It is not sound to assume that a mouse is "frozen in fear" merely because it stops moving, or to assume that the mouse is remembering something when it stops moving. We have no way of knowing what mice are remembering at any particular moments. We can also ask: why didn't the scientists try to use dissection to confirm their claim of a memory stored in some particular spot of the brain? The technique would be simple: train a mouse to fear some particular stimulus, then dissect some little part of the brain where you think the memory is stored, and see whether the mouse still fears the stimulus.

A more recent paper by Ramirez and Liu was published in Nature, and was entitled, "Activating positive memory engrams suppresses depression-like behaviour." But the paper shows the same type of methodological problems of their earlier paper. Figure 2 of the paper says that in one group there were only 6 mice used and 6 mice for the control group, and elsewhere the paper states that a control group had only 3 mice. These sizes are way below the 15 animals per study group (control and non-control) recommended for a reliable experimental result. The authors claim to have counted differences in the degree to which mice "struggled" when presented with a maze – again something involving a subjective interpretation in which a researcher might tend to see whatever he wants to see. The authors' interpretation of what is going on is speculative. The authors do not present any solid evidence that they actually activated a memory by optogenetic stimulation.

But to its credit, Nature did publish an article entitled "Brain-manipulation studies may produce spurious links to behaviour," pointing out that shooting light into one part of a brain (the technique used by Ramirez and Liu) may cause other parts of the brain to fire off, resulting in unpredictable effects. "Manipulating brain circuits with light and drugs can cause ripple effects that could muddy experimental results," the article cautions. That's another reason for doubting these mouse memory studies based on optogenetic brain stimulation, since it undermines the whole simplistic idea of "stimulate just this area and activate just this memory."

The 2019 study here by Ramirez and others is the latest example of an unconvincing study trying to use optogenetics to show some evidence of memories being stored in a brain. There are two big reasons why the study shows nothing of the sort:
(1) The study uses a technique in which animals are trained to fear some stimulus, and are then subjected to a brain "cell reactivation" that can be roughly described as a brain zapping. The animals supposedly froze more often when this brain zapping happening, and the study interpreted this behavior as evidence of an artificially produced memory recall of a fear memory. But such a technique does nothing to show that a memory is being recalled, because it is well known that there are many parts of a mouse brain that will cause freezing behavior when artificially stimulated. The freezing behavior is probably a result of the strange stimulus, and not actual evidence of memory recall. If you were walking along, you would also freeze if someone turned on some brain-zapping chip implanted in your brain.
(2) The study uses sample sizes so small that there is a very high chance of a false alarm. The number of animals per study group was only 10 to 12. But 15 animals per study group is the minimum needed for a modestly convincing result, and a neuroscientist has stated that to get a decent statistical power of .5, animal studies should be using at least 31 animals per study group.

The second problem is one that is epidemic in modern neuroscience. Neuroscientists are well aware that the sample sizes typically used in neuroscience studies (the number of animals per study group) are so low that there must be a very high chance of false alarms in very many or most of their experimental studies; but they continue year after year producing such unreliable studies, and foisting them on the public as evidence of things that neuroscientists want to believe in. There is a "publication quota" expectation that provides a strong incentive for such professional malpractice.

The "mouse memory implant" research described above is inconsistent with a body of memory research produced over a much larger period of time: the memory research of Karl Spencer Lashley. Over many years, Lashley did extensive research in which he tested how memory and learning is affected when you take out various parts of an animal's brain. In one extensive set of experiments, Lashley trained rats to run a maze. The rats then had parts of their brains removed. Lashley found the rats were able to run the maze just as well regardless of which part of the brain was removed. Strongly indicating that particular memories are not localized in one particular part of the brain, this research directly contradicts the "mouse memory implant" work that tried to suggest that a memory was stored in one particular part of the brain.

Lashley tested using three types of mazes of varying difficulty. Astonishingly, Lashley found that you could remove half of a rat's brain, and it had very little effect on the rats ability to remember either of the two simpler types of mazes.

Here are some startling results listed by Lashley (and discussed here):

1. Rats, trained to have a differential reaction to light, showed no reduction in accuracy of performance when the entire motor cortex of the brain, along with the frontal poles of the brain, was removed.
2. Monkeys were trained to open various latch boxes. The entire motor areas of the monkeys' brains were removed. After 8 to 12 weeks of paralysis, during which they had no access to the latch boxes, the monkeys were then able to open the boxes “promptly” and “without random exploratory movements.”
3. Rats were trained to solve mazes, and the rats then had incisions made separating different parts of their brains. This produced no effect in memory retention.
4. Monkeys were trained to unlatch latch boxes. After having their prefrontal cortex removed, there was “perfect retention of the manipulative habits.”
5. “A number of experiments with rats have shown that habits of visual discrimination survive the destruction of any part of the cerebral cortex except the primary visual projection area.”

After discussing these and many other experiments he did for many years, Lashley said this about the idea of an engram or memory trace: “It is not possible to demonstrate the isolated localization of a memory trace anywhere within the nervous system.”

Lashley's research is completely inconsistent with the research claim of Ramirez and Liu. Lashley's research provides compelling evidence that particular memories are not stored in particular parts of a brain. Conducted over more than 30 years with a huge number of animals, Lashley's research was many times more extensive than the scanty 6-mouse research of Ramirez and Liu that got so much press coverage. Given a conflict between the two lines of research, we should believe Lashley's research, which is so much more voluminous. Contrary to the claims of some optogenetic researchers using dubious methodology, there is no compelling evidence that particular memories are stored in particular parts of the brain, and no convincing evidence that specific memories can be recreated by stimulating particular parts of the brain. There is no good evidence for any such thing as a memory engram, a particular set of cells that stores a particular memory. Lashley's many years of research strongly indicates that such ideas are not valid, as does the research of John Lorber (who, as described here, documented many cases of humans who functioned very well, despite having most of their brains destroyed through disease).

In 2014 our credulous and exaggeration-prone news media reported that researchers Wiltgen and Tanaka had erased specific memories in a mouse. But the reports were based on a research paper that justified no such conclusions. Figure 2 and Figure 3 of the paper shows that the experimenters used only 6 mice for two of the experiments. That's way too small a sample size to produce reliable evidence of an effect. The standard is that you are supposed to use at least 15 animals in each study group to get a reliable evidence of an effect. So the paper gave no clear evidence of having erased any memory in a mouse. The paper had some of the same methodological problems as discussed above, such as relying on judgments of a mouse's "freezing rate" that is very hard to objectively quantify.

Neuroscientist Mark Humphries has written a relevant article called "Some limits on interpreting causality in neuroscience experiments." Using the term "supernatural region" to mean an artificially created brain state not corresponding to a natural brain state of an organism, he states the following:

In optogenetics experiments, we turn on a bunch of neurons at the same time, and often hold them on for seconds at a time. Or we turn off a bunch of neurons at the same time, and hold them off for seconds at a time. This is very, very far from a natural region for any bunch of neurons we could name...So we have a fundamental limit to testing causality in the brain: we always push our neurons into the supernatural region, so we can never be sure that what we observe as a behavioural consequence is naturally causal.

There is no reliable basis for concluding that a memory was evoked because a mouse froze when its brain was optogenetically zapped to reach such a "supernatural" state.

The Myth of the Mind-Reading Machine

In the British tabloid the Sun there's a prime example of a bunk and bogus reporting of a scientific study. The headline says, “Mind-reading machine can now translate your thoughts to text immediately by interpreting brain activity.” The text of the article is carefully worded to make you think that such a mind-reading machine was invented.

We are told this machine was “detailed in the Journal of Neural Engineering” and that the study leader was David Moses. There's no link to the study, but when I searched for such a study, I found it. The paper in the Journal of Neural Engineering co-authored by David Moses is entitled, “Real-time classification of auditory sentences using evoked cortical activity in humans.”

The abstract describes the study as follows:

Here, we introduce a real-time neural speech recognition (rtNSR) software package, which was used to classify spoken input from high-resolution electrocorticography signals in real-time. We tested the system with two human subjects implanted with electrode arrays over the lateral brain surface. Subjects listened to multiple repetitions of ten sentences, and rtNSR classified what was heard in real-time from neural activity patterns using direct sentence-level and HMM-based phoneme-level classification schemes. Main results. We observed single-trial sentence classification accuracies of 90% or higher for each subject with less than 7 minutes of training data.

This isn't mind-reading at all. It's auditory perception classification, and to only a very limited extent. Two people listened to the same ten sentences being spoken over and over again, while their heads were hooked up to equipment that monitored electrical signals from their brain. Some software used these readings to make guesses about which of these ten sentences were later spoken to the people. This type of guessing is not any type of thought reading. Something that you are hearing is not something that you are thinking. When you hear something, that's a perception, not a thought.

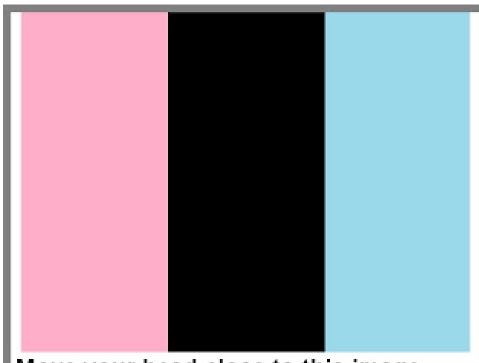
The Sun news story has a phony-baloney infographic telling us that in this experiment “thoughts appear on screen as words,” but no such thing actually occurred. The story has been repeated, with similar inaccuracies, by other sources such as the Daily Mail.

What we have here is a stunt of no obvious usefulness. It's hard to foresee how anything useful might come out of being able to predict which sentence a person is listening to by reading traces of auditory perception in his mind. The study raises ethical concerns. Did Moses and his team implant electrodes in two people's brains (presumably something that might risk brain damage) to achieve this unimportant result?

A similar bunk story appeared in 2016, with the headline "Scientists Have Invented a Mind-Reading Machine That Visualizes Your Thoughts." The actual activity was based on analyzing brain activity during visual perceptions, and did not involve any actual reading of thoughts (although it may have exploited perceptual after-images, as discussed below).

A 60 Minutes segment on an alleged "mind-reading machine" is preserved on a youtube.com video entitled "Mind Reading Machine on CBS Reads Your Thoughts." But it isn't a reading of thoughts. The video shows people hooked up to a brain scanner. The people are shown viewing pictures of one of ten different objects, The machine then predicts from patterns in their visual cortex which of the ten things they were looking at. This is perception prediction, not a reading of thoughts.

In some of these experiments, the experimenters may be exploiting a kind of brief after-effect where traces of something you just saw linger for a few seconds in the visual cortex. Imagine if I hook someone up to a brain scanner, and show them a picture of a wrench for five seconds, and then ask them to close their eyes for five seconds and think of what he just saw. It is entirely possible that the parts of the visual cortex activated by such a perception will show traces that linger for a few seconds. We seem to see this in after-image optical illusions. An example of one is below. If you look at this image for 30 seconds, and then close your eyes, you should be able to still see one of the bars for a few seconds, as a kind of ghostly bar in your mind's eye. You can find many other examples of after-image optical illusions by doing a Google image search for "afterimage."



Move your head close to this image, and stare at it for 30 seconds. Then close your eyes. You should see an after-image of one of the bars.

We can imagine how an experimenter might exploit such an effect. He might hook a subject up to a brain scanner, and ask the subject to stare at an image for 30 seconds, and then close his eyes and think about the image just seen. The brain scanner might then scan the person's brain for a few seconds, and be able to predict which of 7 images the person saw, based on what was seen in the brain when the subject's eyes were closed. The experimenter might then encourage people to think such a thing was mind-reading. But this is not thought-reading. The scanner is just picking up a perceptual after-image. This is probably what is going on in the 60 *Minutes* video.

If an experiment like the phony description in the Sun story had actually occurred, it would be a monumental breakthrough of the greatest interest to every philosopher of mind. It would tell us that thoughts are actually generated by brains, an idea which has never been proven. There are good reasons for doubting such an idea. Among these are the fact that we have no understanding at all of how a brain could generate a thought or an abstract idea. As discussed here, attempts to search for a neuroscience explanation for how a brain could generate a thought results in a spectrum of incoherence that doesn't add up to anything. Thoughts are mental things, so how could they possibly be generated by merely physical things like brains? That would be rather like blood pouring out of a stone.

Other very dubious stories in the press include one that memory can be enhanced by electrical stimulation. One headline says, “Electric pulses to the brain can improve memory as much as 15 per cent, finds study.” Such a result is unimpressive. An experimenter could show a 15 percent increase in memory retention when people held a rabbit's foot in their hands. The experimenter need merely try 20 or 30 tests, and then submit for publication whichever one produced the best performance, taking advantage of random variations.

There is no such thing as a pure memory test, since every memory test is a test of perception, concentration, and memory. It is easy to imagine how some meaningless brain stimulus might cause someone to do a little better in a memory test. Suppose you do an experiment in which you first have a subject try to memorize things under normal conditions, and then have the subject try to memorize things while some fancy brain gizmo is attached to his head. Let's imagine the brain gizmo doesn't actually do anything except give the reader a little buzzing effect. It's entirely possible that this will produce a 10 percent or 15 percent performance improvement that is purely the result of a kind of power of suggestion and expectation. The subject may kind of have the feeling that when he's wearing the brain gizmo, this is when he is expected to perform really well; so he may simply concentrate a little harder while wearing the brain gizmo. A minor difference in concentration could easily account for a 15 percent difference in performance.

It is also possible that such a minor difference in performance is simply a result of a kind of placebo effect. The power of the placebo effect is well documented. If a doctor in a white coat gives a man some sugar pill, and tells him this is a powerful cure for his ailment, the patient will very often report that the pill was effective. We don't understand why this happens again and again, and it may be a mysterious type of mind over matter. It is easily possible that such a placebo effect can also come into play in a memory test. Hook someone up to some fancy brain gizmo and test his memory, and he may perform a little better. The result may have nothing to do with the gizmo, but may be simply the person performing a little better because he believed something had been done to make him perform better, with the result being a kind of placebo effect.

One recent experiment (dubiously billed as a test of a "memory prosthesis") involved 22 patients with brain electrodes who 100 times chose a particular visual image from a group of images. The brain electrodes recorded electrical activity in the hippocampus. Then some of these signals were played back in a later test in which patients had to pick the original image from a set of 3. This reportedly producing a 40% increase in "memory recall" involving that particular image. But it is known that the hippocampus has a role in visual perception, as this long scientific paper tells us. So what could have been going on here is that some of the visual perception mechanism of the brain was captured and replayed. Such a result can be explained without any assumption that anything is going on involving memory. We could have a bit of "perception playback" rather than enhanced memory recall.

I can imagine a type of experiment which to the best of my knowledge has never succeeded. A person would be hooked up to a brain scanner, and would then try to concentrate very hard on one of 7 things which he had not recently seen, such as an apple, a banana, a blue ring, and so forth. Software connected to the scanner would then try and guess which of the things the person was thinking about. If the prediction was successful, would this prove that the brain is generating such ideas? Not at all. It would merely suggest that the visual cortex used by the brain in vision can be leveraged when someone is trying hard to visualize something. A mind's eye image of something is not necessarily the idea of a thing. You may first have the idea of Marilyn Monroe in a bikini, and then concentrate hard to kind of visualize that, fleshing out some details (such as imagining a particular bikini color). If we use a little of the visual cortex when making a vivid visualization in our minds, that does not prove the preceding idea came from our brains.

The tabloid Daily Mail has a story about a "mind-reading headset" that has "90 percent accuracy." It has nothing to do with the brain, however. It turns out that if you try hard to speak a word in your mind, so you "can hear it loudly" in your mind's ear, you usually inadvertently use a little muscle to do that. You can prove this by trying to "silently shout" the word "banana" in your mind while holding your neck -- you should feel a little muscle movement. So the "mind-reading headset" is merely working off such a thing. And the "90% accuracy" is only for a few words that it's been trained on. This tells us nothing about whether your brain is creating thoughts.

You will no doubt continue to see quite a few "mind-reading machine" stories in the news, even though no one will actually create such machines. The rule on the web these days is "clicks=cash." The more you click on a link to sensational-sounding science stories, the more advertising revenue the web site makes from ads on the site. With such a situation, there is a great incentive for careless exaggeration of science and technology developments.

Postscript: In April 2019 we had a news story with the headline "Synthetic speech generated from brain recordings." But it wasn't at all a case of generating speech from mere neural activity recordings of someone thinking words in his mind. The neural activity recordings were taken while people were speaking aloud. Also, the fancy system also used an input of vocal recordings of what the people said. So a more accurate headline would have been "Synthetic speech generated from brain recordings and tape recordings of speech." We cannot tell from this whether the system would have failed if it only used the neural activity recordings. Such a system is not evidence that thought comes from the brain, although it could be evidence the brain helps you to move your mouth muscles.

at April 05, 2018 No comments:

Labels: optogenetics

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Head Truth

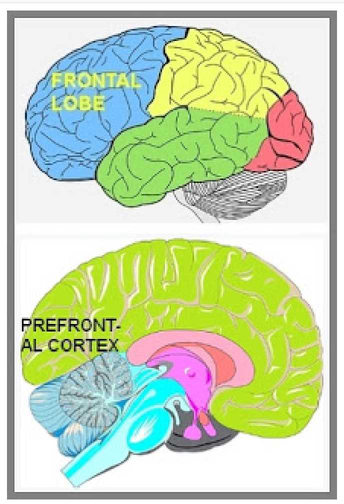
The huge case for thinking minds do not come from brains

Friday, June 8, 2018

Reasons for Doubting Thought Comes from the Frontal Lobes or Prefrontal Cortex

Scientists lack any coherent explanation for how a brain could generate thought or intellect. Thoughts are immaterial things, so how could they possibly be generated by material things such as neurons? We know how physical things can generate other physical things (such as continental plates generating earthquakes), and we know how mental things can generate other mental things (such as one idea leading to a related idea). But nobody can give a coherent explanation as to how a physical thing such as a brain could produce a mental thing such as a thought or idea.

Scientists often fall back on localization claims to try to hide this shortfall. A scientist who cannot explain the *how* of a brain making an idea or a decision will often try to use a *where* as a substitute, by suggesting that specific mental capabilities come from particular parts of the brain. A common claim is that higher thought comes from the frontal lobe of the brain. More specifically, someone may claim that higher thought comes from the front-most part of the frontal lobe, what is called the prefrontal cortex. But the evidence fails to strongly support such claims, and the evidence often conflicts with such claims.



We certainly do not know from brain scans that higher thought comes from the frontal lobe or the prefrontal cortex. With the exception of the auditory and visual cortex, which show clear signs of "lighting up" during visual or auditory perception, there is no part of the brain that shows more than about a 1 percent increase in activity when humans think, decide, or remember. As a technical paper states, "cognitive effects give signal changes on the order of 1%."

Those visuals showing "activating regions" of the brain in red are typically making use of a deceptive data presentation technique in which mere 1 percent differences in activity (or less) are represented in red, making them looking

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like big differences when they're really tiny differences. When you run, your heart gives a very clear signal of being involved in such a thing – for your heart rate may increase by 50 percent. But when you think, decide, or remember an old memory, there is no part of your brain that gives any clear sign of shifting into high gear or being crucially involved in such a thing.

Interestingly, a recent scientific paper notes that "neuroimaging studies have shown that intelligent individuals, despite their larger brains, tend to exhibit lower rates of brain activity during reasoning." So here we have an *inverse* correlation between brain activity and thinking.

Let us look at general intelligence and the frontal lobe. It is part of the dubious folklore of neuroscientists that the prefrontal cortex is some center of higher reasoning. But the scientific paper here tells us that patients with prefrontal damage "often have a remarkable absence of intellectual impairment, as measured by conventional IQ tests." The authors of the scientific paper tried an alternate approach, using a test of so-called "fluid" intelligence on 80 patients with prefrontal damage. They concluded "our findings do not support a connection between fluid intelligence and the frontal lobes." Table 7 of this study reveals that the average intelligence of the 80 patients with prefrontal cortex damage was 99.5 – only a tiny bit lower than the average IQ of 100. Table 8 tells us that two of the patients with prefrontal cortex damage had genius IQs of higher than 140.

In a similar vein, the paper here tested IQ for 156 Vietnam veterans who had undergone frontal lobe brain injury during combat. If you do the math using Figure 5 in this paper, you get an average IQ of 98, only two points lower than average. You could plausibly explain that 2 point difference purely by assuming that those who got injured had a very slightly lower average intelligence (a plausible assumption given that smarter people would be more likely to have smart behavior reducing their chance of injury). Similarly, this study checked the IQ of 7 patients with prefrontal cortex damage, and found that they had an average IQ of 101.

It also should be remembered that brain-damaged patients taking standard IQ tests may have higher intelligence than the test score suggests. A standard IQ test requires visual perception skill (to read the test book) and finger coordination (to fill in the right answers using a pencil). Brain damage might cause reduced finger coordination and reduced visual perception unrelated to intelligence; and such things might cause a subject to do below-average on a standard IQ test even if his intelligence is normal.

The 1966 study here states, "Taken as a whole, the mean I.Q. of 95.55 for the 31 patients with lateralized frontal tumors suggests that neoplasms in either the right or left frontal lobe result in only slight impairment of intellectual functions as measured by the Wechsler Bellevue test." In this paper (page 276), scientist Karl Lashley noted that you can remove 50% of the cortex of an animal without having any effect on the retention of mazes learned by the animal. Lashley noted on page 270 of this paper something astonishing, that the smartest animal he had tested was one in which the fibers of the cortex had been severed:

"The most capable animal that I have studied was one in which the cortex and underlying association fibers had been divided throughout the length of each hemisphere. His I.Q., based on ten tests, was 309."

It is sometimes claimed that the dorsolateral prefrontal cortex is the "CEO" of the brain. This study examined six patients with damage to the dorsolateral prefrontal cortex, and found that they had an average IQ of 104, above the average of 100. The study here tells us that 37 patients with damage to the dorsolateral prefrontal cortex had an average IQ of 97.4, only slightly

- Vacillating Disarray of the Memory Trace Theorists
- Study Finds "Poor Overall Reliability" of Brain Scanning Studies
- "Brains Store Memories" Dogma Versus the Reality of Noisy Brains
- The Brain Has Nothing Like 7 Things a Computer Uses to Store and Retrieve Information
- Exhibit A Suggesting Scientists Don't Understand How a Brain Could Store a Memory
- The Dubious Dogma That Brains Make Decisions
- Long Article Tries to Show Neural Memory Storage, but Gives No Real Evidence for It
- How Evidence for ESP Undermines the “Minds Come From Brains” Dogma
- Gender Differences in Brains Help Discredit Prevailing Dogmas About Brains
- Study Finds Equal Brain Connectivity in All Mammals
- Some Reasons the Main Theory of Neural Memory Storage Is Unbelievable
- Scientists Can't Persuasively Explain How a Brain Could Instantly Retrieve a Memory
- The Lack of Evidence for Memory-Storage Engram Cells
- Candid Confessions of the Cognitive Experts
- Global Workspace Theory Sure Isn't an Explanation for Consciousness
- When Animals Cast Doubt on Dogmas About Brains
- Memories Can Form Many Times Faster Than the Speed of Synapse Strengthening
- The Guy with the Smallest Brain Had the Highest IQ
- He Had Half a Brain and Above Normal Intelligence
- The Truth About Neurons and Synapses
- A Diagram of Explanatory Dysfunction in Academia
- The Brain Shows No Sign of Working Harder During Thinking or Recall
- More Evidence of High Mental Function Despite Large Brain Damage
- The Lack of a Viable Theory of Neural Memory Encoding
- More Evidence That Neuron Loss Has Little Effect on Cognition
- Fraud and Misconduct Are Not Very Rare in Biology
- Reasons for Doubting Thought Comes from the Frontal Lobes or

below average (Table 1 and Table 2). The same study tells us that 25 patients with damage to the ventromedial prefrontal cortex had an average IQ of 105.7 (Table 3 and 4). This study says, “We have studied numerous patients with bilateral lesions of the ventromedial prefrontal (VM) cortex” and that “most of these patients retain normal intellect, memory and problem-solving ability in laboratory settings.”

In the paper "Neurocognitive outcome after pediatric epilepsy surgery" by Elisabeth M. S. Sherman, we have some discussion of the effects on children of hemispherectomy, surgically removing half of their brains to stop seizures. Such a procedure involves a 50% reduction in the frontal lobe of the brain, and a 50% reduction of the prefrontal cortex. We are told this:

Cognitive levels in many children do not appear to be altered significantly by hemispherectomy. Several researchers have also noted increases in the intellectual functioning of some children following this procedure....Explanations for the lack of decline in intellectual function following hemispherectomy have not been well elucidated.

Referring to a study by Gilliam, the paper states that of 21 children who had parts of their brains removed to treat epilepsy, including 10 who had surgery to the frontal lobe, none of the 10 patients with frontal lobe surgery had a decline in IQ post-operatively, and that two of the children with frontal lobe resections had "an increase in IQ greater than 10 points following surgery."

The paper here gives precise before and after IQ scores for more than 50 children who had half of their brains removed in a hemispherectomy operation. For one set of 31 patients, the IQ went down by an average of only 5 points. For another set of 15 patients, the IQ went down less than 1 point. For another set of 7 patients the IQ went up by 6 points.

A writer at Slate.com states the following:

And victims of prefrontal injuries can still pass most neurological exams with flying colors. Pretty much anything you can measure in the lab—memory, language, motor skills, reasoning, intelligence—seems intact in these people.

Now let us look at whether there is good evidence that decision making is generated by the prefrontal cortex. It should be first noted that the evidence discussed above discredits such an idea, because you can't perform well on an IQ test unless you have a good decision-making ability. Each IQ test question requires you to make a decision; none are tests of learned knowledge. For example, when an IQ test asks which of 5 figures most closely resembles a particular figure, that is something that requires you to make a decision rather than just remember something you have learned.

A 2002 scientific paper was entitled “Decision-making processes following damage to the prefrontal cortex.” The scientists who wrote the paper identified 19 patients with damage to the prefrontal cortex, and had them do various tests. Some of the results are below:

- Patients with local orbitofrontal lesions performed normally (at control levels) on three-decision making tasks.
- There was no statistically significant difference among the four frontal subgroups and controls on letter fluency or category fluency.
- Pattern recognition performance (percentage correct) was not significantly impaired in either the combined frontal group or the five subgroups.
- On spatial recognition (percentage correct), the combined frontal group were unimpaired relative to controls.

Prefrontal Cortex
- Why Most Animal Memory Experiments Tell Us Nothing About Human Memory
- Other Evidence of Human Paranormal Abilities
- Why Brains Are Not Suitable for Storing Long Sequences Like Humans Remember
- Why Brain Scans Don't Show Brains Make Minds
- Why Strokes, Alzheimer's Disease and Drunkenness Don't Prove the “Brains Make Minds” Dogma
- Synaptic Density Studies Contradict the Most Popular Memory Theory
- The Rare "Total Recall" Effect That Conflicts with Brain Dogmas
- Physical Connections Do Nothing to Explain Cognition
- The Sociological Reasons Why Bad Explanations Persist in Academia
- Split-Brain Cases Conflict with "Brains Make Minds" Dogma
- Why So Much of Neuroscience News Is Unreliable
- An Analogy Clarifying Why the "Brain Stores All Your Memories" Dogma Is Untenable
- Why Darwinism Fails to Explain the Human Mind
- What Is It That a Brain Does?
- Cloud Computing and a Non-Local Model of Consciousness
- Why We Do Not Understand the Origin of Complex Biological Innovations
- Our Minds May Arrive Top-Down Not Bottom-Up
- Fancy New Technology Fails to Prove Memory Dogmas
- The Argument for Determinism Collapses Once We Discard the "Minds Come from Brains" Dogma
- Animal Experiments Conflicting with the Dogma That the Brain Stores All Memories

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- On a gambling test to determine decision making, “The combined frontal group did not show poorer decision making than controls... and there were no significant differences among the five subgroups.”

Based on the results above, you would have to conclude that the idea that the prefrontal cortex generates decisions or thoughts is false. But there's another test that neuroscientists use in cases such as these – a kind of very subtle and sneaky test. We might put this test under a category of “desperately seeking evidence of performance deterioration.

The test is called the “Iowa gambling task.” A person will sit in front of a computer screen that shows four card decks. The person can pick from any of the decks, and is told that when you pick a card, your money can be either increased or decreased. Normally decks A and B give you a much higher money reward, compared to decks C and D. For example, it might be that picking from deck A will normally give you about $100, and picking from decks C and D will normally give you only about $10. But there's a sneaky catch. Occasionally decks A and B will cause you to lose a large amount such as $1200.

So a person doing this test has to recognize a very subtle rule that can be detected only after 40 or 50 trials – that even though decks A and B normally give more money, they can cause big money subtractions, which means that it's really better to keep picking from decks C and D.

As a test of executive ability, the Iowa gambling task is dubious indeed. One reason is that it may be largely testing short-term memory or prolonged concentration rather than executive ability. Another reason is that it is debatable whether the assumption of the people applying this test (that picking from decks C and D is a wiser decision) is correct. It can be argued that the person who picks from decks A and B has made a correct short-term decision. Such a person is like an investor who continues to invest in the stock market because of nice annual gains even though he knows that about every 8 years or so, stock markets have nasty downturns in which investors lose 30% or so of their money. This wikipedia page on the Iowa gambling task gives some scientific papers that argue it is flawed, and should not be used to judge executive ability. In the paper I referred to above, the patients with prefrontal damage did worse on the Iowa gambling task, although whether that actually was inferior executive ability is debatable. We can summarize the paper by saying its tests provided no clear evidence that decisions are produced by the prefrontal cortex, and no clear evidence that damage to the prefrontal cortex significantly impairs executive ability.

Another dubious test used on some patients with frontal lobe damage is called the Wisconsin Card Sorting Test. Subjects are asked to put a card in one of 4 card stacks. As soon as they make a choice, they are told whether their choice was correct. We are told in 1:34 of this video that “After ten consecutive correct matches, the classification principle changes without warning.” So this test is also a subtle, sneaky type of test, not a straightforward test of executive ability. What it tests is the ability to discard a principle you have already adopted when the evidence no longer supports that principle. One paper says, “These findings strongly suggest that WCST scores cannot be regarded as valid nor specific markers of prefrontal lobe function.”

The studies above are studies involving small numbers of unusual subjects with damage in the frontal lobes. Perhaps a much better way to consider the issue of how much cognition depends on the frontal lobes (or the prefrontal cortex) is to consider a much larger class of subjects: the many millions of people older than 60.

This scientific paper states this: “General linear model analyses revealed that the greatest age effects occurred in prefrontal cortex gray matter... with an average rate of volumetric decline of 4.9% per decade” after age 18. This should result in a decline in the prefrontal cortex gray matter of more than 20% by the time someone reaches 70. But we see nothing like a 20% decline in intelligence or decision-making ability in those who have reached the age of 70. People older than 70 still serve as presidents, congressmen, senators and CEO's.

I could cite some statistics comparing the IQ tests of 20-year-olds and 70-year-olds, but then we would run into the confounding factor known as the Flynn Effect. The Flynn Effect is that for many decades, the performance of young people on IQ tests has been improving, with the improvement being about 3 points per decade. The study here states the following:

The Flynn effect was large enough to account for 100% of the variance in performance between age groups for cross-sectional analyses. After accounting for the Flynn effect, IQ was found to be relatively stable across the adult portion of the lifespan. Verbal abilities remain stable and even show gains through a large segment of the lifespan, while abilities measured by the Performance scale show modest declines from younger to older samples.

So the study finds that after we adjust for the Flynn effect, the IQ of people about 70 is about the same as people about 20. This finding is not at all what we should expect if the prefrontal cortex is responsible for intellectual capabilities, given a decline of about 20% that should occur in the prefrontal cortex between the age of 20 and 70.

I may note that the very fact of the Flynn effect is inconsistent with the dogma that our intelligence is a product of our brain. The Flynn effect, which involved an increase in IQ scores of about 3 percent per decade, went on for at least seven decades (although some think it is wearing off). During this time there was no change in human brains that could account for such a change.

Another relevant point is that the human brain is currently much smaller than it was previously. A science article in the mainstream Discover magazine tells us this: “Over the past 20,000 years, the average volume of the human male brain has decreased from 1,500 cubic centimeters to 1,350 cc, losing a chunk the size of a tennis ball.” But most people would guess that humans are smarter, or as least as smart, as those who lived 20,000 years ago.

A recent article on Aeon mentions how there is little correlation between brain size and intelligence, or a correlation between intelligence and the size of a frontal cortex. The article states the following:

Some of the most perspicacious animals are the corvids – crows, ravens, and rooks – which have brains less than 1 per cent the size of a human brain, but still perform feats of cognition comparable to chimpanzees and gorillas. Behavioural studies have shown that these birds can make and use tools, and recognise people on the street, feats that even many primates are not known to achieve. ....Among rodents, for instance, we can find the 80-gram capybara brain with 1.6 billion neurons and the 0.3-gram pygmy mouse brain with probably fewer than 60 million neurons. Despite a greater than 100-fold difference in brain size, these species live in similar habitats, display similarly social lifestyles, and do not display obvious differences in intelligence.

Consider the growth of intelligence in a child. A child is born with about as many neurons as it will ever have. During the period from birth to age 18, the child's intelligence seems to grow by perhaps 300%. But there is no corresponding brain growth.

There are, however, many new connections formed between brain cells. But an article at Neurosciencenews.com tells us the following:

The more intelligent a person, the fewer connections there are between the neurons in his cerebral cortex. This is the result of a study conducted by neuroscientists working with Dr Erhan Genç and Christoph Fraenz at Ruhr-Universität Bochum; the study was performed using a specific neuroimaging technique that provides insights into the wiring of the brain on a microstructural level..… The researchers associated the gathered data with each other and found out: the more intelligent a person, the fewer dendrites there are in their cerebral cortex.

Let's put some of these facts into a table listing predictions of the theory that your intelligence comes from your brain, comparing such predictions to reality.

Prediction of theory that intelligence comes from brain, specifically the frontal lobe or prefrontal cortex	**Reality**
Injury to prefrontal cortex or frontal lobes should cause sharp drop in intelligence, as should hemispherectomy	This does not generally occur
Human intelligence should not have increased since 1900, because there has been no change in brain size or structure .	Since about 1930, IQ scores have risen by about 3 percent per decade (the Flynn Effect).
People about 70 should be much less intelligent than 20-year-olds, because of 5% volume decline in prefrontal cortex per decade.	Adjusting for Flynn Effect, no such drop in intelligence occurs.
Humans today should be much more stupid than humans 20,000 years ago, because our brains are smaller by about the size of a tennis ball.	Most people today would guess that humans are smarter, or at least as smart, as humans 20,000 years ago.
Elephants should be much smarter than humans, because their brains are three or four times heavier.	Humans are actually smarter than elephants.
Crows should be very stupid, because their brains are tiny, and have no neocortex.	Crows are astonishingly smart.
Greater number of connections in the brain should increase effective intelligence.	"The more intelligent a person, the fewer connections there are between the neurons in his cerebral cortex." - - neuroscience news cited above.
Men should be about nine percent smarter than women, because their brains are about nine percent bigger.	It is generally recognized that on average men are not significantly smarter than women.
Adults should not be much smarter than babies or toddlers, because they have no more brain cells than babies or toddlers.	Adults seem to be much smarter than babies and toddlers.

We see from this table that the claim that intelligence comes from the brain (specifically the frontal lobe or prefrontal cortex) massively fails to predict reality correctly.

The evidence discussed here argues against the claim that the prefrontal cortex or the frontal lobe can be identified as the source of decision making or the center of higher thought in the brain. The evidence discussed here is consistent with the claim that human higher thought capability does not come from the brain but from some unknown other source. Such a claim is also supported by many other considerations discussed at this site, including (1) convincing and well-replicated laboratory evidence (discussed here and here) for psychic phenomena such as ESP, evidence suggesting that the mind has powers that cannot be explained by brain activity; (2) evidence for near-death experiences indicating minds can continue to function even when brains have shut down because the heart has stopped.

Postscript: In 1930 a patient listed as Joe A. in the medical literature underwent a bilateral frontal lobectomy performed by Dr. Walter Dandy, who removed almost all of his frontal lobes. An autopsy in 1949 confirmed that "both frontal lobes had been removed." The paper describing the autopsy said that from 1930 to 1944 Joe A.'s behavior was "virtually unchanged." On page 236 of this source, we read that Dandy said this of three patients including Joe A.: "These three patients with the extirpation of such vast areas of brain tissue without the disclosure of any resulting defect is most disappointing." I could see how it would be disappointing for someone hoping to prove a connection between some brain area and intellectual function. Page 237 of the same source tells us that on casual meeting Joe A. appeared to be mentally normal. Page 239 of this source states this about Joe A, summarizing the findings of Brickner.:

Nor was intellectual disturbance primary. The frontal lobes played no essential role in intellectual function; they merely added to intellectual intricacy, and "were not intellectual centers in any sense except, perhaps, a quantitative one."

A 1939 paper you can read here was entitled "A Study of the Effect of Right Frontal Lobectomy on Intelligence and Temperament." A patient C.J was tested for IQ before and after an operation removing his right frontal lobe. He had the same IQ of 139 before and after the operation. Page 9 says the lobectomy "produced no modification of intellectual or personality functions." On page 10 we are told this about patients having one of their frontal lobes removed:

Jefferson (1937) reported a series of eight frontal lobectomies in which the patients were observed for intellectual and emotional deficits following operation. There were five cases of right frontal lobectomy, three of whom were living and well when the article was written. It could be stated definitely that in two of the three cases there were no abnormalities which could be noted by the surgeon, patient, or family, and while the third case showed a mild memory defect, the operation had been too recently performed to judge whether or not the loss would be permanent. The three cases of left frontal excision likewise showed no significant changes, but comment was made that one patient was slightly lacking in reserve, another remained slightly facetious, and the third, who suffered a transient post-operative aphasia, appeared a trifle slow and diffident.

If the frontal cortex is some kind of "seat of reason," we might expect the human frontal cortex to be unusually large for a primate. But the paper here states, "The consistency of our results across independent data sets supports the view...that human frontal cortex, and regions and tissue subtypes within it, are no larger than expected for a nonhuman primate of our overall cortex or brain size."

The following excerpt from a scientific paper tells us of additional cases of people who did not seem to suffer much mind damage after massive damage to the frontal lobes or prefrontal cortex. Resection is defined as "the process of cutting out tissue or part of an organ."

*Several well-documented patients have been described with a normal level of consciousness after extensive frontal damage. For example, Patient A (**Brickner, 1952**) (**Fig. 2**A), after extensive surgical removal of the frontal lobes bilaterally, including Brodmann areas 8–12, 16, 24, 32, 33, and 45–47, sparing only area 6 and Broca's area (**Brickner, 1936**), "toured the Neurological Institute in a party of five, two of whom were distinguished neurologists, and none of them noticed anything unusual until their attention was especially called to A after the passage of more than an hour." Patient KM (**Hebb and Penfield, 1940**) had a near-complete bilateral prefrontal resection for epilepsy surgery (including bilateral Brodmann areas 9–12, 32, and 45–47), after which his IQ improved. Patients undergoing bilateral resection of prefrontal cortical areas for psychosurgery (**Mettler et al., 1949**), including Brodmann areas 10, 11, 45, 46, 47, or 8, 9, 10, or 44, 45, 46, 10, or area 24 (ventral anterior cingulate), remained fully conscious (see also **Penfield and Jasper, 1954**; **Kozuch, 2014**; **Tononi et al., 2016b**). A young man who had fallen on an iron spike that completely penetrated both frontal lobes, affecting bilateral Brodmann areas 10, 11, 24, 25, 32, and 45–47, and areas 44 and 6 on the right side, went on to marry, raise two children, have a professional life, and never complained of perceptual or other deficits (**Mataró et al., 2001**).*

Apparently patient KM got smarter after they took out most of his prefrontal cortex. That's a case helping to show that brains don't make minds. The book here discusses intelligence tests done on patients who underwent surgery on the frontal lobes:

"It was natural that the effect of an injury on the frontal lobes, said to be concerned with the higher functions of men, should be measured by these tests of intelligence. The absence of marked effects on mental ability, as measured by these intelligence tests, was, not surprisingly, felt to be puzzling."

This paper here describes a case of a "modern Phineas Gage": a patient C.D. who suffered massive prefrontal damage after a penetrating head injury. But C.D's IQ after the injury was measured at 113, well above average. His verbal IQ after the injury was 119, in the 90th percentile. We read:

C.D. reported that he did not have any cognitive or emotional problems following the accident. In describing how his thinking skills were completely unaffected, C.D. stated that, "all the shattered bone was caught in the gray matter in front of the brain."

The paper also tells us, "C.D.'s performances on memory tests were all in the average to above-average ranges in terms of the traditional measure of level of correct responses."

Using the term "decorticate" to refer to animals that had their cortex surgically removed, the scientific paper here tells us that rats and cats seem to show relatively little behavioral effects when you remove their cortex:

"All of the behaviors just mentioned are also exhibited by experimental animals after their cerebral cortex is removed surgically, either in adulthood or neonatally. Best studied in this regard are rodents (Woods 1964; Wishaw 1990). After recovery, decorticate rats show no gross abnormalities in behavior that would allow a casual observer to identify them as impaired in an ordinary captive housing situation, though an experienced observer would be able to do so on the basis of cues in posture, movement and appearance (Whishaw 1990, on which what follows relies, supplemented by additional sources as indicated). They stand, rear, climb, hang from bars and sleep with normal postures (Vanderwolf et al. 1978). They groom, play (Pellis et al. 1992; Panksepp et al. 1994), swim, eat, and defend themselves (Vanderwolf et al. 1978) in ways that differ in some details from those of intact animals, but not in outline. Either sex is capable of mating successfully when paired with normal cage mates (Carter et al. 1982; Whishaw & Kolb 1985), though some behavioral components of normal mating are missing and some are abnormally executed. Neonatally decorticated rats as adults show the essentials of maternal behavior which, though deficient in some respects, allows them to raise pups to maturity. Some, but not all, aspects of skilled movements survive decortication (Whishaw and Kolb 1988), and decorticate rats perform as readily as controls on a number of learning tests (Oakley 1983). Much of what is observed in rats (including mating and maternal behavior) is also true of cats with cortical removal in infancy: they move purposefully, orient themselves to their surroundings by vision and touch (as do the rodents), and are capable of solving a visual discrimination task in a T-maze (Bjursten et al. 1976; see also Bard & Rioch 1937)."

The paper "Neuropsychological outcome following frontal lobectomy for pharmacoresistant epilepsy in adults" here deals specifically with the surgical removal of the frontal lobe to treat epilepsy. Neuroscientists have made more claims about the frontal lobe than any other part of the brain. We have been told that the frontal lobe is some kind of center of judgment and memory. The paper states the following:

"Forty-eight percent of the sample did not show decline on any of the 16 cognitive measures examined in this study. Forty-two showed decline on measures in 1 or 2 cognitive domains. In contrast, 10% of the sample showed declines in 3 or more cognitive domains."

Elsewhere the paper states, "The vast majority of patients who undergo frontal lobectomy for treatment of pharmacoresistant epilepsy demonstrate good cognitive and motor outcomes." Using the term "frontal lobectomy" for the removal of the front part of the brain, the paper also states, "Interestingly, there was a subset of patients who demonstrated clinically meaningful improvements in confrontation naming (15% of sample), verbal intellectual function (11%), or memory (10%–17%) following frontal lobectomy." The paper says, "Existing studies that have examined change in intellectual functioning following frontal lobe surgery have had mixed results, with some studies reporting no change on intelligence measures and others reporting apparent improvements."

at June 08, 2018   No comments:

Labels: brain injury, high mental function despite large brain damage, prefrontal cortex, source of thoughts

Wednesday, April 25, 2018

An Analogy Clarifying Why the "Brain Stores All Your Memories" Dogma Is Implausible

Let us imagine a man named Ed who gets a job as a warehouse worker at a warehouse called Warehouse B. Ed reports to work on the first day.

Ed: Reporting for work, sir.
Supervisor: Welcome to Warehouse B. Let me brief you on the job we need you to do.
Ed: I'm all ears.
Supervisor: We want to start storing at this warehouse all the information we get from our television set.
Ed: I see you have lots of empty shelves here. That's good; they'll be lots of storage room. So you do have a video recorder to start recording the shows?
Supervisor: Absolutely not. Such devices are forbidden here.
Ed: So how could you store all the information coming from the TV?
Supervisor: That is something you must figure out, given the rules I set.
Ed: Okay, give me the rules.
Supervisor: Nothing can be written down. We have no pens or pencils here, and you can never bring any. Writing with a pen or pencil or electronic device is forbidden here. If you want to store information, you can only use chemicals or proteins or electricity.
Ed: Chemicals or proteins or electricity?
Supervisor: Yes, we have all kinds of chemicals you can use to store the information from the TV. Plus we have lots of batteries, which you can set to any voltage you want. Plus we have lots of proteins lying around: ham, cheese, you name it. You can any use of these things to store the information from the TV set. But no writing is allowed.
Ed: How on earth could I use chemicals, electricity and proteins to store all that complicated information from the TV set?
Supervisor: I don't know. It's your job to figure that out.
Ed: Can I use some type of electronics to store the information from the TV shows?
Supervisor: No, electronics are strictly forbidden here.
Ed: I see you have lots of boxes.
Supervisor: Yes. If you figure out how to store information from the TV shows using chemicals, electricity, and proteins, you can put your successful solution in a box, and store it on the shelf.
Ed: How many of these TV shows do you need to store?
Supervisor: We need to store all the programs we get for the next 50 years. And after we've stored that, we need to be able to retrieve the information *instantaneously*. So if someone wants to know what was in some particular show on some particular date, we have to get that information from the shelves real fast.
Ed: So these boxes on the shelf will have to be carefully sorted and labeled, according to some system allowing rapid retrieval.
Supervisor: But you can't label the outside of any box – no writing allowed here. And once you've put a box on a shelf, you can never sort the boxes. And you can't label any of the shelves or aisles.
Ed: Wait a minute. I'm trying to imagine two years into the future, when thousands of these unmarked boxes are on the shelf. How on earth would anyone be able to instantly find a particular box when somebody asked for the info from one particular show – say, the information from the next Super Bowl or from the last episode of *America's Got Talent?*
Supervisor: I don't know. That's your job to figure that out. We have lots of wire – you can use as much of that as you want. But you can't bend the wire into letters. No writing allowed. And there's one other big problem.
Ed: What's that.
Supervisor: We have ten employees here who like to steal stuff. So once you start putting things on the shelves, whatever you put will get stolen real frequently.
Ed: Can you fire those employees?
Supervisor: No, they're guaranteed lifetime employees, because they're the warehouse owner's kids. They'll stay working here, no matter how much they steal. And another problem is that we get lots and lots of rats who come out every night, and who eat lots of any proteins or chemicals put on the shelves.
Ed: Can we just use some poison to kill off those rats?

Supervisor: No, that's strictly forbidden.
Ed: So let me see if I have this right. I have to set things up so that all the information that comes from the TV for the next 50 years gets stored on our shelves. But I can't use any electronics or writing to store all that information. All I can use is electricity, wire, chemicals and protein. I can use boxes, but none of the boxes can be labeled, marked or sorted. I've got to set things up so that the information from any requested TV show can be instantly retrieved, even though we'll just have shelves filled with unlabeled boxes. The information has to stay put for 50 years, even though there's ten employees who will be stealing lots of it every night, and lots of rats who will be eating up lots of chemicals or proteins I use to store the information.
Supervisor: That's about it. Can you think of some way to handle this?
Ed: Hell, no! I quit!

As you may have guessed already, Warehouse B is an analogy. Warehouse B represents the difficulty of storing information in a human brain. The stream of information from the television set represents the stream of information that flows through a particular person's senses as he lives. Storing the information from 50 years of TV shows would be about as difficult as storing the information from 50 years of living.

In our analogy, Ed is told that he must store the complicated information from the TV using only chemicals, electricity, and proteins, not by using any kind of electronics or writing. This corresponds to some limitations that would be in a brain if a brain were to store memories. We have no electronics in our brains. And neuroscientists examining brain tissue with electron microscopes have never detected any actual writing in the brain. In other words, even if we were to examine neurons at a magnification of 500,000 times, we would never see any tiny little letters that corresponded to some words in your memory.

Neuroscientists claim that the brain stores the very complex information we remember by using only chemicals, electricity and proteins. No neuroscientist has ever given a credible detailed explanation as to how such a miracle of encoding and translation could be accomplished. How, for example, could there ever be some combination of chemicals, electricity or proteins that represented your concept of your country or your religion or your mother?

In our analogy, Ed is told he must stick to a system of storage that is woefully unsuited for the instantaneous retrieval of specific information. He is told that he must put things in unmarked boxes that must be put on unlabeled shelves. Once lots of information accumulates, this system will not be able to handle instantaneous retrieval of specific information. For example, if someone asks three years from now, "What happened in the last Super Bowl?" or "Who were the winners at the Oscar awards two years ago?" no one at Warehouse B will be able to produce a quick answer. With thousands of unmarked boxes on the shelves, there will be no way to get such information instantaneously.

A brain would suffer from exactly this problem if it stored memories. For the brain has no coordinate system or position notation system by which an exact brain location could be located (such as neuron number 343,363,233), nor any labeling capability by which particular neurons or groups of neurons can be labeled. So an instantaneous recall of a specific memory (such as what a particular famous person looks like) should be impossible if it is stored in the brain. Also, neurons cannot be sorted, given the way they are arranged in a brain, with hundreds or thousands of connections between each neuron and nearby neurons. Given such an arrangement, you can no more sort things than you could sort the trees in a forest.

Suppose someone asks me, “Who was John F. Kennedy.” I instantly am able to recall an image of his face, and various facts about him, such as that he died by assassination on November 22, 1963. But how could I find that information so quickly if it was stored in some very tiny little part of my brain, perhaps from a location near neuron number 825,223,252? There would be no way for my brain to know where that exact location was.

It won't do any good for you to suggest that perhaps my brain scans all of its neurons to find that information. When you are asked some specific question, you do not at all have any type of thought experience similar to what it might be like to scan through all of your memories. You just instantly remember something. And if your brain was scanning through all its neurons to retrieve some information, that would take hours or days. You wouldn't be able to remember something instantly.

There is one other state of affairs in Warehouse B which is analogous to the situation in the brain. It is the fact that in Warehouse B there is a rapid loss of information stored on the shelves. In Warehouse B any information put on the shelves has a large chance of being lost within a few weeks, because of all the thievery by the ten guaranteed lifetime employees who are larcenous and can steal without risk, and because of all the rats that eat things on the shelves. In the brain there would be an equally great loss of any information stored, because of the rapid turnover of proteins. The most popular theory of memory storage in the brain is that memories are stored in synapses. But the proteins in synapses have an average lifetime of only a few weeks. There are other types of turnover going on. Synapses themselves have lifetimes of less than a year, as do the protrusions known as dendritic spines and synaptic boutons. As discussed here, there is no understanding of how the brain could possibly store information long enough so that you could remember things that happened decades ago.

Just as Ed will never be able to figure out a system by which Warehouse B could actually store decades of TV shows (in a manner allowing instantaneous retrieval) given the limitations that the Supervisor has stated, our neuroscientists will never be able to specify a detailed scenario by which a brain could store memories for 50 years despite rapid protein turnover, and also allow specific memories to be instantly retrieved in the way our minds do, so that someone can name some obscure person, and you instantly recall facts about such a person you haven't thought about in many years. The most reasonable conclusion is that memories involve some mental facility other than the brain. We don't know how such a facility works, just as we don't have any reasonable idea of how a memory like a human's could possibly work using a brain. But by postulating a non-neural basis for memory, we at least have a hypothesis that is not ruled out by what we know about the brain.

Nature never told us that a brain stores all a person's memories, and your body does nothing to suggest to you that you are retrieving memories from your brain. The idea that brains store memories is simply one that scientists gradually started assuming, without ever having sufficient evidence for such a conclusion.

In one respect, the brain is even less suitable for storing memories than the Warehouse B described here. I described Warehouse B as having boxes and shelves, which would allow for some type of grouping effect, in which related bits of information can be grouped together. But in a brain, physical grouping should be impossible. The brain is a mass of neurons, and the average neuron is connected to 10,000 other neurons. In such a system there would seem to be no way in which related data items can be physically grouped together like pages in a manila file, nor any way in which data can be arranged in a discrete sequence, with a start point and a stop point. As discussed here, such a system should not at all be suitable for storing long sequences, such as humans remember when they memorize songs, lists, and theatrical roles.

at April 25, 2018 No comments:

Labels: memory encoding, memory recall, memory storage

Tuesday, April 10, 2018

Split-Brain Cases Conflict with "Brains Make Minds" Dogma

Certain stories crop up in the scientific literature, and persist year after year despite a lack of solid basis in fact. One such story is that Galileo threw spheres of different weights from the Leaning Tower of Pisa to test whether they would reach the ground at the same time. A wikipedia.org article on the experiment says such an experiment (never reported by Galileo) probably never occurred.

Another such story is the idea that Darwin found evidence for his ideas about evolution in finches he studied at the Galapagos Islands. Page 35 of a long paper on the topic by a Harvard scientist (entitled “Darwin and His Finches: The Evolution of a Legend”) states Darwin “never actually put finches forward as evidence for the theory of evolution.” Page 39 states this:

In spite of the legend's manifest contradictions with historical fact, it successfully holds sway today in the major textbooks of biology and ornithology, and is frequently encountered as well in the historical literature on Darwin. It has become, in fact, one of the most widely circulated legends in the history of the life sciences, ranking with famous stories of Newton and the apple and of Galileo's experiments at the Leaning Tower of Pisa.

On page 134 of his recent biography of Darwin, A.N. Wilson states the following:

Peter and Rosemary Grant, evolutionary biologists from Harvard University, spent twenty-five summers studying these birds....They revealed that the beak changes were reversible -- this is hardly 'evolution.' Beaks adapted from season to season, depending on whether droughts left large, tough seeds, or heavy rainfall resulted in smaller, softer seeds.

A legend that arose fairly recently is that split-brain patients patients have a splitting of their perception, or maybe something like “split consciousness.” Such an idea was based on research done by Roger Sperry and Michael Gazzaniga. A split-brain patient is a patient who has a severing of the corpus callosum, a mass of fiber-like nerves that connect the left hemisphere of the brain and the right hemisphere of the brain.

Even though split-brain patients continued to show a unity of consciousness, and did not by any means show something like a split personality, materialists have tried to make as much hay as possible out of the research of Sperry and Gazzaniga. For example, in 2007 psychologist Steven Pinker claimed that “Surgery that severs the corpus callosum, separating the two hemispheres (a treatment for epilepsy), spawns two consciousnesses within the same skull,” and spoke as if this alleged observation was evidence against a human soul. Such a claim was bogus. None of the experimental results reported that split-brain patients had two consciousnesses.

In 2014 the wikipedia.org article on split-brain patients stated the following:

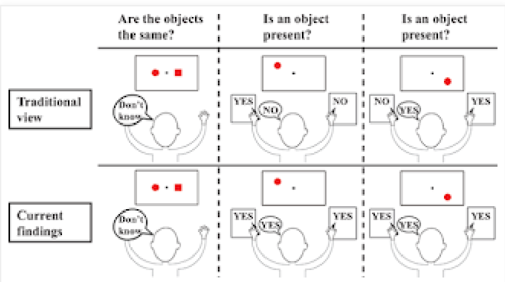
In general, split-brained patients behave in a coordinated, purposeful and consistent manner, despite the independent, parallel, usually different and occasionally conflicting processing of the same information from the environment by the two disconnected hemispheres...Often, split-brained patients are indistinguishable from normal adults.

On page 202 of his recent book "The Consciousness Instinct" neuroscientist Michael Gazzaniga claims that "a neurosurgeon can disconnect the two hemispheres of the brain and produce two minds in your single head." The claim is false, and he provides no historical examples of this happening. In fact, on page 203 Gazzaniga refers to split-brain patients, and says, "Oddly, after having their brains cut in half, all those patients said they felt fine, and the only difference they noted was the loss of seizures." That statement contradicts his statement on page 202.

In the video here we see a split-brain patient who seems like a pretty normal person, not at all someone with "two minds." And at the beginning of the video here the same patient says that after such a split-brain operation "you don't notice it" and that you don't feel any different than you did before – hardly what someone would say if the operation had produced "two minds" in someone. And the video here about a person with a split brain from birth shows us what is clearly someone with one mind, not two.

A scientific study published in 2017 set the record straight on split-brain patients. The research was done at the University of Amsterdam by Yair Pinto. A press release entitled "Split Brain Does Not Lead to Split Consciousness" stated, "The researchers behind the study, led by UvA psychologist Yair Pinto, have found strong evidence showing that despite being characterised by little to no communication between the right and left brain hemispheres, split brain does not cause two independent conscious perceivers in one brain."

The press release states the following: "According to Pinto, the results present clear evidence for unity of consciousness in split-brain patients." The paper states, "These findings suggest that severing the cortical connections between hemispheres splits visual perception, but does not create two independent conscious perceivers within one brain." Their paper had the visual below showing their results:



Pinto and his colleagues criticize the research previously done on this topic, saying the following:

Strikingly, although this clinical observation features in many textbooks (Gazzaniga et al., 1998; Gray, 2002) the reported data are never quantitative...Sperry notes: 'Although the general picture has continued to hold up in the main as described [... .] striking modifications and even *outright exceptions can be found among the small group of patients examined to date.'*

So apparently the original researchers weren't very numerically precise in measuring things, and got mixed results. Such nuances were ignored by a host of writers eager to use Sperry and Gazzaniga's research as something to prop up conventional dogmas that the brain generates the mind. Now doing things in a proper quantitative way, Pinto and his colleagues have come up with a result conflicting with the result of Sperry and Gazzaniga, a result telling us that split-brain patients have a perceptual unity of consciousness.

Pinto's paper notes that his findings spell trouble for two theories of consciousness, the Global Workspace Theory, and the Integrated Information Theory, which are just flavors of the theory that brains make minds:

This preserved unity of consciousness may be especially challenging for the two currently most dominant theories of consciousness, the Global Workspace theory (Baars, 1988, 2005;Dehaene and Naccache, 2001) and the Integration Information theory (Tononi, 2004, 2005; Tononi and Koch, 2015). A core assumption of the Global Workspace theory is that cortical broadcasting of selected information by the 'global workspace' leads to consciousness. Thus severing of the corpus callosum, which prevents broadcasting of information across hemispheres, seems to exclude the emergence of one global workspace for both hemispheres. Rather, it seems that without a corpus callosum either two independent global workspaces emerge, or only one hemisphere will have a global workspace, while the other does not. In either case, an integrated global workspace, and thus preserved conscious unity, seems to be difficult to fit into this framework.

The general prediction of the "minds come from brains" dogma would seem to be that if you split a brain so that the left half is not connected to the right half, this should result in two minds -- perhaps a "left half of the body in conflict with the right half of the body" situation. But no such thing occurs. After the split-brain operation there is still one consciousness and one self that at worst has some minor perceptual issues. The result of a unified consciousness in split-brain patients is perfectly compatible with the thesis of this website, that the human mind is not produced by the brain.

Postscript: See also this scientific paper "The Myth of Dual Consciousness in the Split Brain." The actual facts about split-brain surgery are related here by a surgeon who has performed such an operation. He states this about split-brain patients:

"After the surgery they are unaffected in everyday life, except for the diminished seizures. They are one person after the surgery, as they were before."

The surgeon states: "In a rational scientific community in which evidence and reason held sway, split-brain surgery would be hailed as compelling evidence for dualism and the immateriality of the intellect and will."

at April 10, 2018 No comments:

Labels: split-brain operation

Head Truth

The huge case for thinking minds do not come from brains

Sunday, November 18, 2018

Brain Dogmas Versus Case Histories That Refute Them

Our neuroscientists have the bad habit of frequently spouting dogmas that have not been established by observations. We have all heard these dogmas stated hundreds of times, such as when neuroscientists claim that memories are stored in brains, and that our minds are produced by our brains. There are actually many observations and facts that contradict such dogmas, such as the fact that many people report their minds and memories still working during a near death experience in which their brains shut down electrically (as the brain does soon after cardiac arrest).

One of the most dramatic type of observations conflicting with neuroscience dogmas is the fact that memory and intelligence is well-preserved after the operation called hemispherectomy. Hemispherectomy is the surgical removal of half of the brain. It is performed on children who suffer from severe and frequent epileptic seizures.

In a scientific paper “Discrepancy Between Cerebral Structure and Cognitive Functioning,” we are told that when half of their brains are removed in these operations, “most patients, even adults, do not seem to lose their long-term memory such as episodic (autobiographic) memories.” The paper tells us that Dandy, Bell and Karnosh “stated that their patient's memory seemed unimpaired after hemispherectomy,” the removal of half of their brains. We are also told that Vining and others “were surprised by the apparent retention of memory after the removal of the left or the right hemisphere of their patients.”

On page 59 of the book *The Biological Mind*, the author states the following:

A group of surgeons at Johns Hopkins Medical School performed fifty-eight hemispherectomy operations on children over a thirty-year period. "We were awed," they wrote later of their experiences, "by the apparent retention of memory after removal of half of the brain, either half, and by the retention of the child's personality and sense of humor."

In the paper "Neurocognitive outcome after pediatric epilepsy surgery" by Elisabeth M. S. Sherman, we have some discussion of the effects on children of temporal lobectomy (removal of the temporal lobe of the brain) and hemispherectomy, surgically removing half of the brain to stop seizures. We are told this:

After temporal lobectomy, children show few changes in verbal or nonverbal intelligence....Cognitive levels in many children do not appear to be altered significantly by hemispherectomy. Several researchers have also noted increases in the intellectual functioning of some children following this procedure....Explanations for the lack of decline in intellectual function following hemispherectomy have not been well elucidated.

Referring to a study by Gilliam, the paper states that of 21 children who had parts of their brains removed to treat epilepsy, including 10 who had surgery to

Translate

Select Language ▼

remove part of the frontal lobe, "none of the patients with extra-temporal resections had reductions in IQ post-operatively," and that two of the children with frontal lobe resections had "an increase in IQ greater than 10 points following surgery."

The paper here gives precise before and after IQ scores for more than 50 children who had half of their brains removed in a hemispherectomy operation in the United States. For one set of 31 patients, the IQ went down by an average of only 5 points. For another set of 15 patients, the IQ went down less than 1 point. For another set of 7 patients the IQ went up by 6 points.

The paper here (in Figure 4) describes IQ outcomes for 41 children who had half of their brains removed in hemispherectomy operations in Freiburg, Germany. For the vast majority of children, the IQ was about the same after the operation. The number of children who had increased IQs after the operation was greater than the number who had decreased IQs.

Referring to these kind of surgeries to remove huge amounts of brain tissue, the paper "Verbal memory after epilepsy surgery in childhood" states, "Group-wise, average normed scores on verbal memory tests were higher after epilepsy surgery than before, corroborating earlier reports."

Some try to explain these results as some kind of special ability of the child brain to recover. But there are similar results even for adult patients. The page here mentions 41 adult patients who had a hemispherectomy. It says, "Forty-one patients underwent additional formal IQ testing postsurgery, and the investigators observed overall stability or improvement in these patients," and notes that "significant functional impairment has been rare."

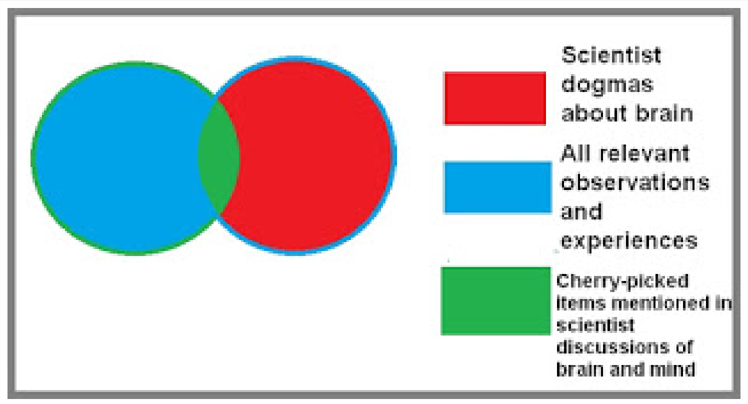
Of these cases of successful hemispherectomy, perhaps none is more astonishing than a case of a boy named Alex who did not start speaking until the left half of his brain was removed. A scientific paper describing the case says that Alex "failed to develop speech throughout early boyhood." He could apparently say only one word ("mumma") before his operation to cure epilepsy seizures. But then following a hemispherectomy (also called a hemidecortication) in which half of his brain was removed at age 8.5, "and withdrawal of anticonvulsants when he was more than 9 years old, Alex suddenly began to acquire speech." We are told, "His most recent scores on tests of receptive and expressive language place him at an age equivalent of 8–10 years," and that by age 10 he could "converse with copious and appropriate speech, involving some fairly long words." Astonishingly, the boy who could not speak with a full brain could speak well after half of his brain was removed. The half of the brain removed was the left half – the very half that scientists tell us is the half that has more to do with language than the right half.

We learn of quite a few such cases in the scientific paper "Long-Term Memory: Scaling of Information to Brain Size" by Donald R. Forsdyke of Queens University in Canada. He quotes the physician John Lorber on an honors student with an IQ of 126:

Instead of the normal 4.5 centimetre thickness of brain tissue between the ventricles and the cortical surface, there was just a thin layer of mantle measuring a millimeter or so. The cranium is filled mainly with cerebrospinal fluid. ... I can't say whether the mathematics student has a brain weighing 50 grams or 150 grams, but it's clear that it is nowhere near the normal 1.5 kilograms.

Forsdyke notes two similar cases in more recent years, one from France and another from Brazil.

Cases like this make a mockery of scientist claims to understand the human brain. When scientists discuss scientific knowledge relating to memory, they almost never discuss the most relevant thing they could discuss, the cases of high brain function after hemispherectomy operations in which half of the brain is removed. Instead the scientists cherry-pick information, and describe a few experiments and facts carefully selected to support their dogmas, such as the dogma that brains store memories, and brains make minds. They also fail to discuss the extremely relevant research of John Lorber, who documented many cases of high-functioning humans who had lost almost all of their brain due to hydroencephaly.



A scientist discussing memory will typically refer us to experiments involving rodents. Such experiments are almost always studies with low statistical power, because the experimenter failed to use at least 15 animals per study group, the minimum needed for a moderately reliable result with a low risk of a false alarm. There will be typically be some graph showing some measurement of what is called freezing behavior, when a rodent stops moving. The experimenter will claim that this shows something was going on in regard to memory, although it probably does not show such a thing, because all measurements of a rodent's degree of freezing are subjective judgments in which an experimenter's bias might have influenced things. There will often be claims that a fear memory was regenerated by electrically zapping some part of the brain where the experimenter thought the memory was stored. Such claims have little force because it is known that there are many parts of a rodent's brain that will cause a rodent to stop moving when such parts are electrically stimulated. And, of course, rodent experiments prove nothing about human memory, because humans are not rodents.

When a scientist discusses memory research, he will typically discuss the case of patient HM, a patient who was bad at forming new memories after damage to the tiny brain region called the hippocampus. Again and again, writers will speak as if this proves the hippocampus is crucial to memory. It certainly does not. The same very rare effect of having a problem in forming new memories cropped up (as reported here) in a man who underwent a dental operation (a root canal). The man had no brain damage, but after the root canal he was reportedly unable to form new memories. Such cases are baffling, and the fact that they can come up with or without brain damage tells us no clear tale about whether the hippocampus is crucial for memory. The hemispherectomy cases suggest that the hippocampus is not crucial for memory, for each patient who had a hemispherectomy lost one of their two hippocampuses, and overall there was little permanent effect on the ability to form new memories.

A scientific paper tells us that "lesions of the rodent hippocampus do not produce reliable anterograde amnesia for context fear," meaning rodents with a damaged hippocampus can still produce new memories. The paper also tells us, "These data suggest that the hippocampus is normally involved in context conditioning but is not necessary for learning to occur." So it seems that the

About Me

Mark Mahin

www.markmahin.com

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main claim that neuroscientists cite to persuade us that they have some understanding of a neural basis for memory (the claim that the hippocampus is "crucial" for memory) is really a factoid that is not actually well established.

Postscript: The case of patient HM has been cited innumerable times by those eager to suggest that memories are brain based. Such persons usually tell us that patient HM was someone unable to form any new memories. But a 14-year follow-up study of patient HM (whose memory problems started in 1953) actually tells us that HM was able to form some new memories. The study says this on page 217:

In February 1968, when shown the head on a Kennedy half-dollar, he said, correctly, that the person portrayed on the coin was President Kennedy. When asked him whether President Kennedy was dead or alive, and he answered, without hesitation, that Kennedy had been assassinated...In a similar way, he recalled various other public events, such as the death of Pope John (soon after the event), and recognized the name of one of the astronauts, but his performance in these respects was quite variable.

The study also says that patient HM was able to learn a maze (although learning it only very slowly), and was able eventually to walk the maze three times in a row without error.

at November 18, 2018 No comments:

Labels: hemispherectomy, high mental function despite large brain damage

Saturday, November 3, 2018

Vacillating Disarray of the Memory Trace Theorists

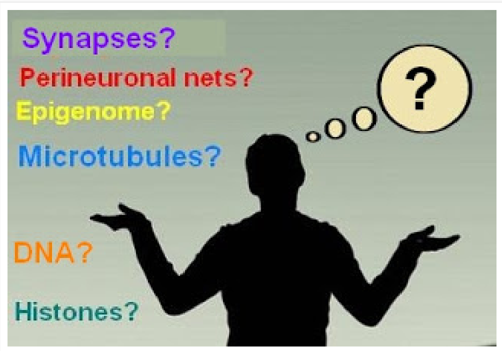
In a February post entitled "Turmoil of the Baffled Engram Theorists," I discussed a Science News article that showed the theoretical disarray of engram theorists, scientists who speculate about a physical brain basis for human memories. Three scientific papers in recent years suggest that claims that human memories are stored in brains do not have a solid theoretical basis well-substantiated by experiments.

One paper was entitled "The mysteries of remote memory," and was published in the Philosophical Transactions of the Royal Society B. Speaking of long-lasting memories, the authors told us that "our current knowledge of how such memories are stored in the brain and retrieved, as well as the dynamics of the circuits involved, remains scarce." Using the term "engrams" to mean the hypothesis that there are cells in the brain that store memories, the authors state "what and where engrams are implicated in remote memory storage and how they change over time have received little experimental attention thus far." The authors also frankly tell us that "From engrams to spines surprisingly little evidence exists in the literature on the grounds of remote information processing, maintenance and storage to account for the lifelong and persistent nature of the mnemonic signal." This type of candor is a refreshing contrast from the click-bait hype about memory research that we get in the science news, where dubious studies using insufficient experimental groups are often trumpeted as scientific breakthroughs.

One of the ideas about a brain storage of memory is that memories get stored in dendritic spines, little bumps on dendrites. But this study found that dendritic spines in the hippocampus last for only about 30 days. And this study found that dendritic spines in the cortex of mice brains have a half-life of only 120 days. So such dendritic spines don't last enough to store memories that last for years. The "Mysteries of remote memory" paper mentions a study that found that studied the persistence of dendritic spines, and found a "near full erasure of the synaptic connectivity pattern within 15 days post-learning." The paper says “these incongruent findings point to the need for an alternative explanation to spine dynamics for remote memory stability.” In other words, we can't explain dendritic spines as some physical basis for long-term memory. Referring to the often stated speculations that memories start out in the hippocampus and are transferred to the cortex, the paper states “unequivocal experimental evidence in support of it is lacking.” The paper then spends some time talking about the very speculative possibility that DNA methylation has something to do with long-term memory, an idea for which there is no evidence.

The overall impression we get from reading such a paper is one of uncertainty and disarray, as if no clear idea was emerging from brain studies on the long-term storage of memory. We get such an impression even more strongly from two other papers on this topic published in recent years. One is the 2016 paper “What Is Memory? The Present State of the Engram.” Very oddly for a scientific paper, the paper consists of ten sections, each written by a different author or authors. We get conflicting theories as to how a brain might store memories, with little agreement between the sections.

The 2017 paper here is entitled, "On the research of time past: the hunt for the substrate of memory." It is a portrait of memory theorists in disarray, presenting no one theory about how memory might be stored in a brain, and instead suggesting seven or more possibilities, none of which is plausible. The paper is all over the map in its speculations, like someone shooting a gun in all different directions.



The paper tells us on its sixth page that “Engram-labeling studies have shown that certain populations of neurons encode specific memories in mice.” This is not correct. The studies in question are typically small-sample studies with very low statistical power, in which there is a high chance of false alarms. In a typical such study, an experimenter will zap some small portion of a mouse's brain, and claim that he has elicited a fear memory stored in that part, producing a freezing effect in the mouse. But such freezing effects (which require subjective judgments) mean little, since it is known that there are many parts of a mouse's brain that can be stimulated to produce a freezing effect in a mouse.

The paper tells us on page 9 that “synaptic weight changes can now be excluded as a means of information storage.” But for many years neuroscientists have been pushing the very dubious dogma that memories are stored by changes in synaptic weights. As discussed here, this idea never made any sense, for there has never been a proven case of any information that was ever stored as changes in the weights of something, and also synapses are too volatile to store memories that last for decades, for reasons discussed later in this post.

The authors then proceed to discuss a wide variety of possibilities for how memory might be stored in a brain. These include the following (the quotes below in italics are from the paper):

- memory recall
- memory storage
- morphogenesis
- natural selection
- near death experiences
- neural noise
- non-local consciousness
- nonneuralism
- optogenetics
- panpsychism
- precognition
- prefrontal cortex
- remote viewing
- savants
- scientist misconduct
- source of thoughts
- split-brain operation
- synapse theory of memory
- top-down theory of mind
- visual recognition

Theory 1: *"The particularly longlived proteins associated with DNA (i.e., nucleoporins and histones)."* This is not a good option because a scientific paper tells us that the half-life of histones in the brain is only about 223 days, meaning that every 223 days half of the histone molecules will be replaced. So histones are not suitable for storing memories lasting decades.

Theory 2: *"Some have suggested that DNA (or the epigenetic modifications on it) is the most suitable candidate for memory, being the cellular storage mechanism for other (lifelong) information."* For why this speculation is untenable, see the section entitled "Why Very Long-Term Memories Cannot Be Stored in the Cell Nucleus" in this post. Human DNA molecules have been exhaustively analyzed by multi-year projects such as the Human Genome Project and the ENCODE project, and no evidence has been found of human memories stored in DNA. See the "Why Long-Term Memories Cannot Be Stored in the DNA Methylome" section of this post for why DNA methylation is also an unsuitable possibility for memory storage. If DNA molecules stored memories, we would find that the DNA molecules in the brain of a dead person would vary a lot, with one DNA molecule in the brain being very different from another. Instead, all DNA molecules in the brain are basically the same, and are the same as DNA molecules in other parts of the body.

Theory 3: *"The late Roger Tsien recently proposed the notion that perineuronal nets, the extracellular matrices around neurons and synapses, provide the architecture for information."* Wikipedia tells us that these perineuronal nets are "composed of chondroitin sulfate proteoglycans," but this paper tells us that the half-life of such molecules is only 10 days, making them unsuitable for a storage of memories lasting a lifetime. The idea behind this perneuronal nets speculation is that memory may be stored in a pattern of holes, like punch cards. The idea is absurd. IBM punchcards worked back in the 1960's because they worked with a punchcard reader which shined light through the punch cards. The brain has nothing like a punchcard reader to read information if it had information stored in such a way, and such a system only works with flat two-dimensional surfaces, not three-dimensional surfaces like that in the brain. There are two research papers that claim to have a result suggesting that perineuronal nets may be important in memory, but both do nothing to establish such a claim, because they both used fewer than 10 animals in some of their study groups (for a moderately reliable research result, 15 is the minimum number of animals per study group).

Theory 4: "*Structures composed of short-lived components could constitute a long-term memory if the configurations were preserved by normal homeostatic replenishment."* To the contrary, there is certainly no "normal" bodily mechanism that might allow "structures composed of short-lived components" to store memories for decades.

Theory 5: *"Other theories involve information storage or processing in microtubules, the long polarized helices of tubulin subunits that compose the cellular skeleton."* There is no evidence for such theories, and there is a good reason for rejecting them: the fact that there is high molecular turnover in microtubules. This paper tells us, "Neurons possess more stable microtubules compared to other cell types...These stable microtubules have half-lives of several hours and co-exist with dynamic microtubules with half-lives of several minutes." So microtubules in the brain last less than a week, and are not any place that memories lasting decades could be stored.

Theory 6: *"The physical connectivity within neural ensembles is a plausible new candidate substrate for memory information storage, with many merits, including robustness to insult, bioenergetic efficiency, stability of information storage in a potentially binary format, and a high capacity for informational content."* This is a completely different idea from all the previous things discussed, and the paper does not discuss it truthfully. Far from being a "plausible" idea having "many merits," the idea has no merits. No one has any plausible idea as to how mere "physical connectivity" could be storing the complex things human remember. The paper refers us to the previously mentioned "What Is Memory? The Present State of the Engram" paper, but the sketch of the idea given in that paper does not present the idea in a coherent manner. We see a diagram showing what looks like a necklace of green beads as a representation of how "physical connectivity" could supposedly store information. That's not a way to store complex information like humans learn. If there is "stability of information storage" in the connections between neurons, it is not the type of stability that would allow memories to be stored for years, let alone decades. The proteins in synapses have an average half-life of less than a week, and synapses themselves have a lifetime of less than a year. The research of Stettler suggests that synaptic connections do not last longer than about three months. In a paper he stated the following, referring to remodeling which would break any "connectivity pattern":

Depending on whether the population of boutons is homogeneous or not, the amount of bouton turnover (7% per week) has different implications for the stability of the synaptic connection network. If all boutons have the same replacement probability per unit time, synaptic connectivity would become largely remodeled after about 14 weeks.

A very important recent scientific paper is the paper "Synaptic Tenacity or Lack Thereof: Spontaneous Remodeling of Synapses." The paper used the term "synaptic tenacity" for the idea that synapses (brain connections) are relatively stable. Making a devastating case against such a claim, the paper stated the following:

The aim of this Opinion is to discuss challenges to the notion of synaptic tenacity that come from general biological considerations and experimental findings. Such findings collectively suggest that synaptic tenacity is inherently limited, since synapses do change spontaneously and to a fairly large extent....It is probably unrealistic to expect that synapses maintain their particular contents and, by extension, their functional properties with pinpoint precision. This expectation is further challenged by the fact that synapses are not rigid structures but rather are dynamic assemblies of molecules (and organelles) that continuously migrate into, out of, and between neighboring assemblies through lateral diffusion, active trafficking, endocytosis, and exocytosis....Closer examination reveals, however, that properties of individual synapses, such as spine volume, presynaptic bouton volume, synaptic vesicle number, active zone (AZ) molecule content, and PSD protein content fluctuate considerably over these timescales....Imaging studies in primary culture indicate that synaptic configurations erode significantly over timescales of a few days....The findings summarized above indicate that synaptic tenacity is inherently limited or, using the terminology of Rumpel, Loewenstein, and others, that synapses are intrinsically 'volatile'....When it comes to cognitive functions, long-term memory is one area where the notion of synaptic volatility raises perhaps some of the most challenging questions. In light of findings discussed in this Opinion article, and possibly others, age-old notions concerning relationships between histories of 'elementary brain-processes', connection strengths, and memory traces might need to be revisited; put differently (to paraphrase James, modern science might need to improve on this explanation.

The evidence presented by this "Spontaneous Remodeling of Synapses" paper is devastating evidence against the predominant theory of the brain storage of memories (that memories are stored by changes in synapse strength), and also Theory 6 mentioned above, that memories are stored by some "connectivity pattern" created by synaptic connections. Neither theory can be true if synapses have the kind of volatility described in the paper.

In a 2010 book two neuroscientists state that they are "profoundly skeptical" about the main theory of a physical storage of memory, but suggest that they have nothing like a substitute theory to offer:

We take up the question that will have been pressing on the minds of many readers ever since it became clear that we are profoundly skeptical about the hypothesis that the physical basis of memory is some form of synaptic plasticity, the only hypothesis that has ever been seriously considered by the neuroscience community. The obvious question is: Well, if it's not synaptic plasticity, what is it? Here, we refuse to be drawn. We do not think we know what the mechanism of an addressable read/write memory is, and we have no faith in our ability to conjecture a correct answer.

I submit that the reason for such hesitancy is that there is no theory of a physical storage of memory that can stand up to careful scrutiny, no theory that can explain both memories that can form instantly and the fact that we can instantly retrieve memories of things learned or experienced long ago. Deprived of any credible neural explanation, we should conclude that human episodic and conceptual memory must be a spiritual or psychic or soul phenomenon, not a neural phenomenon**.**

One of the many reasons for rejecting claims that memories are stored in brains discussed at this site is the essentially instantaneous speed at which humans are able to remember very rarely recalled pieces of information. You say to me, "Dizzy Dean," and I may in less than two seconds start saying, "eccentric St. Louis Cardinals pitcher, in the 1930's," even though I haven't thought or read about Dizzy Dean in decades. How could a brain achieve this effect through reading just the right little spot where the information was stored, which would be like instantly finding a needle in a mountain-sized haystack, given a million little spots in the brain where a memory might be stored?

One major reason why it seems hard to believe that the brain could achieve instant recall is that neurons are slow. Information is passed around in a brain at the slow speed of about 100 meters per second, which is only the tiniest fraction of the speed at which electrical signals move about in a computer. Based on this fact we should consider a brain absolutely incapable of performing memory recall as quickly as humans do.

It is often claimed that the brain "makes up" for its slow speed of nerve transmission by being "massively parallel." The claim that the brain is massively parallel is false. In the computer world, a computer system is massively parallel if it consists of multiple CPUs or central processing units, each of which is running a computer program. We know of nothing in the brain that acts like a computer CPU, nor do we know of anything like a program that the brain runs to compute. It is false to claim that each neuron is like its own CPU. Neurons do not run any program like a computer CPU does. So we cannot at all overcome the problem of low signal transmission speeds in the brain by claiming that the brain is "massively parallel." It is true that the brain consists of many neurons working together, but that does not make the brain massively parallel. My television set has many transistors working together, but my television set is not massively parallel; and my arms have many cells working together, but that does not make my arms massively parallel. The brain does does not consist of multiple programs running together on multiple processors, and we don't even know of a single program running anywhere in the brain.

Let us imagine some weird group of conspiracy theorists who maintain that secret information from the World War II era is stored in the leaves lying about in modern Germany. If the theorists were to maintain that such information is written on individual leaves, you could easily show the absurdity of the theory by pointing out that leaves don't last much longer than a year. If the theorists were to maintain instead that it was the *arrangements* of the leaves that stored the information, with one type of leaf pile representing one thing and another type of leaf pile representing something else, you could also show the error of the theory by pointing out that leaf piles are unstable and ever-changing, being blown around by the wind. Similarly, the protein turnover, synaptic volatility and synaptic remodeling discussed in the "synaptic remodeling" paper above are constraining effects as powerful as the short lifetimes of leaves and the instability and impermanence of leaf piles. Anyone claiming that memories persist in synapses for 50 years is advancing a claim as unbelievable as the 50-year "leaf storage" claims of such conspiracy theorists.

at November 03, 2018 No comments:

Labels: memory storage, synapse theory of memory

Sunday, September 9, 2018

Some Reasons the Main Theory of Neural Memory Storage Is Unbelievable

How is it that humans can remember things for decades? For decades neuroscientists have been offering an answer: that memories are stored when synapses are strengthened. But this idea has never made any sense. There are two gigantic reasons why it cannot be correct.

The first reason has to do with how long humans can remember things. People in their sixties or seventies can reliably remember things that they saw 50 or more years ago, even if nothing happened to refresh those memories in the intervening years. I have a long file where I have noted many cases when I remember very clearly things I haven't thought about, seen or heard about in four or five decades, memories that no sensory experiences or thoughts ever refreshed. I have checked the accuracy of very many of these memories by using resources such as Google and Youtube.com (where all kinds of clips from the 1960's TV shows and commercials are preserved). A recent example was when I remembered a distinctive characteristic of the “Clutch Cargo” animated TV show (circa 1960) that I haven't watched or thought about in 50 years, merely after seeing a picture of Clutch Cargo's head. The characteristic I remembered was the incredibly poor animation, in which only the mouths moved. Using youtube.com, I confirmed that my 50-year old recollection was correct. A scientific study by Bahrick showed that “large portions of the originally acquired information remain accessible for over 50 years in spite of the fact the information is not used or rehearsed.”

Is this reality that people can remember things for 50 years compatible with the idea that memories are stored by a strengthening of synapses? Synapse strengthening occurs when proteins are added to a synapse, just as muscles are strengthened when additional proteins are added to a muscle. But we know that the proteins in synapses are very short-lived. The average lifetime of a synapse protein is less than a week. But humans can reliably remember things for 50 years, even information they haven't reviewed in decades. Remarkably, the length of time that people can reliably remember things is more than 1000 times longer than the average lifetime of a synapse protein.

The latest and greatest research on the lifetime of synapse proteins is the June 2018 paper “Local and global influences on protein turnover in neurons and glia.” The paper starts out by noting that one earlier 2010 study found that the average half-life of brain proteins was about 9 days, and that a 2013 study found that the average half-life of brain proteins was about 5 days. The study then notes in Figure 3 that the average half-life of a synapse protein is only about 5 days, and that all of the main types of brain proteins (such as nucleus, mitochondrion, etc.) have half-lives of less than 20 days.

Consequently, it is absurd to maintain that long-term memory results from synapse strengthening. If synapse strengthening were the mechanism of memory storage, we wouldn't be able to remember things for more than a few weeks. We can compare the synapse to the wet sand at the edge of a seashore, which is an area where words can be written for a few hours, but where long term storage of information is impossible.

It may be noted that scientists have absolutely not discovered any effect by which synapses undergo any type of strengthening lasting years. Every single type of synapse strengthening ever observed is always a short-term effect not lasting for years.

There is another equally gigantic reason why it is absurd to maintain that memories are stored through synapse strengthening. The reason is that it is, in general, wrong to try to explain information storage by appealing to a mere process of strengthening. Strengthening is not storage. We know of many ways in which information can be stored, and none of them are cases of strengthening.

Below are some examples:

1. People can store information by writing using a paper and pen. This does not involve strengthening.
2. People can store information by using a typewriter to type on paper. This does not involve strengthening.
3. People can store information by drawing pictures or making paintings. This does not involve strengthening.
4. People can store information by taking photographs, either by using digital cameras, or old-fashioned film cameras. In neither case is strengthening involved.
5. People can store information by using tape recorders. This does not involve strengthening.
6. People can store information by using computers. This does not involve strengthening.

So basically every case in which we are sure information is being stored does not involve strengthening. What sense, then, does it make to claim that memory could be stored in synapses through strengthening?

In all of the cases above, information is stored in the same way. Some unit capable of making a particular type of impression or mark (physically visible or perhaps merely magnetic) moves over or strikes a surface, and a series of impressions or marks are made on the surface. Such a thing is not at all a process of strengthening.

Consider a simple example. You have a friend named Mary, and you one day learn that Mary has a black cat. Now let us try to imagine this knowledge being stored as a strengthening of synapses. There is no way we can imagine such knowledge being stored by a strengthening of synapses. If you happened to have stored in your brain the knowledge that Mary has a black cat, it could conceivably be that a strengthening of synapses might allow you to more quickly remember that Mary has a black cat. But there is no way that the fact of Mary having a black cat could be stored in your brain through a strengthening of synapses.

Every protein molecule of a particular type has exactly the same chemical contents – for example, every rhodopsin molecule has the same chemical contents. Unlike nucleic acids, which can store strings of information of indefinite length, a protein molecule cannot store arbitrary lengths of information. So we cannot imagine that there is some particular tweak of protein molecules added to a synapse (when the synapse is strengthened) that would allow information to be stored such as the fact that Mary has a black cat.

An additional reason for rejecting the synaptic theory of memory storage is that according to such a theory a memory could only be formed after a synapse was strengthened by proteins (something requiring at least minutes for protein synthesis). But humans can form a new memory instantly. Imagine if someone walks into your workplace naked or firing a gun. It wouldn't take you minutes to form a permanent memory of that. The memory would form instantly. But new proteins (such as would be needed to strengthen a synapse) could never form instantly. We know that the synthesis of new proteins requires minutes. If forming new memories required the synthesis of new proteins, the brain would never keep up with sensory experiences which keep coming at you continuously. I can watch a 30-minute television drama, and then tell you every major thing that happened in the show. I wouldn't be able to do that if each new thing I saw required the synthesis of a new protein which required several minutes.

In his Nautilus post "Here's Why Most Neuroscientists Are Wrong About the Brain," C. R. Gallistel (a professor of psychology and cognitive neuroscience) points out the absurdity of thinking that mere changes in synapse strengths could store the complex information humans remember. Gallistel writes the following:

It does not make sense to say that something stores information but cannot store numbers. Neuroscientists have not come to terms with this truth. I have repeatedly asked roomfuls of my colleagues, first, whether they believe that the brain stores information by changing synaptic connections—they all say, yes—and then how the brain might store a number in an altered pattern of synaptic connections. They are stumped, or refuse to answer....When I asked how one could store numbers in synapses, several became angry or diverted the discussion with questions like, "What's a number?"

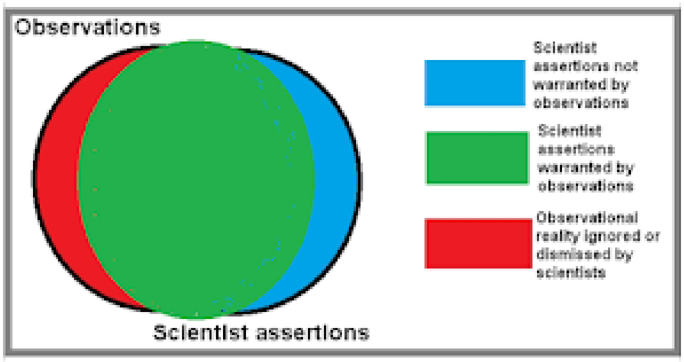
What Gallistel describes sounds dysfunctional: a pretentious neuroscientist community that claims to understand how memory can be stored in a brain, but cannot give anything like a plausible answer to basic questions such as "How could a number be stored in a brain?" or "How could a series of words be stored in a brain?" or "How could a remembered image be stored in a brain?" Anyone who cannot suggest plausible detailed answers to such questions has no business claiming to understand how a brain could store a memory, and also has no business claiming that a brain does store episodic or conceptual memories.

Gallistel suggests a radically different idea, that a memory is stored in a brain as a series of binary numbers. There is no evidence that this is true, and we have strong reasons for thinking that it cannot be true. One reason is that there is no place in the brain suitable for storing binary numbers, partially because nothing in the brain is digital, and everything is organic. Another reason is there is no plausible physiology by which a brain could write or read binary numbers. Another reason is that we cannot account for how a brain could possibly be converting words and images into binary numbers. A computer does this through numerical conversion subroutines and by using a table called the ASCII code. Neither numerical conversion subroutines nor the ASCII code is available for use within the brain.

In short, the prevailing theory of memory storage advanced by neuroscientists is untenable. Why do they advance this theory? Because they have no better story to tell us. There is actually no theory of a brain storage of memories that can stand up to prolonged critical scrutiny. As discussed at length here, there is no part of the brain that is a plausible candidate for a place where 50-year-old memories could be stored. As discussed here, there is no part of the brain that acts like a write mechanism for stored memory or a read mechanism for stored memory.

What our neuroscientists should be doing is telling us, "We have no workable theory as to how a brain could store and instantly retrieve memories." But rather than admit to such a lack of knowledge, our neuroscientists continue to profess the untenable synapse theory of memory. For they want at all costs for us to stay away from a very plausible idea they abhor: that episodic and conceptual memory is a spiritual effect (a capability of the human soul) rather than a neural effect.

Many think that there is an exact match between the assertions of scientists and observations. But this is not correct. The diagram below shows something like the real situation. Claims such as the claim that memories are stored in synapses are part of the blue area, along with many dogmatic and overconfident pronouncements such as string theory, multiverse speculations and evolutionary psychology. The idea that memory is an aspect of the human soul rather than the brain is supported not only by many observations in the green area of the diagram (observations that a typical scientist would not dispute), but also by many observations in the red area (such as the massive evidence for psychic phenomena). See the posts at this site for a discussion of very many of these observations.



Do not be fooled by the small number of scientific papers that claim to have found evidence for an engram or memory trace. As discussed here, I examined about 10 such papers, and found that almost all of them have the same defect: the number of animals tested was way below the standard of 15 animals per study group, meaning there is low statistical power and a very high chance of a false alarm. Besides a reliance on subjective judgments of freezing, the papers all deal with small animals, and don't tell us anything about human memory.

I can give a baseball analogy for the theory that episodic and conceptual memories are stored in the brain. We can compare such a theory to a batter at the plate. If such a theory includes a plausible explanation of how human experiences and concepts could be stored as neural states, overcoming the extremely grave encoding problem discussed here, we can say the theory at least made contact with the pitched ball. If such a theory can credibly explain how memories could be written to the brain, we can say such a theory has reached first base. If such a theory can explain how a stored memory could last for 50 years, despite the very rapid protein turnover in brains and synapses, we can say such a theory has reached second base. If such a theory can explain how humans can so often instantly remember obscure things they learned or experienced decades ago, overcoming the seemingly insurmountable "finding the needle in a haystack" problem discussed here, we can say such a theory has reached third base. If such a theory were to be confirmed by someone actually extracting learned information from a dead brain, we can say such a theory reached home plate and scored a run. But using this analogy it must be reported that the theory of conceptual and episodic memory storage in the brain never even reached first base and never even made contact with the ball. For none of these things has been accomplished.

Occasionally, a neuroscientist will "fess up" about how little evidence there is for the dogma about a brain storage of memories. The neuroscientist Alex Fox once said, "Memory storage in the brain is only a theoretical concept." He also stated, "We haven't come even close to understanding even the most basic types of functioning in the brain."

at September 09, 2018 No comments:

Labels: synapse theory of memory

Saturday, August 11, 2018

The Brain Seems to Have No Mechanism for Reading or Writing Memories

Sometimes an idea may seem fairly believable when it is painted in broad brushstrokes, but we may recognize the idea as being untenable once we start to examine the idea in detail. One such idea is the theory of Santa Claus. When painted in broad brushstrokes, this idea doesn't seem too outrageous: *there's a guy living in the North Pole, who has a big toy workshop; and every Christmas Eve he uses a big sled pulled by flying reindeer to deliver toys to all the little children around the world.* It is when you start to examine this idea in detail that it breaks down. Suppose we calculate how many toys would need to be in a sled to give even one toy to half the world's children. We quickly find you would need a sled the size of a skyscraper tower. And suppose we calculate how quickly Santa would have to move to give one toy to every child in a single day. We quickly find Santa would have to move at a rate faster than one child per second. And suppose we consider that Santa is too fat to go down chimneys, and that most people don't live in houses with chimneys. So how could Santa get into houses with locked doors? And suppose we start asking: how is that reindeer can fly without wings? It would appear the Santa theory cannot hold up to adult intellectual scrutiny.

A theory taught to every adult is that our memories are stored in our brains. This unproven idea does not sound too unreasonable when painted in broad brushstrokes. You can very broadly imagine that sensory experience or knowledge is kind of like a fluid, and that the brain stores this kind of like a cup stores water you pour into it. That doesn't sound too unreasonable. But imagine we try to subject the theory of the brain storage of memories to a very close and detailed scrutiny. Then the theory breaks down again and again, just like the theory of Santa Claus when it is exposed to scrutiny.

One way the theory of a brain storage of memories breaks down upon scrutiny is when we consider: how long should memories last if they are stored in brains? The main theory of brain memory storage is that memories are stored in synapses. But we know that the constituents of synapses are short-lived proteins with an average lifetime of no greater than a few weeks. So based on the prevailing idea of brain memory storage, we should be unable to remember anything for more than a few weeks. But instead people can reliably remember things for 50 years.

Another way the theory of a brain storage of memories breaks down upon scrutiny is when we consider: how long should a brain take to store a memory? Our neuroscientists suggest the formation of a memory requires the synthesis of new proteins, but such proteins take minutes to synthesize, and we can form a memory instantaneously. It doesn't take you minutes to form a memory of when someone fires a gun at you.

Another way the theory of a brain storage of memories breaks down upon scrutiny is when we consider: how could a brain instantly find a memory stored in some exact spot? There are many, many thousands of memories you can recall. But when you hear the name of a person, you are able to instantly recall what you know about that person. There is no plausible theory as to how a brain can do that. Neurons don't have neuron numbers, the brain does not use physical sorting, indexing or grouping, and particular sections of the brain are not labeled by content. So retrieving a memory stored in a brain would seem to be like instantly finding a needle in a mountain-sized haystack. Retrieving a memory stored in a brain should be like instantly finding exactly the right information stored in one particular book in a library, when there are more than 100,000 volumes in the library, and none of the books have covers, and none of the aisles have signs indicating their content. This is the problem I call the navigation problem: how could a brain possibly instantly navigate to precisely the right tiny little millionth of the brain where some exact memory was stored? Materialists have no real answer to this difficulty.

We cannot overcome this difficulty by imagining that a brain scans through all of its stored memories like someone leafing through the pages of a book, until it finds the right answer. That would take days. Nor can we overcome the navigation difficulty by imagining that each memory is stored throughout the brain. Such an idea makes no more sense than imagining a textbook in which each of the thousands of sentences is stored on every line of the textbook.

Then there is the problem of encoding. For a brain to store memories physically, there would need to be some translation of mental experience into neuron states, which would require extensive translation known as encoding. We know that cells do one type of translation, translating the nucleotide base pairs in DNA into proteins. But to do that quite simple translation, the genome uses hundreds of special transfer RNA genes dedicated to such a translation task. It seems that to encode human mental experience into some kind of physical storage in the brain, the genome would need to have thousands of genes dedicated to such an incredibly hard task. But we've mapped the entire genome, and have found no such genes anywhere. As discussed at the end of this post, there's one paper claiming to find some scant evidence of some memory encoding genes, but the methodology of the paper is quite goofy, involving trying to find correlations between gene expression data in one set of people and brain wave data in an entirely different set of people, which makes no sense.

There is another difficulty that arises when we consider the issue of the retrieval of memories stored in a brain. This is a problem that I can call the position focus problem. This is the problem that an organ like the brain would seem to have no mechanism for focusing on some particular part of the brain, so that a memory could be read from some particular location.

When we consider all of the different ways in which information is retrieved from a physical location, we find there is a common characteristic. In each such way there is always some mechanism of position focus. Position focus occurs when some particular part of the information is highlighted as kind of “the current position” within that information.

I can some give examples of this kind of “current position” effect:

1. A book can be opened to only one pair of pages. When a reader reads that book, his eyes can focus on only one line at a time. When the reader focuses on a particular line, position focus is achieved.
2. When a film is run through a film projector, only one frame at a time can be in front of the light that passes through the film. In such a way, position focus is achieved.
3. In the disk of a computer hard-drive, there is a read-write head that moves around to read particular parts of the disk. At any time, the head is above one particular spot of the disk, and position focus is achieved.
4. The needle of a 33 rpm phonograph record can only be resting on on one little spot on the phonograph record. Whenever that needle rests on one particular spot on the record, position focus is achieved.
5. The current tab of a web browser will always be on one particular web page, with a URL displayed at the top of that tab. With such a rule, position focus is achieved, with the URL being a particular position within the vastness of the Internet.

Position focus mechanisms in a record player and computer hard drive

Now let us imagine that when you remember some specific memory, your brain is reading some particular tiny spot in the brain where the memory is stored. Ignoring for the moment the navigation problem of how the brain could instantly find that specific part, which would be like instantly finding a needle in a haystack, let us consider: how could any reading effect possibly occur? The brain has nothing like the needle of a phonograph player, something that restricts position focus to one particular spot. The brain has nothing like the read-write head of a computer hard drive, something that restricts position focus to one particular spot. It seems that there is no mechanism at all in the brain by which position focus could be achieved.

Position focus requires moving parts. For example, the pages of a book move, the eyes move as you read, a phonograph record spins, a movie projector moves the film continuously, and a read-write head moves about on a hard disk. But there is no macroscopic part of the brain that moves about when you retrieve a memory. Other than chemicals and electricity and blood, which are constantly flowing about in the brain, there is no movement that goes on in the brain when you retrieve a memory. It would seem, therefore, that there is no possible way in which a brain could achieve any type of position focus that would be necessary for it read from one particular spot to retrieve one and only one memory.

Answering the question “Are there any moving parts in the brain?” the “expert answer” site quora.com gives us two answers that both claim that there is lots of movement in the brain, but merely mention things like blood flow and neurotransmitter movement. There is, in fact, no type of movement at all in the brain when a memory is retrieved, other than the normal flow of fluid and chemicals that is constantly occurring in the brain. Other than fluid and chemicals in the brain, every single part of the brain stays exactly where it is. This should come as no surprise when we consider that there are no muscles at all in the brain. The brain is a static organ on everything except the microscopic level.

So on a macroscopic scale, there would seem to be no possible way in which a brain could ever achieve anything like the position focus that would be needed to read a memory from one particular spot. If we were to open up someone's skull, and ask him quiz questions, we would see no sign of anything moving in the brain to retrieve a memory from some particular spot. Could it be that there is some type of “chemical focus” or “electrical focus” that occurs in a particular spot of the brain when a memory is retrieved? Could it be that chemicals or electricity kind of “swarm” to some particular part of the brain to achieve some kind of memory retrieval effect? There is no evidence that this occurs. Nor can we imagine how any mere swarming of chemicals or electricity would cause something like a brain to be reading one and only one of countless thousands of memories stored in it.

I submit that the activity that we observe in the brain when someone retrieves a memory is 100% compatible with the claim that the brain does not at all retrieve memories stored inside it. When a human mind retrieves a memory, we see nothing special happening in the brain, no macroscopic sign of movement, and nothing at all that happens only when a memory is recalled. There is no “smoking gun” of memory retrieval that we can detect in the brain. Far more logical than the idea that memories are stored in brains is the idea that memory involves some non-physical faculty that is spiritual or psychic, some faculty that is far beyond our understanding. A host of difficulties arise when we scrutinize the idea that memories are stored and retrieved in brains, and all such difficulties can be avoided by believing that your memories are in your soul instead of your brain.

We have incredibly powerful electron microscopes that can see things as small as 50 picometers, which is about 1000 times smaller than 50 nanometers, the approximate size of a synapse. But our electron microscopes have revealed nothing at all to suggest that encoded memory information is stored in the brain. If such encoded memory information existed in the brain, it almost certainly would have been detected by now.

A 2010 book by two neuroscientists confesses that neuroscientists have no understanding of anything like a mechanism that could read stored memories. It states the following:

How could that encoded information be retrieved and transcribed from the enduring structure into the transient signals that carry that same information to the computational machinery that acts on the information?....In the voluminous contemporary literature on the neurobiology of memory, there is no discussion of these questions.

But some may argue that information could be read from any part of the brain, simply because neurons are all connected, allowing any neurons to be “electrically read.” I can imagine a conversation that illustrates the absurdity of such an idea.

John: I wrote some interesting stuff about my wife. Very private stuff.
Dave: Yeah, that was interesting. I read it myself.
John: What are you talking about? Did you break into my house?
Dave: No, not at all.
John: So you couldn't have read what I wrote. I didn't post it online. I only wrote it using an old computer I have, one that isn't even connected to the

Internet.
Dave: But I read it *electrically,* by using the electrical system.
John: What are you talking about?
Dave: It works like this. All computers connect to the same electrical grid. So when you plug in your computer to power it, that means I can reach out and read what you wrote, because we're all connected to the same electrical grid. So I can "reach out electrically" and read stuff from your computer.

Dave here is just pulling John's leg, and John should be able to realize that Dave is talking hogwash. Just because two machines are connected to the same electrical grid, that would not be enough for one machine to read from another machine. And similarly, just because all neurons are electrically connected, that's no reason why a brain should be able to instantly find and read information from just the right spot in a brain where some particular memory is stored. All known, verified cases of information reading from physical objects involve some kind of position focus mechanism, and there doesn't seem to be any such thing in the brain. This is another reason for thinking that when you remember, your brain is not reading a memory stored in the brain.

Let us imagine some religious cult which taught that 50,000 feet above us there floats a giant castle in the clouds populated by 500-year-old men who control the destiny of the world. Suppose we were to ask the members of such a cult, "How does the castle avoid falling to the ground?" or "How come these men don't die from the low air pressure at that altitude?" or "How can these men live for 500 years when the radiation at that altitude should give them cancer in a few decades?" or "How come none of our astronomers have detected this castle in the sky?" Such cult members would probably say something like, "Do not ask such impertinent questions." Similarly, suppose we were to ask a neuroscientist, "How can a brain find a memory instantly among thousands of stored memories?" or "How could a brain read a memory when it has no read mechanism?" or "How could memories be stored in synapses for decades when the proteins of such synapses are replaced every few weeks?" or "How could a brain encode memories when there are no genes for such a task?" or "How could a brain memory storage require protein synthesis, taking minutes, when you can instantly form a memory?" or "How could our electron microscopes have failed to detect positive signs of memories in the brain if they existed?" We would expect to get a reply that was essentially the equivalent of "Do not ask such impertinent questions."

Besides lacking any mechanism for reading memories, the brain lacks any mechanism for writing memories. Scientists have never specified any plausible mechanism by which a brain could write a memory as stored information. It is often claimed that an effect called LTP is some kind of memory writing mechanism, achieving memory storage through a gradual strengthening of synapses occurring over multiple repetitions of sensory experience. But such an idea is inconsistent with the fact that we can form a memory from a single sensory experience, as you demonstrate whenever you discuss with someone else a TV show or movie you saw only one time recently. LTP (which stands for long-term potentiation) is actually a short-lived effect. A scientific paper states the following:

LTP always decays and usually does so rapidly. Its rate of decay is measured in hours or days (for review, see Abraham 2003). Even with extended "training," a decay to baseline levels is observed within days to a week.

LTP is so weak an effect it is hard to even detect it. A scientific paper asks the following:

Why is it so difficult to see learning-associated synaptic changes?And does their absence in numerous experiments favor the null hypothesis?

Such things would not be true if LTP was actually a write mechanism for memories that can last for decades. Referring to this scientific paper, another paper suggests that "LTP as a memory mechanism" is more of a dogma than something well established by observations:

Shors and Matzel,,.concluded that LTP did not meet the criteria for providing a causal mechanism of memory. To make a long argument very short, they documented instances where changes in memory occur without LTP and where LTP occurs without changes in memory.....They report that between 1974 and 1997, more than 1300 articles occurred with "LTP" in the title. Of these, fewer than 80 described any behavioral manipulation relevant to assessing changes in memory. Furthermore, the articles that contained behavioral manipulations tended to provide evidence against the hypothesis that LTP is a memory mechanism. Thus, the claim that LTP is a molecular mechanism for learning and memory may be more of a dogma of neuroscientific memory research than a hypothesis that is being rigorously tested.

A 2014 book stated, "Although LTP is considered to be the primary model for how learning and memory storage occur at the synapse level, the evidence supporting this claim is still inconclusive and speculative." A 1995 scientific paper found. "There is a striking negative correlation of spatial learning ability with LTP." This is the exact opposite of what we should expect if LTP was some type of memory mechanism.

at August 11, 2018 No comments:

Labels: memory recall, memory storage

Wednesday, July 11, 2018

The Brain Shows No Sign of Working Harder During Thinking or Recall

There have been many studies of how a brain looks when particular activities such as thinking or recall occur. Such studies will typically attempt to find some region of the brain that shows greater activity when some mental activity occurs. No matter how slight the evidence is that some particular region is being activated more strongly, that evidence will be reported and reported as a "neural correlate" of some activity.

But rather than focusing on a question such as "which brain region showed the most difference" during some activity, we should look at some more basic and fundamental questions. They are:

1. Does the brain actually look different when it is being scanned while people are doing some mental activity requiring thought or memory recall?
2. Does the brain actually become more active while people are doing some mental activity requiring thought or memory recall?

If you were to ask the average person by how much brain activity increases during some activity such as problem solving or recall, he might guess 25 or 50 percent, based on all those visuals we have seen showing brain areas "lighting up" during certain activities. But as discussed here, such visuals are misleading, using a visual exaggeration technique that is essentially "lying with colors." The key term to get a precise handle of how much brain activity increases is the term "percent signal change." While the visual and auditory cortex regions of the brain (involved in sensory perception) may increase by much more than 1 percent, this technical document tells us that "cognitive effects give signal changes on the order of 1% (and larger in the visual and auditory cortices)." A similar generalization is made in this scientific discussion, where it says, based on previous results, that "most cognitive experiments should show maximal contrasts of about 1% (except in visual cortex)."

A PhD in neurophysiology states the following:

Those beautiful fMRI scans are misleading, however, because the stark differences they portray are, in fact, minuscule fluctuations that require complex statistical analysis in order to stand out in the pictures. To date, the consensus is that "thinking" has a very minor impact on overall brain metabolism.

You can get some exact graphs showing these signal changes by doing Google searches with phrases such as "neural correlates of thinking, percent signal change" or "neural correlates of recollection, percent signal change." Let's look at some examples, starting with recollection or memory retrieval.

- This brain scan study was entitled "Working Memory Retrieval: Contributions of the Left Prefrontal Cortex, the Left Posterior Parietal Cortex, and the Hippocampus." Figure 4 and Figure 5 of the study shows that none of the memory retrievals produced more than a .3 percent signal change, so they all involved signal changes of less than 1 part in 333.
- In this study, brain scans were done during recognition activities, looking for signs of increased brain activity in the hippocampus, a region of the brain often described as some center of brain memory involvement. But the percent signal change is never more than .2 percent, that is, never more than 1 part in 500.
- The paper here is entitled, "Functional-anatomic correlates of remembering and knowing." It shows a graph showing a percent signal change in the brain during memory retrieval that is no greater than .3 percent, less than 1 part in 300.
- The paper here is entitled "The neural correlates of specific versus general autobiographical memory construction and elaboration." It shows various graphs showing a percent signal change in the brain during memory retrieval that is no greater than .07 percent, less than 1 part in 1000.
- The paper here is entitled "Neural correlates of true memory, false memory, and deception." It shows various graphs showing a percent signal change during memory retrieval that is no greater than .4 percent, 1 part in 250.
- This paper did a review of 12 other brain scanning studies pertaining to the neural correlates of recollection. Figure 3 of the paper shows an average signal change for different parts of the brain of only about .4 percent, 1 part in 250.
- This paper was entitled "Neural correlates of emotional memories: a review of evidence from brain imaging studies." We learn from Figure 2 that none of the percent signal changes were greater than .4 percent, 1 part in 250.
- This study was entitled "Sex Differences in the Neural Correlates of Specific and General Autobiographical Memory." Figure 2 shows that none of the differences in brain activity (for men or women) involved a percent signal change of more than .3 percent or 1 part in 333.

Now let's look at brain scan studies showing brain activity during activities such as thinking, problem solving, and imagination.

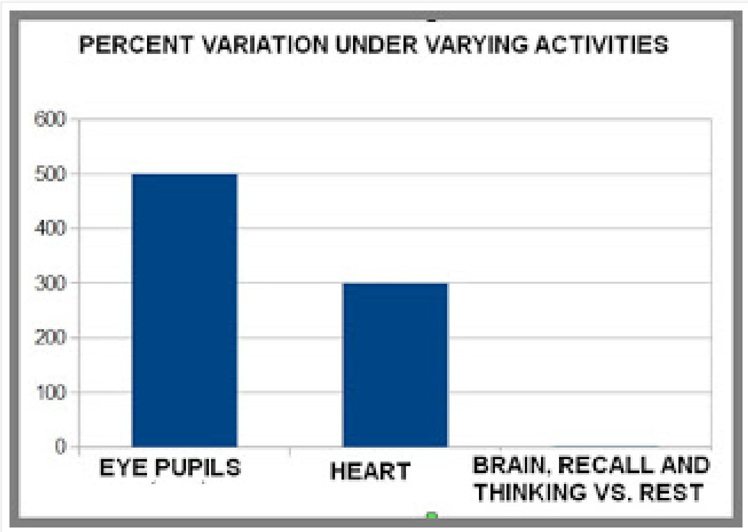
- This brain scanning study was entitled “Neural Correlates of Human Virtue Judgment.” Figure 3 shows that none of the regions showed a percent signal change of more than 1 percent, and almost all showed a percent signal change of only about .25 percent (1 part in 400).
- This brain scanning study examined the neural correlates of angry thinking. Table 4 shows that none of the regions studies showed a percent signal change of more than 1.31 percent.
- This brain scanning study was entitled “Neural Activity When People Solve Verbal Problems with Insight.” Figure 2 shows that none of the problem-solving activity produced a percent signal change in the brain of more than .3 percent or about 1 part in 333.
- This study is entitled “Aha!: The Neural Correlates of Verbal Insight Solutions.” Figure 1 shows that none of the brain regions studies had a positive percent signal change of more than .3 percent or about 1 part in 333. Interestingly, one of the brain regions studied had a negative percent signal change of .4 percent that was greater than any of the positive percent signal changes.
- This brain scanning paper is entitled “Neural Correlates of Evaluations of Lying and Truth-Telling in Different Social Contexts.” Figure 3 shows that none of this evaluation activity produced more than a .3 percent signal change in the brain, or about 1 part in 333.
- This brain scanning paper is entitled "In the Zone or Zoning Out? Tracking Behavioral and Neural Fluctuations During Sustained Attention." It tracked brain activity during a mental task requiring attention. The paper's figures show various signal changes in the brain, but none greater than .09 percent, less than 1 part in 1000.
- This brain scanning paper is entitled "Neuronal correlates of familiarity-driven decisions in artificial grammar learning." The paper's figures show various signal changes in the brain, but none greater than 1 percent.
- This brain scanning study is entitled, "Neural correlates of evidence accumulation in a perceptual decision task." The paper's figures show various signal changes in the brain, but none greater than .6 percent, less than 1 part in 150.
- This brain scanning study was entitled, “Neural correlates of the judgment of lying: A functional magnetic resonance imaging study.” We learn from Figure 3 that none of the judgment activity produced a percent signal change in the brain of more than .2 percent or 1 part in 500.

These studies can be summarized like this: during memory recall and thinking or problem solving, the brain does not look any different, and does not work any harder. The tiny differences that show up in these studies are so small they can be characterized as “no significant difference.” You certainly wouldn't claim that an employee was working harder on some day in which you detected that he merely expended a half of one percent more energy, by working two minutes longer on that day. And we shouldn't say the brain is working harder merely because it was detected that some part used only half of one percent more energy, only one part in 200.

As for whether the brain looks different during thinking or memory recall, based on the numbers in the studies above, it would seem that someone looking at a real-time fMRI scanner would be unable to detect a change in activity when someone was thinking or recalling something. Brain scan studies have the very bad habit of giving us “lying with color” visuals that may show some region of the brain highlighted in a bright color, when it merely displayed a difference of activity of about 1 part in 200. But the brain would not look that way if you looked at a real-time fMRI scan of the brain during thinking. Instead, all of the regions would look the same color (with the exception of visual and auditory cortex regions that would show a degree of activity corresponding to how much a person was seeing or hearing). So we can say based on the numbers above that the brain does not look different when you are thinking or recalling something.

A 1 percent difference cannot even be noticed by the human eye. If I show you two identical-looking photos of a woman, and ask you whether there is any difference, you would be very unlikely to say "yes" if there was merely a 1% difference (such as a width of 200 pixels in one photo and a width of 202 pixels in the second photo). So given the differences discussed above (all 1 percent or less, and most less than half of one percent), it is correct to say that brains do not look different when they are thinking or remembering.

The relatively tiny variation of the brain during different cognitive activities is shown by the graph below, which helps to put things in perspective. The graphed number for the brain (.5 percent) is just barely visible on the graph.



When you run, the heart gives a very clear sign that it is involved, and a young man running very fast may have his heart rate increase by 300%. The pupil of the eye gives a very clear sign that it is involved with vision, because the pupil of the human eye changes from a size of 1.5 millimeters to 8 millimeters depending on how much light is coming into the eye. That's a difference of more than 500%. But when you think or remember, the brain gives us no clear sign at all that the brain is the source of your thoughts or that memories are being stored or retrieved from the brain. The tiny variations that are seen in brain scans are no greater than we would expect to see from random variations in the brain's blood flow, if the brain did not produce thought and did not store memories. You could find the same level of variation if you were to do fMRI scans of the liver while someone was thinking or remembering.

Concerning glucose levels in the brain, an article in Scientific American tells us that a scientist "remains unconvinced that any one cognitive task measurably changes glucose levels in the brain or blood." According to a scientific paper, "Attempts to measure whole brain changes in blood flow and metabolism during intense mental activity have failed to demonstrate any change." Another paper states this: "Clarke and Sokoloff (1998) remarked that although '[a] common view equates concentrated mental effort with mental work...there appears to be no increased energy utilization by the brain during such processes' (p. 664)."

The reality that the brain does not work harder and does not look different during thinking or recollection may be shocking to those who have assumed that the brain is the source of thinking and the storage place of human memories. But to those who have studied the numerous reasons for rejecting such dogmas, this reality will not be surprising at all. To a person who has studied and considered the lack of any viable theory of permanent memory storage in the brain (discussed here), and the lack of any viable theory of how a brain could instantly retrieve memories (discussed here), and the lack of any theory explaining how a brain could store abstract thoughts as neuron states, it should not be surprising at all to learn that brains do not work harder or look different when you are thinking or recalling. The facts discussed here conflict with the dogmas that brains generate thoughts and store memories. If the brain did such things, we would expect brains to work harder during such activities.

We know for sure that there is a simple type of encoding that goes on in human cells: the encoding needed to implement the genetic code, so that nucleotide base pairs in DNA can be successfully translated into the corresponding amino acids that combinations of the base pairs represent. To accomplish this very simple encoding, the human genome has 620 genes for transfer RNA. But imagine if human brains were to actually encode human experiential and conceptual memories, so that such things were stored in brains. This would be a miracle of encoding many, many times more complicated than the simple encoding that the genetic code involves. Such an encoding would require thousands of dedicated genes in the human genome. But the human genome has been thoroughly mapped, and no such genes have been found. This is an extremely powerful reason for rejecting the dogma that brains store human experiential and conceptual memories.

A good rule to follow is a principle I call "Nobel's Razor." It is the principle that you should believe in scientific work that has won Nobel prizes, but often be skeptical of scientist claims that do not correspond to Nobel prize wins. No scientist has ever won a Nobel prize for any work involving memory, or any work backing up the claim that brains generate thoughts or store memories.

Postscript: If you do a Google search for "genes for memory encoding," you will see basically no sign that any such things have been discovered, other than one of those hyped-up press stories with an inaccurate headline of "100 Genes Linked to Memory Encoding." The story is referring to a scientific study described by this paper, entitled "Human Genomic Signatures of Brain Oscillations During Memory Encoding." The very dubious methodology of the authors was to get data on gene expression, and try to see how much it correlated with oscillations in brain waves. Out of more than 10,000 genes studied, the authors have found about 100 which they claim were correlated with these brain wave oscillations. They state, "We were successful in identifying over 100 correlated genes and the genes identified here are among the first genes to be linked to memory encoding in humans." But the correlations reported are weak, with most of these 100 genes correlating no more strongly than .1 or .2 (by comparison, a perfect correlation is 1.0, and a fairly strong correlation is .5). The results reported do not seem any stronger than you would expect to get by chance. We would expect that even if there was no causal relation between gene expression and brain waves, that if you compared gene expression in more than 10,000 genes to brain waves, you might find purely by chance a tiny fraction such as 1% of the genes that would look weakly correlated to brain waves (or any other random data, such as stock market ups and downs). In one of the spreadsheet tables you can download from the study, there is a function listed for each of these roughly 100 genes, and in each case it's a function other than memory encoding. So such genes cannot be any of the thousands of dedicated genes that would have to exist purely for the sake of translating complex conceptual, verbal, and episodic memories into neural states, and vice versa, if a brain stored memories. No such genes have been identified in the genome.

The paper confesses, "All gene expression data are derived from different individuals than the ones that participated in the iEEG study." This means the paper is an absurdity. It is looking for correlations between one set of gene expression data measured in one set of individuals and another set of brain wave data measured in an entirely different set of individuals at a different time. That makes no more sense than trying to look for a correlation between some meal consumption in a 2016 woman's softball team and tooth decay rates in a 2017 male football team.

Most brain scanning studies consist of only one scanning session per individual. A much more reliable approach is to brain scan such individuals on multiple days. In the post here I discuss a case in which 45 subjects had their brain scanned on two different days, in an attempt to find evidence of greater brain activation during two different thinking tasks. For both of these tasks, no evidence was found that reached a correlation level of "excellent," "good" or "fair."

at July 11, 2018 No comments:

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Head Truth

The huge case for thinking minds do not come from brains

Sunday, February 24, 2019

"Brains Store Memories" Dogma Versus the Reality of Noisy Brains

Neuroscientists typically maintain that human mental phenomena are entirely produced by the brain. But this claim is inconsistent with many low-level facts that neuroscientists have discovered. Remarkably, the facts and details that neuroscientists have learned on a low level frequently contradict the dogmatic high-level assertions neuroscientists make.

The table below summarizes this conflict.

High-level Neuroscientist Claims	**Low-Level Facts Discovered by Neuroscientists**
"Brains produce thinking"	Human cognitive ability and memory is not strongly damaged by hemispherectomy operations in which half of a brain is removed to treat epilepsy seizures.
	Most of Lorber's hydrocephalus patients with brains mostly consisting of watery fluid had above average intelligence, and a Frenchman was able to long hold a civil service job while almost all of his brain was gone.
	Brain scans do not show brains working significantly harder during either heavy thinking or recall, and no signal change greater than 1% occurs during such activities.
"When we do accurate mental calculations, it is our neurons that are doing the work"	Neurons are noisy, and synapses transmit signals with only a 50% likelihood or less– the type of thing that should prevent accurate mental arithmetic as savants can perform.
"Our memories are stored in our brains"	Neurons and synapses have been extensively examined at very high microscopic resolutions, and no sign of stored information or encoded information has been found in them other than the gene information in DNA.
	There is high protein turnover in the synapses that neuroscientists claim to be the storage place of memories,

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- Introduction to This Site
- Preservation of Mind and Memories After Removal of Half a Brain
- Why We Should Not Think the Human Brain Can Store Very Old Memories
- Why the Instantaneous Recall of Old Memories Should Be Impossible for a Brain
- Cases of High Mental Function Despite Large Brain Damage
- Reasons for Doubting a Brain Could Do the Super-Complex Encoding Needed to Neurally Store Episodic Memories or Concepts
- The Many Cases Showing a Person's Mind Can Operate When His Brain Has Shut Down
- Your Physical Structure Did Not Arise Bottom-Up, So Why Think Your Mind Did?
- The Brain Seems to Have No Mechanism for Reading or Writing Memories
- No One Understands How a Brain Could Generate Ideas
- 30 Reasons for Rejecting the Theory of Neural Memory Storage
- Groupthink and Peer Pressure Make It Taboo for Neuroscientists to Put Two and Two Together
- Synaptic Delays Mean Brain Signals Must Move at a Snail's Pace
- Brain Dogmas Versus Case Histories That Refute Them
- In Neuroscience Papers Bluffing Is More Common Than Candor
- Young Age of Languages Contradicts Claims of Neural Storage of Linguistic Information

	and the average lifetime of the proteins that make up synapses is only a few weeks – only a thousandth of the lifespan of very old memories in old people.
	There seems to be nothing in the human brain resembling the write mechanism like we see in storage systems such as computers.
“When we remember, we read data from our brains.”	There seems to be nothing in the human brain resembling the read mechanism like we see in storage systems such as computers.
	There is in the human brain no position coordinate system, no indexing, no neuron numbering system, nor anything else that would seem to make possible an instantaneous recall of information from some very precise location in a brain, in a manner similar to a retrieval of data from a particular page of a particular book
	Although we would expect information to be reliably transmitted across neurons during precise and accurate human recall, neurons are actually quite noisy, and transmit signals with only a low reliability.
	Synaptic density studies show that the the density of synapses in brains strongly drops between puberty and adulthood, at the very time when learned knowledge is piling up.

By following the links above, you can read detailed discussions of the claims I make in the right column – except for my claims about neurons being very noisy, which I will justify in this post.

When we talk about the noise in a communication system, we can imagine this as a kind of static that prevents the transmission from occurring without errors. A young reader may not even know what static is, since nowadays digital communication occurs with very little noise. But I experienced static frequently in my youth, back in the days long before the internet. One type of static would occur when I listened to the radio. When I tuned in to a radio station too far away, the radio signal would be mixed with a crackling noise or static that might prevent me from hearing particular words or musical notes in the transmission. In my youth there was also a problem with television noise or static. On top of a TV set there would be an antenna, and if it wasn't pointing just right, a TV signal might be rather noisy. The noise might be of a visual type, with random little blips appearing on the TV screen. Sometimes the static would be so bad you couldn't see much of anything on the TV you recognized.

The table below illustrates an example of noise in a signal transmission system.

Type of system	Input	Output
Low-noise system	“Toto, I've a feeling we're not in Kansas anymore.”	“Toto, I've a feeling we're not in Kansas anymore.”
High-noise system	“Toto, I've a feeling we're not in Kansas anymore.”	“Tojo, I've a f2@eling we're Xot in K3$sas anymore.”

A neuron acts as an electrical/chemical signal transmitter. A neuron will receive an electrical/chemical input, and transmit an electrical/chemical output. But a neuron does not act as efficiently and reliably as a cable TV wire or a computer cable that transmits signals with a very low error rate. Neuroscientists know that a large amount of noise occurs when neurons transmit signals. In other words, when a neuron receives a particular electrical/chemical input signal, there is a very significant amount of chance and variability involved in what type of electrical/chemical output will come out of the neuron. The wikipedia.org article on “neuronal noise” identifies many different types of noise that might degrade neuron performance: thermal noise, ionic conductance noise, ion pump noise, ion channel shot noise, synaptic release noise, synaptic bombardment, and connectivity noise.

In a very recent interview, an expert on neuron noise states the following:

There is, for example, unreliable synaptic transmission. This is something that an engineer would not normally build into a system. When one neuron is active, and a signal runs down the axon, that signal is not guaranteed to actually reach the next neuron. It makes it across the synapse with a probability like one half, or even less. This introduces a lot of noise into the system.

So according to this expert, synapses (the supposed storage place of human memories) transmit signals with a probability of less than 50 percent. Now that's very heavy noise – the kind of noise you would have if half of the characters in your text messages got scrambled by your cell phone carrier. A scientific paper tells us the same thing. It states, "Several recent studies have documented the unreliability of central nervous system synapses: typically, a postsynaptic response is produced less than half of the time when a presynaptic nerve impulse arrives at a synapse." Another scientific paper says, "In the cortex, individual synapses seem to be extremely unreliable: the probability of transmitter release in response to a single action potential can be as low as 0.1 or lower."

Another scientific paper tells us, “Neuronal variability (both in and across trials) can exhibit statistical characteristics (such as the mean and variance) that match those of random processes.” Another scientific paper tells us that “Neural activity in the mammalian brain is notoriously variable/noisy over time.” Another paper tells us, "We have confirmed that synaptic transmission at excitatory synapses is generally quite unreliable, with failure rates usually in excess of 0.5 [50%]." A paper tells us that there are two problems in synaptic transmission: (1) the low likelihood of a signal transmitting across a synapse, and (2) a randomness in the strength of the signal that is transmitted if such a signal transmission occurs. As the paper puts it (using more technical language than I just used):

The probability of vesicle release is known to be generally low (0.1 to 0.4) from in vitro studies in some vertebrate and invertebrate systems (Stevens, 1994). This unreliability is further compounded by the trial-to-trial variability in the amplitude of the post-synaptic response to a vesicular release.

The 2010 paper "The low synaptic release probability in vivo" by Borst is

About Me

Mark Mahin

www.markmahin.com

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devoted to the topic of what is the chance that a synapse will transmit a signal that it receives. It tells us, "A precise estimate of the *in vivo* release probability is diffult," but that "it can be expected to be closer to 0.1 than to the previous estimates of around 0.5."

Another paper concurs by also saying that there are two problems (unreliable synaptic transmission and a randomness in the signal strength when the transmission occurs):

On average most synapses respond to only less than half of the presynaptic spikes, and if they respond, the amplitude of the postsynaptic current varies. This high degree of unreliability has been puzzling as it impairs information transmission.

This is a problem for all claims that memories are retrieved from brains, because humans are known to be able to remember things very accurately, but "neural noise limits the fidelity of representations in the brain," as a scientific paper tells us.

Now, a neuroscientist might claim that such facts can still be reconciled with the mental performance of humans. He might argue like this:

Yes, neurons and synapses are pretty slow and noisy, but that's why human memory is slow and unreliable. Think of how it works when you suddenly see some old schoolmate that you haven't seen in twenty years. It may be a while before you remember their name. And when you remember something about that person, your memory will probably be not terribly accurate. So you have a kind of a slow "noisy" memory.

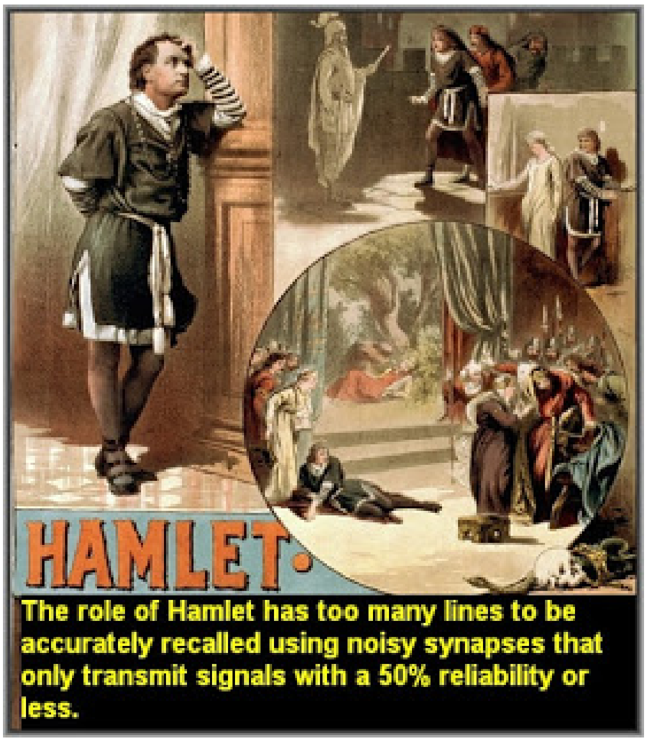
But it is easy to come up with examples of human memory performing without error in a noiseless manner. I just closed my eyes and recited the following lines without any error at a rate faster than you can read these lines aloud:

I am the very model of a modern Major-General
I've information vegetable, animal, and mineral
I know the kings of England, and I quote the fights historical
From Marathon to Waterloo, in order categorical

I'm very well acquainted, too, with matters mathematical
I understand equations, both the simple and quadratical
About binomial theorem I'm teeming with a lot o' news
With many cheerful facts about the square of the hypotenuse

But that's not very impressive, for there are singers who can flawlessly sing without any errors at a very rapid pace the entire delightful song "I Am the Very Model of a Modern Major General" from Gilbert and Sullivan's "The Pirates of Penzance," and the song is about eight times longer than what I have quoted. Also, in the world of opera there are singers who can flawlessly sing every note and every word of the part of Hans Sachs in Wagner's four-hour opera *Die Meistersinger von Nurnberg*, an opera in which Hans is on stage singing for a large fraction of those four-hours. There are other singers who can flawlessly sing the title role in the opera *Siegfried*, which requires the lead singer to sing on stage for most of its three hours. There are other singers who can flawlessly sing the role of Tristan, which also requires a similar demand. In such cases we have a very rapid and flawless error-free retrieval of an amount of information that would take many, many pages to write down.

A rock singer at a funky free-wheeling concert might get away with an error rate of 2% in his memory recall of words, but opera fans are very intolerant of errors. When Wagner fans (who have typically heard an opera many times on recordings) go to something like the Bayreuth festival, they expect singers to recall Wagner's notes and words with 100% fidelity, and that is what they usually get, even when hearing roles such as Tristan and Siegfried which require a singer to memorize hours of singing. Every time an actor performs *Hamlet*, he recites 1480 lines of dialog, and many such actors recall all such lines without any errors.



Then there is Leslie Lemke, who according to this article in wikipedia.org "can remember and play back a musical piece of any length flawlessly after hearing it once." It is well documented that there are quite a few Muslims who can recite the entire holy book of their religion, a book of some 80,000 words. Then there are people who flawlessly remember content that is hard to remember. According to the site of the Guiness Book of World Records, Rajveer Meena memorized pi to 70,000 digits, reciting those 70,000 digits without any errors. Lu Chao memorized pi to 67,000 digits. A 1917 scientific paper stated that one or more people had accurately "memorized the exact layout of words in more than 5,000 pages of the 12 books of the standard edition of the Babylonian Talmud."

How could such feats occur if memory retrieval is being performed by neurons and synapses that are very noisy? They cannot be. In these cases, human memory is acting at a reliability vastly surpassing what should be possible if memory retrieval or thought is a neural phenomenon. A scientific paper states, "Neural noise limits the fidelity of representations in the brain." But humans such as those I have mentioned seem to be able to recall huge amounts of learned text or song without any such problem of a degradation of "fidelity of representations."

A similar conclusion is forced on us when we consider the accuracy of the most impressive human calculators. In 2004 Alexis Lemaire was able to calculate in his head the 13th root of this number:

85,877,066,894,718,045, 602,549,144,850,158,599,202,771,247,748,960,878,023,151, 390,314,284,284,465,842,798,373,290,242,826,571,823,153, 045,030,300,932,591,615,405,929,429,773,640,895,967,991,430,381,763,526,613,357,308,674,592,650,724,521,841,103,664,923,661,204,223

In only 77 seconds, according to the BBC, Lemaire was able to state that it is the number 2396232838850303 which when multiplied by itself 13 times

- memory recall
- memory storage
- morphogenesis
- natural selection
- near death experiences
- neural noise
- non-local consciousness
- nonneuralism
- optogenetics
- panpsychism
- precognition
- prefrontal cortex
- remote viewing
- savants
- scientist misconduct
- source of thoughts
- split-brain operation
- synapse theory of memory
- top-down theory of mind
- visual recognition

equals the number above. Here we have calculation accuracy far beyond anything that could be possible if noisy neurons are the source of human thought.

Given the high amount of noise in neurons and synapses, which would strongly degrade the accuracy of neural memory retrieval and neural signal transmission, the facts of very accurate human calculation and very accurate human memory recall (as shown by calculation savants, Hamlet actors, and Wagnerian opera singers) are very much in conflict with the dogmas that our thinking is performed by our brains and our memories are stored in and retrieved by our brains. This is yet another case in which the low-level facts of neuroscience defy the dogmatic claims of neuroscientists.

Think for a moment about the implications if a synapse can only transmit a signal with about a 50% reliability, as indicated by the previously quoted expert on neuron noise. This does not at all mean that people would recall things with about 50% accuracy if memories are stored in brains; it's much worse than that. Since any act of neural memory retrieval would involve innumerable different signal transmissions through innumerable neurons, we would expect the actual accuracy to be only some tiny fraction of 50% if we were using synapses to retrieve our learned knowledge. Similarly, if you play the game "Chinese whispers" (also called "gossip") at a school lunch table, and have everyone at the table be playing noisy music in earphones as they hear the gossip story being whispered among the players, the tenth person to receive the story will be unlikely to receive even 20 percent of it accurately.

Let us imagine a planet in which the sky was perpetually covered in very thick clouds, so that no one had seen the stars or the local sun. On such a planet there would be a great mystery: from where comes the heat that keeps life on the planet warm? If you were a rather clumsy thinker on such a planet, you might come up with some cheesy theory to explain the heat on your planet, and dogmatically cling to it -- maybe the theory that rocks on your planet warm the planet through radioactivity, or that heat shoots up from the hot core of the planet. But if you were a better thinker, you would say, "There is nothing anyone has observed that can explain this planet's heat -- it must come from some mysterious unseen reality." It is something similar that we should say about our mental capabilities: that nothing we have observed can explain them, and that they must come mainly from some mysterious unseen reality.

Postscript: It is sometimes suggested that by transmission redundancy we can escape the consequences of unreliable and noisy synaptic transmission (in which signals may travel across a synapse only 50% of the time or as little as 10% of the time). But this paper makes clear that in the cortex of the brain there is little such redundancy. It states the following:

In the cortex, individual synapses seem to be extremely unreliable: the probability of transmitter release in response to a single action potential can be as low as 0.1 or lower . In other words, as many as nine out of ten presynaptic stimuli fail to trigger transmitter release. The critical difference between these cortical connections and those at the neuromuscular junction is that, in the cortex, the synaptic connection between a pair of cells is often made up of only a few release sites, sometimes only one [6], [7]. In the cortex, then, the postsynaptic response to a single presynaptic action potential is highly variable, because it is the average over a small and unreliable population....In the periphery [of the brain], reliability is achieved by averaging over many release sites. In the cortex, rich interconnectivity within a restricted volume limits the possible number of such redundant connections.

at February 24, 2019 No comments:

Labels: memory recall, neural noise

Memories Can Form Many Times Faster Than the Speed of Synapse Strengthening

The main theory of a brain storage of memories is that people acquire new memories through a strengthening of synapses. There are many reasons for doubting this claim. One is that information is generally stored through a writing process, not a strengthening process. It seems that there has never been a verified case of any information being stored through a process of strengthening.

If it were true that memories were stored by a strengthening of synapses, this would be a slow process. The only way in which a synapse can be strengthened is if proteins are added to it. We know that the synthesis of new proteins is a rather slow effect, requiring minutes of time. In addition, there would have to be some very complicated encoding going on if a memory was to be stored in synapses. The reality of newly-learned knowledge and new experience would somehow have to be encoded or translated into some brain state that would store this information. When we add up the time needed for this protein synthesis and the time needed for this encoding, we find that the theory of memory storage in brain synapses predicts that the acquisition of new memories should be a very slow affair, which can occur at only a tiny bandwidth, a speed which is like a mere trickle. But experiments show that we can actually acquire new memories at a speed more than 1000 times greater than such a tiny trickle.

One such experiment is the experiment described in the scientific paper "Visual long-term memory has a massive storage capacity for object details." The experimenters showed some subjects 2500 images over the course of five and a half hours, and the subjects viewed each image for only three seconds. Then the subjects were tested in the following way described by the paper:

Afterward, they were shown pairs of images and indicated which of the two they had seen. The previously viewed item could be paired with either an object from a novel category, an object of the same basic-level category, or the same object in a different state or pose. Performance in each of these conditions was remarkably high (92%, 88%, and 87%, respectively), suggesting that participants successfully maintained detailed representations of thousands of images.

In this experiment, pairs like those shown below were used. A subject might be presented for 3 seconds with one of the two images in the pair, and then hours later be shown both images in the pair, and be asked which of the two was the one he saw.

Although the authors probably did not intend for their experiment to be any such thing, their experiment is a great experiment to disprove the prevailing dogma about memory storage in the brain. Let us imagine that memories were being stored in the brain by a process of synapse strengthening. Each time a memory was stored, it would involve the synthesis of new proteins (requiring minutes), and also the additional time (presumably requiring additional minutes) for an encoding effect in which knowledge or experienced was translated into neural states. If the brain stored memories in such a way, it could not possibly keep up with remembering images that appeared for only three seconds each in a long series. It would be a state of affairs like that depicted in what many regard as the funniest scene that appeared in the "I Love Lucy" TV series, the scene in which Lucy and her friend Ethel were working on a confection assembly line. In that scene Lucy and Ethel were supposed to wrap chocolates that were moving along a conveyor belt. But while the chocolates moved slowly at first, the conveyor belt kept speeding up faster and faster, totally exceeding Lucy and Ethel's ability to wrap the chocolates (with ensuing hilarious results).

The experiment described above in effect creates a kind of fast moving conveyor belt in which images fly by at a speed so fast that it should totally defeat a person's ability to memorize accurately – if our memories were actually being created through the slow process imagined by scientists, in which each memory requires a protein synthesis requiring minutes, and an additional time (probably additional minutes) needed for encoding. But nonetheless the subjects did extraordinarily well in this test.

There is only one conclusion we can draw from such an experiment. It is that the bandwidth of human memory acquisition is vastly greatly than anything that can be accounted for by neural theories of memory storage. We do not remember at the speed of synapse strengthening, which is a snail's speed similar to the speed of arm muscle strengthening. We instead are able to form new memories in a manner that is basically instantaneous. The authors of the scientific paper state that their results "pose a challenge to neural models of memory storage and retrieval." That is an understatement, for we could say that their results are shockingly inconsistent with prevailing dogmas about how memories are stored.

There are some people who are able to acquire new memories at an astonishing rate. The autistic savant Kim Peek was able to recall everything he had read in the more than 7000 books he had read. Here we had a case in which memorization occurred at the speed of reading. Stephen Wiltshire is an autistic savant who has produced incredibly detailed and accurate artistic works depicting cities that he has seen only from a brief helicopter ride or boat ride. Of Wiltshire, savant expert Darold Treffert says, "His extraordinary memory is illustrated in a documentary film clip, when, after a 12-minute helicopter ride over London, he completes, in 3 hours, an impeccably accurate sketch that encompasses 4 square miles, 12 major landmarks and 200 other buildings all drawn to scale and perspective." Again, we have a case in which memories seem to be formed at an incredibly fast rate. Savant Daniel Tammet (who one time publicly recited accurately the value of pi to 22,514 digits) was able to learn the Icelandic language in only 7 days. Derek Paravicini is a blind and brain-damaged autistic savant who has the incredible ability to replay any piece of music he has heard for the first time. In 2007 the Guardian reported the following:

Derek is 27, blind, has severe learning difficulties, cannot dress or feed himself - but play him a song once, and he will not only memorize it instantly, but be able to reproduce it exactly on the piano. One part of his brain is wrecked; another has a capacity most of us can only dream of.

Other savants such as Leslie Lemke and Ellen Boudreaux have the same extraordinary ability to replay perfectly a song heard for the first time.

Cases such as these are inconsistent with prevailing theories of memory. Are we to believe that such people (typically with substantial brain damage) can somehow synthesize proteins in their brains ten times or thirty times faster than the average human, so that their synapses can get bulked up ten times or thirty times faster? That's hardly credible. But if memories are not actually stored in brains, but stored in or added to a human psychic or spiritual facility, something like a soul, then there would be no reason why the brain-damaged might not have astonishing powers of memorization.

Some people can form memories 1000 times faster than should be possible under prevailing theories of brain memory storage, which involve postulating protein synthesis and encoding operations that should take minutes. This thousand-fold shortfall in only one of three thousand-fold shortfalls of the prevailing theory of brain memory storage. The two other shortfalls are: (1) humans can remember things for 50 years or more, which is 1000 times longer than the synaptic theory of memory storage can account for (synapses having average protein lifetimes of only a few weeks); (2) humans can recall things 1000 times faster than should be possible if you stored something in some exact location of the brain. If you stored a memory in your brain (an organ with no numbering system or coordinate system), it would be like throwing a needle onto a mountain-sized heap of needles, in the sense that finding that exact needle at some later point should take a very long time.

The imaginary conversation below illustrates some of the many ways in which prevailing dogma about brain memory storage fails. It's the kind of conversation that might occur if memories were formed according to the "brain storage of memory" dogmas that currently prevail among neuroscientists.

Costello: Alright, guy, I'm now going to teach you an important geographical fact: which city is the capital city of Spain.
Abbott: Go ahead, I'm all ears.
Costello: Okay, here it is. The capital city of Spain is Madrid.
Abbott: Okay, I'll try to remember that.
Costello: So what is the capital city of Spain?
Abbott: I haven't formed the memory of that yet. It takes time. I'm still synthesizing the proteins I need to strength my synapses, so I can remember that.
Costello: So try hard. Remember, Madrid is the capital city of Spain.
Abbott: I'm working on forming the memory.
Costello: So do you remember by now what the capital city of Spain is?
Abbott: Don't ask me too soon. It takes minutes to synthesize those proteins.

After five additional minutes like this, the conversation continues.

Costello: Okay, so it's been five minutes since I first told you what the capital city of Spain is. You should have had enough time to have formed your memory of this fact.
Abbott: I'm sure by now I have formed that memory, because there has been enough time for protein synthesis in my synapses.
Costello: So what is the capital city of Spain?
Abbott: I can't recall.
Costello: But you formed the memory by now. Why can't you recall it?
Abbott: The problem is that I don't know exactly *where* in my brain the memory was stored. So I can't just instantly recall the memory. The memory is like a tiny needle in a haystack. There's no way I can find that quickly.

Costello: Can't you just search through all the memories in your brain, looking for this one?
Abbott: I could try, but it would take hours or days to search through all those memories.
Costello: Sheesh, this is driving me crazy. How about this? I can teach you that Madrid is the capital city of Spain, and when you form the memory, you can tell me the exact tiny spot where your memory was formed. So maybe you'll tell me, “Okay I stored that memory at brain neuron number 273,835,235.” Then I'll just say to you something like, “Please look in your brain at neuron number 273,835,235, and retrieve the memory you stored of what is the capital city of Spain.”
Abbott: That's a brilliant idea!
Costello: Thanks.
Abbott: On second thought, it will never work.
Costello: Why not?
Abbott: Neurons aren't numbered, and the brain has no coordinate system. It's like some vast city in which none of the streets are named, and none of the houses have house numbers. So if I put a memory in one little “house” in the huge brain city, I'll never be able to tell you the exact address of that house.
Costello: So how the hell am I supposed to teach you anything?
Abbott: Beats me. And if I ever learn anything new, I'm sure I won't remember it for more than a few weeks. That's because there's a big problem with those proteins that I will synthesize to store those new memories. They have average lifetimes of only a few weeks.

As long as they cling to “brain storage of memory” dogmas, our neuroscientists will never be able to overcome difficulties such as those mentioned in this conversation.

Postscript: I did an experiment with results similar to the experiment mentioned above. I used the card game "Stare!" which includes a deck of cards, each containing a unique picture. A subject was given several minutes to study 40 picture cards, having no more than 5 seconds to study each card. Two hours later, the subject was shown 80 picture cards, 40 of which were the ones previously examined, and 40 of which were similar-looking picture cards the subject had never seen. These 80 picture cards had been thoroughly shuffled. The subject was asked to answer "yes" or "no" as to whether the card had previously been seen. Making "yes" answers about 50% of the time, the subject correctly identified 38 out of 40 of the cards that the subject had previously seen.

at January 07, 2019 No comments:

Labels: memory storage, savants, synapse theory of memory

Thursday, December 20, 2018

The Lack of a Viable Theory of Neural Memory Encoding

If we are to believe in the claim that brains store human memories, we must have a credible account of four things: encoding, neural storage of very old memories, the instantaneous formation of memories, and the instantaneous retrieval of memories. The theory that human memories are stored in the brain fails in regard to each of these things.

There exists no plausible theory as to how a brain could store memories lasting for 50 years, but we know humans can remember many things for that long. The most popular idea of brain memory storage claims that memories are stored in synapses, but the proteins in synapses have an average lifetime of less than two weeks, meaning such a theory falls short by a factor of 1000 when it comes to explaining memories that persist for 50 years. As for memory retrieval, there is no theory explaining how humans could possibly recall instantly things they learned many years ago, and haven't thought about in years. You may hear the name of some obscure historical or cultural figure you learned about decades ago, and haven't heard about or thought about since that time. You may then instantly recall something about that person. But if that memory was stored somewhere in your brain, how could you instantly find the exact little location where that memory was? Doing that (for example, instantly finding a memory in storage spot 834,220 out of 1,200,000) would be like instantly finding a needle in a mountain-sized haystack. If a brain had an indexing system, or a coordinate system, or a neuron numbering system, there might be a faint hope for explaining instantaneous memory retrieval; but the brain has no such things. As for the instantaneous formation of memories, there is no theory that can account for it in a brain. The prevailing theory that memories are stored by synapse strengthening (which would involve protein synthesis requiring minutes) fails to account for memories that humans can form instantly.

When we consider the issue of memory encoding, we find a difficulty as great as the difficulties just discussed. Encoding is supposedly some translation that occurs so that a memory can be physically stored in a brain, so that it might last for years. The problem is that human memories include incredibly diverse types of things, and we have no idea how most of these things could be stored as neural states. Consider only a few of the types of things that can be stored in a human memory:

- Memories of daily experiences, such as what you were doing on some day
- Facts you learned in school, such as the fact that Lincoln was shot at Ford's Theater
- Sequences of numbers such as your social security number
- Sequences of words, such as the dialog an actor has to recite in a play
- Sequences of musical notes, such as the notes an opera singer has to sing
- Abstract concepts that you have learned
- Memories of particular non-visual sensations such as sounds, food tastes, smells, pain, and physical pleasure
- Memories of how to do physical things, such as how to ride a bicycle
- Memories of how you felt at emotional moments of your life
- Rules and principles, such as “look both ways before crossing the street”
- Memories of visual information, such as what a particular person's face looks like

How could all of these very different types of information ever be translated into neural states so that a brain could store them?

Our neuroscientists have told us again and again that the brain does such an encoding, but there is no real evidence that any such thing takes place. What we have evidence for is merely evidence that humans remember things. If you are someone who believes that memories are physically stored in brains, then you may claim that memory encoding occurred at such and such a rate whenever you observe people learning something at such and such a rate. But merely observing evidence of learning or memory is not acquiring any actual evidence that encoding has occurred. There remains the possibility that our memories are not stored as neural states, the possibility that our repository of memory is some spiritual or psychic facility that is non-neural and non-biological.

Such a possibility should not seem remote when we consider that there is no workable theory as to how learned knowledge and experiences could be encoded so that they might be stored in a brain. No matter what theory we may create to account for the encoding of learned knowledge and episodic experience so that they can be stored in a brain, such a theory will always end up sounding ridiculous after we examine the theory in detail and consider its requirements and shortcomings. Let's look at some possibilities, and why they fail.

Theory #1: Direct writing of words and images

First, let's consider the simplest theory of encoding we can imagine – that a memory is stored in the brain so that it appears in a neural form pretty much as we see it in our minds. Under this theory, when you memorized some series of words, this would cause a sequence of microscopic little letters to become stored in your brain; and when you experienced some visual experience, this would get stored as some tiny little image in your brain. So, for example, under this theory, if someone memorized the sentence, "There may be green aliens in the center of the galaxy," then after the person died, some scientist might examine that person's brain with an electron microscope, and actually find some tiny little words in some neurons, words that directly spelled out, "There may be green aliens in the center of the galaxy." And under this theory, if someone was given a picture of a toy purple pony, and asked to memorize it, then after the person died, a scientist might be able to examine the person's brain under an electron microscope, and the scientist might say, "Aha, I see in his neurons a tiny little image of a toy purple pony."

This theory may immediately provoke giggles, and it is rather easy to think of some reasons why it does not work. They are these:

1. If memory worked in such a way, we would surely have already discovered such easily-recognizable memory traces. But no such things have been seen, even though a great deal of human neural tissue has been examined at very high magnification. When we look at brain tissue at the highest magnification, we see no tiny little letters or tiny little images of animals, cars, and persons.
2. For a brain to be able to write words that we memorized in this type of direct manner, it would seem that the brain would need some very precise write mechanism, capable of forming the exact characters of the alphabet in brain tissue; but no such brain capability is known to exist.
3. It seems that if such a theory were true, recalling some words would be like reading. But recalling words is almost never like reading, and we don't see in our mind's eye some stream of letters as we recall some words we memorized.
4. For a brain to be able to read words that we memorized in this type of direct manner, it would seem that the brain would need some very precise reading mechanism, capable of reading the exact characters of the alphabet stored in very tiny letters written in brain tissue; but no such thing is known to exist. We don't have tiny little "micro-eyes" in our brains that might allow us to read tiny microscopic letters stored in our brains.

Theory #2: Brain storage of words and images using some unknown non-binary coding or translation protocol

Now, let's consider a different theory of memory encoding – the idea that instead of directly storing words and images (so that we could directly read the words and directly see the images), the brain uses some type of unknown coding or translation protocols. For example, it could conceivably be that words that we learn are somehow translated into proteins or chemicals or electrical states, using some as-of-yet undiscovered translation scheme.

For example, such a scheme might work a little like this:

Item	**How the item might be represented**
Letter "A"	Some particular neural arrangement of atoms, chemicals or electricity
Letter "B"	Some other neural arrangement of atoms, chemicals or electricity
Letter "C"	Some other neural arrangement of atoms, chemicals or electricity

Such a scheme might work a little like the Morse code, in which particular letters are translated into some sequence of dots, dashes, or dots and dashes. Some particular arrangement of atoms, chemicals or electricity might work like a dot in the Morse code, and some other particular arrangement of atoms, chemicals or electricity might work like a dash in the Morse code.

Or there could be some higher-level translation system based on particular words rather than letters. For example, we can imagine something like this:

Item	**How the item might be represented**
Word "sun"	Some particular neural arrangement of atoms, chemicals, proteins or electricity
Word "man"	Some other neural arrangement of atoms, chemicals, proteins or electricity
Word "move"	Some other neural arrangement of atoms, proteins chemicals or electricity

There is one giant problem with such a theory. All of the languages that we use are fairly recent innovations, having been created in only the last few percent of the time that humans have existed. For example, back in the Roman Empire people used Latin, but the English we use today has only been in use for less than 1200 years. The alphabet used for English is less than 1000 years old, and its alphabetic predecessor (the Latin alphabet) is only a few thousand years old. It is generally acknowledged even by Darwinism enthusiasts that very complex evolutionary innovations cannot arise in only a few centuries of time or a few thousand years. So we could never explain how the brain could naturally possess some elaborate translation system based on such a relatively recent innovation as the English language and the English alphabet.

Scientists strain our credulity whenever they talk about novel functional genes accidentally appearing even over the course of a million years. Think, then, on how much greater a problem there would be in explaining how hundreds of novel functional genes could have appeared in less than 3000 years, to perform some translation operation involving characters and words that have existed for less than 3000 years. To assume such a thing would be to assume evolution working thousands of times faster than the rate we would predict from known mutation rates.

There is also no evidence that any such great burst of genetic novelty has occurred. Although the half-life of DNA is 512 years, we have enough samples of human DNA from ancient Rome and ancient Egypt to know that there has been no big change in the DNA of humans during the past 3000 years. So it seems impossible that there could be any genetic capability (arising in the past few thousand years) that would allow humans to neurally store information using some encoding mechanism specifically tailored to the letters and words of the English language that have existed for less than 3000 years.

Another difficulty with the theory of encoding just mentioned is that if it existed, we would see big differences in the genes of people who spoke different languages. According to such a theory, we would expect that Chinese people would have one group of genes corresponding to proteins or RNA molecules needed to translate Chinese words into neural states, and that English speaking people would have some other quite different set of genes corresponding to proteins or RNA molecules needed to translate English words into neural states (particularly since the Chinese language and alphabet is so different from the English language and alphabet). But there exists no such difference in the genes of Chinese speaking people and English speaking people.

There is also the difficulty, discussed more fully in the conclusion of this post, that there is no sign in the human genome that any such genes exist for performing such an elaborate operation of encoding human learned knowledge and episodic experience so that it can be stored in neurons or synapses (and there would need to be many hundreds or thousands of genes dedicated to performing such a task if it was done).

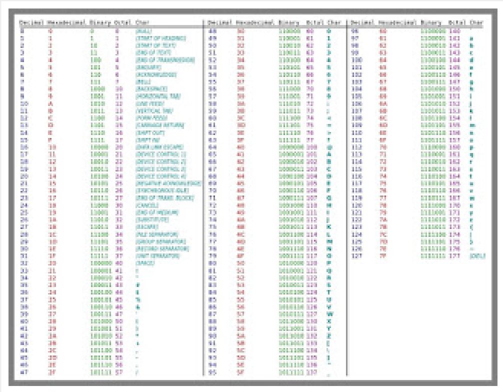
Theory #3: Binary writing of words and images

Now, let's consider a theory of memory encoding that perhaps the words we memorize and the images we remember are stored in binary format. We know that computers store information in binary format, so when it is suggested that the brain may use a similar format, this may sound reasonable to the average person (although it isn't, a brain being radically different from an electronic computer).

This possibility actually has all of the difficulties of the previous possibility. What goes on when your computer stores words in binary format is the following:

1. First individual letters in the words are converted into decimal numbers (such as 13, 19, and 23) using a particular translation table called the ASCII code.
2. Then, those numbers are converted from decimal to binary using a decimal-to-binary conversion routine.

So if we are to believe that the brain does binary encoding like a computer, we would need to believe that built into the brain on a low level is some type of translation scheme like the one below, a scheme in which letters are translated into decimal numbers.



ASCII table used by a computer to store encoded information

In addition, we would also have to believe that the brain has some kind of capability to translate the numbers in such a system into binary numbers. Alternately, we could believe that the brain has a scheme for directly translating characters into binary, but the overall complexity of such a translation mechanism would be every bit as great as a system in which characters are converted into decimal, and then into binary.

We have the following difficulties involved with such an idea:

1. If memory worked in such a way, we would surely have already discovered such easily-recognizable memory traces. We would have discovered tiny little traces in the brain that resemble binary coding. But no such things have been seen, even though a great deal of neural tissue has been examined at very high magnification.
2. For a brain to be able to write words that were memorized in this type of direct manner, it would seem that the brain would need some very precise write mechanism, capable of writing binary traces; but no such thing is known to exist.
3. For a brain to be able to read words that we memorized in this type of direct manner, it would seem that the brain would need some very precise reading mechanism, capable of reading in binary; but no such thing is known to exist.
4. Since the alphabets of human languages are only a few thousand years old, there would have been no time for the human body to have evolved some complex biological mechanism capable of converting specific alphabetic characters to binary.
5. We can imagine no way in which a brain could achieve the translation effect in which words are translated into binary. As far as we know, there is nothing anything like an ASCII table in your brain, nor is there anything like a facility for translating English letters directly into binary, nor is there anything like a facility for translating English letters into decimal, and then translating decimal numbers into binary. There are no genes in the genome that perform such tasks.

Theory #4: Storage of sensations occurring when something is learned or experienced

Now, let's consider a whole different theory. It could be that instead of storing words that you memorized, a brain might store the sensations that occurred when you memorized something. So imagine I open up a copy of Vogue magazine, and read an ad saying, “You'll feel fresher than the morning dew.” If I memorize that slogan, it might be that my brain is storing the electrical or chemical activity in my brain when I saw that slogan. And if I hear on the radio some advertising slogan of “We'll build your wealth sky-high,” and memorize that, it could be that my brain is storing something corresponding to the electrical and chemical activity in my brain when I heard such a slogan.

One reason for doubting this theory of memory encoding is that perceptions involve large parts of the brain, and it is hard to imagine that sensations involving large fractions of the brain could be stored in a tiny part of the brain. Since our minds store many thousands or millions of visual memories, if we are to believe that memories are stored in brains, we would have to believe that each stored memory uses only a tiny portion of the brain. But my current visual sensations require the involvement of a large fraction of the occipital lobes of the brain – probably many cubic centimeters. But we cannot plausibly imagine that the brain simply dumps the chemical or electrical contents of those cubic centimeters into some memory that took up only a tiny space on my brain, a millionth or less. It would seem, therefore, that if the brain simply dumped your visual and auditory sensations into memory, that it would require a space vastly bigger than itself to store all the memories we have of things we have seen and heard.

Another difficulty in the "memories are sensation dumps" idea is that there is no evidence of any mechanism for copying information from one part of the brain to another. Let's imagine that when a memory forms, the state of your occipital lobes (involved in vision) is copied to some point on the cortex where the memory is stored. That would require some biological functionality for copying the state of one large part of the brain to another part of the brain; but we know of no such functionality.

It is easy to think of another big reason for doubting such a theory. It is that if our brains were to be storing something corresponding to sensations, we would expect that when we remembered words, we would remember something visual, with a characteristic font or color, or something auditory, with a characteristic sound. But while that sometimes happens, in almost all cases it does not work that way.

For example, if I remember the words, "Here's looking at you, kid," I do remember a very specific audio sound, the distinctive sound of Humphrey Bogart saying that in the movie *Casablanca*. And if I remember the phrase "Men walk on moon," I do remember a specific font, the font used in the famous New York Times headline of the Apollo 11 lunar mission. But a very large fraction of my memories do not have specific visual or audio characteristics. For example, if someone asks, "What is the lightest particle in an atom?" I may reply, "The electron is the lightest particle in the atom." But that memory I have recalled does not have any specific sound or sight associated with it. I don't hear the answer in someone's voice, and I do not see the answer as words in any particular font or color. And if someone asks me, "What is your birthday?" I will remember a particular day. But I will not see in my mind's eye some date written in a particular font and having some particular color, nor will I hear in my mind's ear some particular type of voice stating the answer.

For almost all of my knowledge memories, the same thing is true: when I recall the memory, I don't see something that appears with some particular visual appearance, nor do I hear something that has some particular sound. It seems this would not be the case if the brain was storing my memories by storing visual and auditory sensations.

It is also true that I can memorize something that does not correspond to any particular visual or auditory sensation I had. For example, I can visualize some imaginary thing such as a giant purple elephant. If I think about this imaginary thing enough times, it will become a permanent memory. But this imaginary thing I have memorized does not correspond to any sensation I had. In this case I never saw a giant purple elephant. So it cannot be that my memory of the giant purple elephant was formed from sensations that I had of such a thing. Similarly, a fiction writer can dream up on Tuesday an idea for a short story, and then write that short story on Wednesday, using the memory he formed on Tuesday. But the memory will not correspond to any visual or auditory sensations he had.

It seems that we therefore cannot explain memories as merely being a storage of sensations that we had at some time when we learned something. You learned many thousands of things in school, but when you remember such knowledge, you virtually never remember the sight and sound of your school teacher teaching you such things or the sight of you reading a book telling you such things (as you would if your memory of learned knowledge was just a dump of the sensations you had when you learned such things).

Conclusion

I have reviewed some of the theories that could be used to account for the encoding of learned information as neural states. There are strong reasons for rejecting each such theory. It seems it is impossible to present a specific theory of memory encoding that stands up to scrutiny as a reasonable possibility.

How is it that neuroscientists sidestep this difficulty? They simply avoid presenting specific theories of how a brain could translate learned information into neural states. An example is the wikipedia.org article on "Memory (encoding)." The article tells us, "Encoding allows the perceived item of use or interest to be converted into a construct that can be stored within the brain and recalled later from short-term or long-term memory."
But the article fails to discuss any specific theory discussing how such a conversion would work. The article has all kinds of digressions and tangential information, but nowhere does it advance a single specific idea of how learned information (such as a learned sequence of words) could be translated into neural states when a memory was stored in a brain. An article on a memory experiment states, "Press a scientist to tell you how memories are encoded and decoded in the brain, and you'll soon find that the scientific community doesn't have an answer." In his book *Crimes of Reason: On Mind, Nature, and the Paranormal*, philosopher Stephen Braude says on page 19 that neuroscience "never addresses the fundamental issues of how any physical modification can represent or stand for what is remembered."

A speculative neuroscience paper confesses that "codifying memories is one of the fundamental problems of modern Neuroscience," but that "the functional mechanisms behind this phenomenon remain largely unknown." It would have been more accurate to have stated "entirely unknown." A document published by the BRAIN Initiative (a major neuroscience research effort) states in Section II, " We do not yet have a systematic theory of how information is encoded in the chemical and electrical activity of neurons."

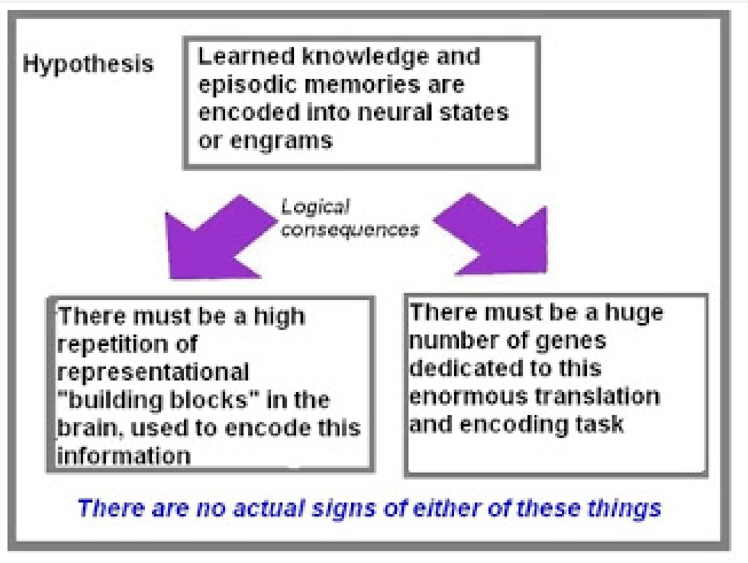
Just as it is impossible to advance a credible detailed theory as to how Santa Claus could distribute a toy to every good little boy and girl in the world in a single 24 hours, it is impossible to advance a credible detailed theory of how learned knowledge and episodic experience could be encoded and permanently stored as neural states. If memories were to be encoded so that they could be stored in brains, there would be two major "footprints" of such a thing, physical traces showing that it was going on. They are the following:

High repetition of representational building blocks. Whenever encoded information is stored, there is a repetition of two or more things we can call *representational building blocks* or *representational atoms*. In binary encoding these representational building blocks are the 1's and 0's or their electromagnetic equivalent. In alphabetic encoding, the representational building blocks are the letters of the alphabetic. In DNA the representational

building blocks are the four types of nucleotide base pairs that are repeated over and again. In Morse code, the representational building blocks are dots and dashes. Even if you don't know the system of encoding that was used, it is easy to detect that encoded information is present, by seeing a high repetition of representational building blocks. If brains stored memories encoded into neural states, we would see a gigantic degree of repetition of some type of representational building blocks.
Genes dedicated to memory encoding. If human brains were to actually be translating thoughts and sensory experiences so that they can be stored as memory traces, such a gigantic job would require a huge number of genes – many times more than the 500 or so genes that are used for the very simple encoding job of translating DNA nucleotide base pairs into amino acids.

There is no sign at all of either of these things in the brain. We absolutely do not see anything like very highly repeated representational building blocks in the brain that might be the footprints of encoded memory information. And we see no sign of any such memory encoding genes in the human genome.

There is a study that claims to have found possible evidence of memory encoding genes, but its methodology is ridiculous, and involved the absurd procedure of looking for weak correlations between a set of data extracted from one group of people and another set of data retrieved from an entirely different group of people. See the end of this post for reasons we can't take the study as good evidence of anything. There is not one single gene that a scientist can point to and say, "I am sure this gene is involved in memory encoding, and I can explain exactly how it works to help translate human knowledge or experience into engrams or memory traces." But if human memories were actually stored in brains, there would have to be *thousands* of such genes.



There is an additional general difficulty involved in the idea that brains encode our episodic experiences and learned knowledge as neural states. It is that if the brain did such a thing, it would require a translation facility so marvelous that it would be a "miracle of design," something that we would never expect to ever appear by unguided evolution.

Yet another problem is that if brains encoded learned knowledge and episodic experiences into engrams or memory traces, then forming new memories would be slow, and retrieving memories would be slow -- for whenever we formed a new memory, all kinds of translation work and encoding would have to be done (which would take a while), and whenever we retrieved a stored memory, all kinds of decoding work would have to be done (which would take a while). But instead humans can form memories instantly and retrieve memories instantly, much faster than things would work if all this encoding and decoding work had to be done.

What has been discussed here is only a small fraction of the very large case for thinking that human cognition and memory must be some psychic or spiritual reality rather than a biological or neural reality.

Let's imagine a boy who thinks that his mother will give him a pony for Christmas. December 25th comes, and the boy searches everywhere around his house and yard; but there's no pony. On December 28th, having spent several more days looking for such a pony without success, the boy says, "There must be a pony around here *somewhere*." We may compare this boy to the modern neuroscientist who believes there are brain engrams that encode our learned knowledge, but who still hasn't found such things, despite decades of searching. He says to himself, "They must be *somewhere* in the brain." But if they existed, they would have been found long ago. There is microscopic encoded information in DNA (specifying the amino acids in proteins). Unmistakable evidence of that was discovered around 1950. Why would it possibly be that we would have failed to discover encoded memory information in a brain by the year 2018, if such information actually existed in brains? It would be as easy to find as the genetic information in DNA.

at December 20, 2018   No comments:

Labels: memory encoding

Thursday, November 22, 2018

Why Most Animal Memory Experiments Tell Us Nothing About Human Memory

Recently the BBC reported a science experiment with the headline “'Memory transplant' achieved in snails.” This was all over the science news on May 14. Scientific American reported it with a headline stating “Memory transferred between snails,” and other sites such as the New York Times site made similar matter-of-fact announcements of a discovery. But you need not think very hard to realize that there's something very fishy about such a story. How could someone possibly get decent evidence about a memory in a snail?

To explain why this story and similar stories do not tell us anything reliable about memory, we should consider the issue of small sample sizes in neuroscience studies. The issue was discussed in a paper in the journal Nature, one entitled *Power failure: why small sample size undermines the reliability of neuroscience*. The article tells us that neuroscience studies tend to be unreliable because they are using too small a sample size. When there is too small a sample size, there's a too high chance that the effect reported by a study is just a false alarm. An article on this important Nature article states the following:

The group discovered that neuroscience as a field is tremendously underpowered, meaning that most experiments are too small to be likely to find the subtle effects being looked for and the effects that are found are far more likely to be false positives than previously thought. It is likely that many theories that were previously thought to be robust might be far weaker than previously imagined.

I can give a simple example illustrating the problem. Imagine you try to test extrasensory perception (ESP) using a few trials with your friends. You ask them to guess whether you are thinking of a man or a woman. Suppose you try only 10 trials with each friend, and the best result is that one friend guessed correctly 70% of the time. This would be very unconvincing as evidence of anything. There's about a 5 percent chance of getting such a result on any such test, purely by chance; and if you test with five people, you have perhaps 1 chance in 4 that one of them will be able to make 7 such guesses correctly, purely by chance. So having one friend get 7 out of 10 guesses correctly is no real evidence of anything. But if you used a much larger sample size it would be a different situation. For example, if you tried 1000 trials with a friend, and your friend guessed correctly 700 times, that would have a probability of less than 1 in a million. That would be much better evidence.

Now, the problem with many a neuroscience study is that very small sample sizes are being used. Such studies fail to provide convincing evidence for anything. The snail memory test is an example.

The study involved giving shocks to some snails, extracting RNA from their tiny brains, and then injecting that into other snails that had not been shocked. It was reported that such snails had a higher chance of withdrawing into their shells, as if they were afraid and remembered being shocked when they had not. But it might have been that such snails were merely acting randomly, not experiencing any fear memory transferred from the first set of snails. How can you have confidence that mere chance was not involved? You would have to do many trials or use a sample size that guarantees that sufficient trials will occur. This paper states that in order to have moderate confidence in results, getting what is called a statistical power of .8, there should be at least 15 animals in each group. This statistical power of .8 is a standard for doing good science.

But judging from the snail paper, the scientists did not do a large number of trials. Judging from the paper, the effect described involved only 7 snails (the number listed on lines 571 -572 of the paper). There is no mention of trying the test more than once on such snails. Such a result is completely unimpressive, and could easily have been achieved by pure chance, without any real "memory transfer" going on. Whether the snail does or does not withdraw into its shell is like a coin flip. It could easily be that by pure chance you might see some number of "into the shell withdrawals" that you interpret as "memory transfer."

Whether a snail is withdrawing into its shell requires a subjective judgment, where scientists eager to see one result might let their bias influence their judgments about whether the snail withdrew into its shell or not. Also, a snail might withdraw into its shell simply because it has been injected with something, not because it is remembering something. Given such factors and the large chance of a false alarm when dealing with such a small sample size, this "snail memory transfer" experiment offers no compelling evidence for anything like memory transfer. We may also note the idea that RNA is storing long-term memories in animals is entirely implausible, because of RNA's very short lifetime. According to this source, RNA molecules typically last only about two minutes, with 10 to 20 percent lasting between 5 and 10 minutes. And according to this source, if you were to inject RNA into a bloodstream, the RNA molecules would be too large to pass through cell membranes.

The Tonegawa memory research lab at MIT periodically puts out sensational-sounding press releases on its animal experiments with memory. Among the headlines on its site are the following:

- "Neuroscientists identify two neuron populations that encode happy or fearful memories."
- "Scientists identify neurons devoted to social memory."
- "Lost memories can be found."
- "Researchers find 'lost' memories"
- "Neuroscientists reverse memories' emotional associations."
- "How we recall the past."

- “Neuroscientists identify brain circuit necessary for memory formation.”
- “Neuroscientists plant false memories in the brain.”
- “Researchers show that memories reside in specific brain cells.”

But when we take a close look at the issue of sample size and statistical power, and the actual experiments that underlie these claims, it seems that few or none of these claims are based on solid, convincing experimental evidence. Although the experiments underlying these claims are very fancy and high-tech, the experimental results seem to involve tiny sample sizes so small that very little of it qualifies as convincing evidence.

A typical experiment goes like this: (1) Some rodents are given electrical shocks; (2) the scientists try to figure out where in the rodent's brain the memory was; (3) the scientists then use an optogenetic switch to “light up” neurons in a similar part of another rodent's brain, one that was not fear trained; (4) a judgment is made on whether the rodent froze when such a thing was done.

Such experiments have the same problems I mentioned above with the snail experiment: the problem of subjective interpretations and alternate explanations. The MIT memory experiments typically involve a judgment of whether a mouse froze. But that may often be a hard judgment to make, particularly in borderline cases. Also, we have no way of telling whether a mouse is freezing because he is remembering something. It could be that the optogenetic zap that the mouse gets is itself sufficient to cause the mouse to freeze, regardless of whether it remembers something. If you're walking along, and someone shoots light or energy into your brain, you might stop merely because of the novel stimulus. A science paper says that it is possible to induce freezing in rodents by stimulating a wide variety of regions. It says, "It is possible to induce freezing by activating a variety of brain areas and projections, including the hippocampus (Liu et al., 2012), lateral, basal and central amygdala (Ciocchi et al., 2010); Johansen et al., 2010; Gore et al., 2015a), periaqueductal gray (Tovote et al., 2016), motor and primary sensory cortices (Kass et al., 2013), prefrontal projections (Rajasethupathy et al., 2015) and retrosplenial cortex (Cowansage et al., 2014).”

But the main problem with such MIT memory experiments is that they involve very small sample sizes, so small that all of the results could easily have happened purely because of chance. Let's look at some sample sizes, remembering that according to this scientific paper, there should be at least 15 animals in each group to have moderate confidence in your results, sufficient to reach the standard of a “statistical power of .8.”.

Let's start with their paper, “Memory retrieval by activating engram cells in mouse models of early Alzheimer’s disease,” which can be accessed from the link above after clicking underneath "Lost memories can be found." The paper states that “No statistical methods were used to predetermine sample size.” That means the authors did not do what they were supposed to have done to make sure their sample size was large enough. When we look at page 8 of the paper, we find that the sample sizes used were merely 8 mice in one group and 9 mice in another group. On page 2 we hear about a group with only 4 mice per group, and on page 4 we hear about a group with only 4 mice per group. Such a paltry sample size does not result in any decent statistical power, and the results cannot be trusted, since they very easily could be false alarms. The study therefore provides no convincing evidence of engram cells.

Another example is this paper by the MIT memory lab, with the grandiose title “Creating a False Memory in the Hippocampus.” When we look at Figure 2 and Figure 3, we see that the sample sizes used were paltry: the different groups of mice had only about 8 or 9 mice per group. Such a paltry sample size does not result in any decent statistical power, and the results cannot be trusted, since they very easily could be false alarms. No convincing evidence has been provided of creating a false memory.

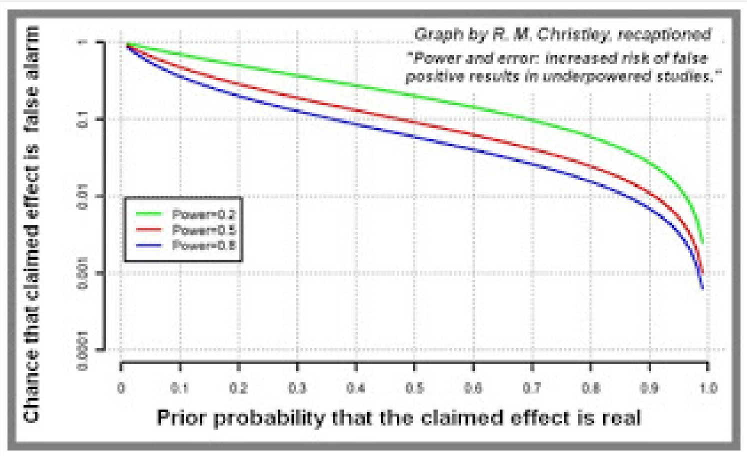
A third example is this paper with the grandiose title “Optogenetic stimulation of a hippocampal engram activates fear memory recall.” Figure 2 tells us that in one of the groups of mice there were only 5 mice, and that in another group there were only 3 mice. Figure 3 tells us that in two other groups of mice there were only 12 mice. Figure 4 tells us that in some other group there was only 5 mice. Such a paltry sample size does not result in any decent statistical power, and the results cannot be trusted, since they very easily could be false alarms. No convincing evidence has been provided of artificially activating a fear memory by the use of optogenetics.

Another example is this paper entitled “Silent memory engrams as the basis for retrograde amnesia.” Figure 1 tells us that the number of mice in particular groups used for the study ranged between 4 and 12. Figures 2 and 3 tell us that the number of mice in particular groups used for the study ranged between 3 and 12. Such a paltry sample size does not result in any decent statistical power, and the results cannot be trusted, since they very easily could be false alarms. Another unsound paper is the 2015 paper "Engram Cells Retain Memory Under Retrograde Amnesia," co-authored by Tonegawa. When we look at the end of the supplemental material, and look at figure s13, we find that the experimenters were using a number of mice that was equal to only 8 in one study group, and 7 in another study group. Such a paltry sample size does not result in any decent statistical power, and the results cannot be trusted, since they very easily could be false alarms.

We see the same "low statistical power" problem in this paper claiming an important experimental result regarding memory. The paper states in its Figure 2 that only 6 mice were used for a study group, and 6 mice for the control group. The same problem is shown in Figure 3 and Figure 4 of the paper. We see the same "low statistical power" problem in this paper entitled "Selective Erasure of a Fear Memory." The paper states in its Figure 3 that only 6 to 9 mice were used for a study group, That's only about half of the "15 animals per study group" needed for a modestly reliable result. The same defect is found in this memory research paper and in this memory research paper.

The term “engram” means a cell or cells that store memories. Decades after the term was created, we still have no convincing evidence for the existence of engram cells. But memory researchers are shameless in using the term “engram” matter-of-factly even though no convincing evidence of an engram has been produced. So, for example, one of the MIT Lab papers may again and again refer to some cells they are studying as “engram cells,” as if they could try to convince us that such cells are actually engram cells by telling us again and again that they are engram cells. Doing this is rather like some ghost researcher matter-of-factly using the term “ghost blob” to refer to particular patches of infrared light that he is studying after using an infrared camera. Just as a blob of infrared light merely tells us only that some patch of air was slightly colder (not that such a blob is a ghost), a scientist observing a mouse freezing is merely entitled to say he saw a mouse freezing (not that the mouse is recalling a fear memory); and a scientist seeing a snail withdrawing into its shell is merely entitled to tell us that he saw a snail withdrawing into its shell (not that the snail was recalling some fear memory).

The relation between the chance of a false alarm and the statistical power of a study is clarified in this paper by R. M. Christley. The paper has an illuminating graph which I present below with some new captions that are a little more clear than the original captions. We see from this graph that if a study has a statistical power of only about .2, then the chance of the study giving a false alarm is something like 1 in 3 if there is a 50% chance of the effect existing, and much higher (such as 50% or greater) if there is less than a 50% chance of the effect existing. But if a study has a statistical power of only about .8, then the chance of the study giving a false alarm is only about 1 in 20 if there is a 50% chance of the effect existing, and much higher if there is less than a 50% chance of the effect existing. Animal studies using much fewer than 15 animals per study (such as those I have discussed) will result in the relatively high chance of false alarms shown in the green line.



The PLOS paper here analyzed 410 experiments involving fear conditioning with rodents, a large fraction of them memory experiments. The paper found that such experiments had a "mean normalized effect size" of only .29. An experiment with an effect size of only .29 is very weak, with a high chance of a false alarm. Effect size is discussed in detail here, where we learn that with an effect size of only .3, there's typically something like a 40 percent chance of a false alarm.

To determine whether a sample size is large enough, a scientific paper is supposed to do something called a sample size calculation. The PLOS paper here reported that only one of the 410 memory-related neuroscience papers it studied had such a calculation. The PLOS paper reported that in order to achieve a moderately convincing effect size of .80, an experiment typically needs to have 15 animals per group; but only 12% of the experiments had that many animals per group. Referring to statistical power (a measure of how likely a result is to be real and not a false alarm), the PLOS paper states, "no correlation was observed between textual descriptions of results and power." In plain English, that means that there's a whole lot of BS flying around when scientists describe their memory experiments, and that countless cases of very weak evidence have been described by scientists as if they were strong evidence.

Our science media shows very little sign of paying any attention to the statistical power of neuroscience research, partially because rigor is unprofitable. A site can make more money by trumpeting borderline weakly-suggestive research as if it were a demonstration of truth, because the more users click on a sensational-sounding headline, the more money the site make from ads. Our neuroscientists show little sign of paying much attention to whether their studies have a decent statistical power. For the neuroscientist, it's all about publishing as many papers as possible, so it's a better career move to do 5 underpowered small-sample studies (each with a high chance of a false alarm) than a single study with an adequate sample size and high statistical power.

In this post I used an assumption (which I got from one estimate) that 15 research animals per study group are needed for a moderately persuasive result. It seems that this assumption may have been too generous. In her post "Why Most Published Neuroscience Findings Are False," Kelly Zalocusky

PhD calculates (using Ioannidis's data) that the median effect size of neuroscience studies is about .51. She then states the following, talking about statistical power:

To get a power of 0.2, with an effect size of 0.51, the sample size needs to be 12 per group. This fits well with my intuition of sample sizes in (behavioral) neuroscience, and might actually be a little generous. To bump our power up to 0.5, we would need an n of 31 per group. A power of 0.8 would require 60 per group.

If we describe a power of .5 as being moderately convincing, it therefore seems that 31 animals per study group is needed for a neuroscience study to be moderately convincing. But most experimental neuroscience studies involving rodents and memory use fewer than 15 animals per study group.

Zalocusky states the following:

If our intuitions about our research are true, fellow graduate students, then fully 70% of published positive findings are "false positives." This result furthermore assumes no bias, perfect use of statistics, and a complete lack of "many groups" effect. (The "many groups" effect means that many groups might work on the same question. 19 out of 20 find nothing, and the 1 "lucky" group that finds something actually publishes). Meaning—this estimate is likely to be hugely optimistic.

All of these things make it rather clear that a large fraction or most animal memory experiments are dubious. There is another reason why the great majority of these experiments tell us nothing about human memory. It is that most such experiments involve rodents, and given the vast differences between men and rodents, nothing reliable about human memory can be determined by studying rodent memory.

Postscript: The paper here is another example of a memory experiment failing to actually prove anything because of its too-small-sample size. Widely reported in the press with headlines suggesting scientists had added memories to mice while the mice slept, the study says, "We induced an explicit memory trace, leading to a goal-directed behavior toward the place field." Typically this type of study will be behind a pay wall, allowing the scientists to hide their too-small sample sizes where the public won't be able to see them without paying. But luckily www.researchgate.net often publishes the graphs from such studies, where anyone can see them. In this case the graph explanation allows us to see the scientists were using only 5 to 7 animals per study group, which means that the reported result isn't strong evidence for anything, being the type of result we might easily get from chance effects.

Post-Postscript: The latest example of a memory experiment failing to actually prove anything (because of its too-small-sample size) is a study in Nature that has been hyped with headlines such as "Artificial memory created." The study has the inaccurate title, "Memory formation in the absence of experience." The study fails to prove any such thing occurred. When we look at the number of animals involved, we often find that the study fails to meet the minimum standard of 15 animals per study group. In Figure 1 we learn that two of the study groups consisted of only 8 mice. In Figure 2 we learn that two of the study groups consisted of only 10 mice. In Figure 3 we learn that one of the study groups consisted of only 7 mice. Moreover, the methodology used in the study is so convoluted that it fails to provide clear and convincing evidence for anything interesting. The only evidence of memory recall is that the mice supposedly avoided some area, something that might have occurred for any number of reasons other than a recall of some memory. A robust test of an artificial memory would test an actual acquired skill, such as the ability to navigate a maze in a certain time.

at November 22, 2018 No comments:

Head Truth

The huge case for thinking minds do not come from brains

Sunday, July 21, 2019

Scientists Can't Persuasively Explain How a Brain Could Instantly Retrieve a Memory

Most neuroscientists claim that memories are retrieved by some action of the brain. But they have no coherent credible theories as to how this could happen. As Exhibit A in support of this claim, I refer you to this page on the ResearchGate.net site. The page (dating from 2015) simply asks the question, "How are memories retrieved in the brain?"

I read the page carefully, hoping for clarification on the seemingly insurmountable problem of explaining how a brain could instantly retrieve a memory. One aspect of this problem is what I call the navigation problem. This is the problem that if a memory were to be stored on some exact tiny spot on the brain, it would seem that there would be no way for a brain to instantly find that spot. For that to occur would be like someone instantly finding a needle in a gigantic haystack, or like someone instantly finding just the right book in a vast library in which books were shelved in random positions. Neurons are not addressable, and have no neuron numbers or neuron addresses. So, for example, we cannot imagine that the brain instantly finds your memory image of Marilyn Monroe (when you hear her name) because the brain knows that such information is stored at neural location #235355235. There are no such "neural addresses" in the brain.

Then there is also the fact that the brain seems to have nothing like a read mechanism by which some small group of neurons are given special attention. The hard disk of a computer has a read/write head, but there's nothing like that in the brain. Then there is the fact that if memory information were encoded into neural states, the brain would have to decode that encoded information; but such a decoding would seem to require time that would prevent instantaneous recall.

There are 68 "expert answers" on the ResearchGate.net page, but only 1 of them is rated as a "popular answer" by the site. This one "popular answer" is simply to a link to a speculative paper talking about some weird and not-currently-popular "holographic" theory of memory. The paper says this at its beginning:

"Yet, all attempts to describe human memory as a hologram have failed up to now. Hence, the holographic brain hypothesis is simply ignored in neuroscience textbooks. Probably, my attempt will fail too."

So the most popular answer on the page is one in which the author does not sound like she has much confidence in her claims. I will now review some of the answers on the page, going from its top to its bottom. One of the first answers (given by one Richard Traub) states the following:

"I have no doubts at all that the mechanisms controlling retrieval are a collaborating team of high-level cognitive, affective and motorically-influence & influencing subsystems that encode and identify specific circumstantially

Translate

Select Language ▼

- Introduction to This Site
- Preservation of Mind and Memories After Removal of Half a Brain
- Why We Should Not Think the Human Brain Can Store Very Old Memories
- Why the Instantaneous Recall of Old Memories Should Be Impossible for a Brain
- Cases of High Mental Function Despite Large Brain Damage
- Reasons for Doubting a Brain Could Do the Super-Complex Encoding Needed to Neurally Store Episodic Memories or Concepts
- The Many Cases Showing a Person's Mind Can Operate When His Brain Has Shut Down
- Your Physical Structure Did Not Arise Bottom-Up, So Why Think Your Mind Did?
- The Brain Seems to Have No Mechanism for Reading or Writing Memories
- No One Understands How a Brain Could Generate Ideas
- 30 Reasons for Rejecting the Theory of Neural Memory Storage
- Groupthink and Peer Pressure Make It Taboo for Neuroscientists to Put Two and Two Together
- Synaptic Delays Mean Brain Signals Must Move at a Snail's Pace
- Brain Dogmas Versus Case Histories That Refute Them
- In Neuroscience Papers Bluffing Is More Common Than Candor
- Young Age of Languages Contradicts Claims of Neural Storage of Linguistic Information

relevant goals and, in terms of which, index circumstantially relevant sensory circuit assemblies - the computed output of which causes a top-down activation of the decided-upon distributed assemblies and consequent re-representation of their own combined output in the earlier event of analyzing, perceiving and mapping the "live" stimuli upon which a particular episodic memory was originally founded."

This gobbledygook may sound impressive, until we realize that there is no real theory behind it at all, except for the idea that when a memory is recalled the brain is replaying the sensory experience that caused the memory to form. That does nothing to explain how the brain could find the exact location of the correct tiny spot where a memory was stored. We also know that the basic idea of this "replaying sensory experience when you learned something" theory is not correct. When someone asks me how many states are in the United States, my mind does not play back the sensory experience I had when I first learned that the United States consists of 50 states. And if someone asks me who killed Abraham Lincoln, I do not play back the sensory experience of my fifth-grade teacher telling me that John Wilkes Booth did this act.

The next answer is from an Engineering PhD named Mells who admits, “I don't have an immediate answer to the retrieving of 'old' data.” This is followed by a humble answer by Simon Penny that offers no theory or explanation. We then have an answer by Salman Zubedat, who works at a neuroscience lab, but merely refers to speculative theories of neural memory storage, without mentioning any theory or explanation for memory retrieval.

We then have an answer from Herwig Lange, a neuroscientist who says nothing in answer to the question “How are memories retrieved in the brain?” other than, “He who finds out wins the next Nobel-prize.” We can interpret this as a confession that neuroscientists do not currently understand how a brain could retrieve a memory.

We then have an answer from physiologist Sutarmo Vincentius Setiadji who states the following:

"New experience firstly stimulates some components of sensory organs. These organs then stimulates some neural circuits in the higher parts of nervous system and then stimulate one or more primary sensory cortex/cortices. These stimulations go to uniassociation cortex or also directly to multi association cortex. From there through entorhinal cortex go to the hippocampus for being processed for several times. After that from hippocampus will be sent back through entorhinal cortex to multi association cortex as long term memory."

This is not an explanation as to how a brain could find the exact location at which a memory is stored, nor is it an explanation of how any reading effect could occur from such a location. The account above basically amounts to saying that sensory experience causes electricity to start traveling around between different parts of the brain, but that doesn't explain memory retrieval. Moreover, memory retrieval very often occurs without sensory experience being the start of things. For example, I may start randomly recalling my mother, without seeing anything that caused such a memory retrieval.

Then we have Ursula Ehfield offering the not-very-clear poetics below:

"As to my view it is a huge concert of waves and oscillations involved. (EEG are very important as a 'global player'!) Any neurotransmitter population plays its own concert. Sometime the piano starts, sometime the violin, sometimes the trumpets, which ever is resonating first."

We then have a rather long argument back and forth between Ehfield, Setiadji, and Graeme Smith. Within that argument we do not get any real explanation

- Vacillating Disarray of the Memory Trace Theorists
- Study Finds "Poor Overall Reliability" of Brain Scanning Studies
- "Brains Store Memories" Dogma Versus the Reality of Noisy Brains
- The Brain Has Nothing Like 7 Things a Computer Uses to Store and Retrieve Information
- Exhibit A Suggesting Scientists Don't Understand How a Brain Could Store a Memory
- The Dubious Dogma That Brains Make Decisions
- Long Article Tries to Show Neural Memory Storage, but Gives No Real Evidence for It
- How Evidence for ESP Undermines the “Minds Come From Brains” Dogma
- Gender Differences in Brains Help Discredit Prevailing Dogmas About Brains
- Study Finds Equal Brain Connectivity in All Mammals
- Some Reasons the Main Theory of Neural Memory Storage Is Unbelievable
- Scientists Can't Persuasively Explain How a Brain Could Instantly Retrieve a Memory
- The Lack of Evidence for Memory-Storage Engram Cells
- Candid Confessions of the Cognitive Experts
- Global Workspace Theory Sure Isn't an Explanation for Consciousness
- When Animals Cast Doubt on Dogmas About Brains
- Memories Can Form Many Times Faster Than the Speed of Synapse Strengthening
- The Guy with the Smallest Brain Had the Highest IQ
- He Had Half a Brain and Above Normal Intelligence
- The Truth About Neurons and Synapses
- A Diagram of Explanatory Dysfunction in Academia
- The Brain Shows No Sign of Working Harder During Thinking or Recall
- More Evidence of High Mental Function Despite Large Brain Damage
- The Lack of a Viable Theory of Neural Memory Encoding
- More Evidence That Neuron Loss Has Little Effect on Cognition
- Fraud and Misconduct Are Not Very Rare in Biology
- Reasons for Doubting Thought Comes from the Frontal Lobes or

for how a brain could retrieve a memory.

We then have an answer from psychology PhD John S. Antrobus who tells us that memories are not retrieved but activated, and then merely says, “After that, the answer could fill a book.” Later on in the page John gets more detailed, although he isn't really telling us anything. He states the following:

"Lexical recognition of a word is accomplished by the activation of the neurons that represent that word, and the suppression of all others. Auditory word recognition requires another network. The 'meanings,' syntax, motor networks of speech, typing, etc., pictorial representation, values, and other features are accomplished by reciprocal circuits, largely in the prefrontal cortex. Any of these may play a part in activating the lexical representation, and may modify the largely 'bottom-up' recognition network. All, and in different ways, are part of the 'memory' of the lexical representation in that they are able to activate [or] suppress the activation of the neurons that represent a particular word."

This long statement really says nothing at all other than vaguely claiming that some type of activation is going on, claiming that some type of circuits are involved, and claiming that some neurons represent a word. But how could neurons conceivably represent a word? We can imagine no combination of neurons that would represent the word “freedom” or “religion” or “eternity” or “proficiency.” And if there were such a set of neurons somehow storing the meaning of a word, how could my brain ever instantly find that exact tiny set of neurons instantly, as soon as I heard that word? Our author provides no answers.

Since electricity passes around between in the brain, the brain can be conceived rather loosely as a huge collection of circuits. But we don't do anything to explain instant memory retrieval by saying it “is accomplished by circuits,” just as we don't explain something going on in your smartphone or computer by vaguely saying that it is “accomplished by circuits” or “accomplished by components” or “accomplished by electrons.”

We then have Paul Michael Guinther PhD state this: “Asking how the brain in some way causes the retrieval of memories involves a lot of metaphor ...and therefore isn't really answerable in any kind of scientifically meaningful way.” This is followed by a long answer from a “Deleted Profile” user who doesn't cast much light on this question.

We then have additional comments by Graeme Smith, who has no credentials in this area, He states the following:

"Output comes in the form of release of neurotransmitters, and in some rare cases actual electric contact between cells. ...A great amount of the storage and retrieval of memories has to be thought of as interpretation of the signals to retrieve the sense of them despite the processing steps taken at the same time as the storage steps. ...Different areas of the Cortex are interpreted differently especially the modal areas which take the inputs from specific sensory zones, and analyse it according to the mode of sensory input those sensory zones respond to. At different stages in the memory different areas in the cortex are activated resulting in processing of different types of outputs. The architecture of the brain, and micro-structure of the tissues, act together to guide information of a specific type through processes of a particular type, to other areas of the brain forming networks that process the information in a pattern that is similar across the brain."

This very much sounds like the talk of someone who does not understand how a brain could retrieve a memory, and who is just tossing around a few vague phrases, hoping that it sounds like something resembling understanding.

Prefrontal Cortex
- Why Most Animal Memory Experiments Tell Us Nothing About Human Memory
- Other Evidence of Human Paranormal Abilities
- Why Brains Are Not Suitable for Storing Long Sequences Like Humans Remember
- Why Brain Scans Don't Show Brains Make Minds
- Why Strokes, Alzheimer's Disease and Drunkenness Don't Prove the “Brains Make Minds” Dogma
- Synaptic Density Studies Contradict the Most Popular Memory Theory
- The Rare "Total Recall" Effect That Conflicts with Brain Dogmas
- Physical Connections Do Nothing to Explain Cognition
- The Sociological Reasons Why Bad Explanations Persist in Academia
- Split-Brain Cases Conflict with "Brains Make Minds" Dogma
- Why So Much of Neuroscience News Is Unreliable
- An Analogy Clarifying Why the "Brain Stores All Your Memories" Dogma Is Untenable
- Why Darwinism Fails to Explain the Human Mind
- What Is It That a Brain Does?
- Cloud Computing and a Non-Local Model of Consciousness
- Why We Do Not Understand the Origin of Complex Biological Innovations
- Our Minds May Arrive Top-Down Not Bottom-Up
- Fancy New Technology Fails to Prove Memory Dogmas
- The Argument for Determinism Collapses Once We Discard the "Minds Come from Brains" Dogma
- Animal Experiments Conflicting with the Dogma That the Brain Stores All Memories

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We then have an answer from the authority Dorian Aur of the Department of Comparative Medicine at Stanford University. Aur claims, "Fragments of memory are written inside neurons and synapses within molecular structure." There is no real evidence that this is true. There is no evidence of any information-writing capability in the brain, nothing like the write head of a disk drive. No one has a coherent detailed theory as to how learned knowledge or episodic memories could be translated into neural states. We know that the proteins that make up synapses are very short-lived, having average lifetimes of only a few weeks. There is no workable theory as to how a brain could store memories lasting for decades.

Aur then states, "These structures vibrate and generate a broad electromagnetic spectrum," and says, "In computational terms, meaningful fragments of information which are stored inside the structure are read out." This isn't really saying anything. Aur doesn't give an answer to the question or an explanation, other than claiming memories are written and read.

There then follows a long passage by Graeme Smith, who talks about electrical signals crossing synapses gaps, and the artificially produced effect called LTP. This provides nothing to clarify how a brain could instantly find a memory and load it into your mind so that you thought of that memory.

So this finishes my look at the 68 answers the experts have given to the basic question, "How Are Memories Retrieved in the Brain?" I have quoted all the best answers. The answers run to a total of about 8000 words. But the experts provide no real insight as to how a brain could instantly retrieve a memory. The authors toss around their erudition in various ways without any answers to the basic questions. There seems to be an awful lot of "just faking it" kind of verbiage, the type of empty phraseology and gobbledygook that people use when trying to persuade you that they understand something that they don't. None of the main problems are answered, and some of the main problems are not even mentioned.

None of the authors offers anything like a theory as to how instant memory retrieval could occur. The authors speak as if they were completely ignorant of this difficulty. None of them seems to be aware that explaining how a brain could find a memory instantly is 1000 times harder than explaining how a brain could find a memory if it has hours or days to scan though memories stored in it.

None of the authors suggests anything like a theory as to how a brain could read encoded information stored in it, translating that into a thought. The authors don't even offer a suggestion as to some neural effect that could act like a read mechanism.

Quite a few of the people offering answers are guilty of what we may call jargon bluffing, which is what goes on when someone offers dense, jargon-laden prose trying to make you think that he understands something he does not at all understand. Below is an imaginary example of this type of prose, which sounds like quite a few of the answers that are found on this page:

"The remembrance phenomenon is produced by a complex symphony of interlocking reciprocal causal factors. Neurotransmitters, circuits, specific synapses and highly specialized neural components all play specific roles in the intricate functionality. We are beginning to unravel the mechanistic specificity that evokes what we experience as a distinct recollection event. A distinct repertoire of biochemical events involving diverse interconnected cells may elicit a vivid reminiscence."

A statement like this is just bluffing, and neither shows any understanding of how a brain could retrieve a memory, nor does it describe any real theory as to how such a thing could occur. We should not be impressed at all by this type of empty verbiage, which is found all over the place on the web page I am discussing.

But two or three of the writers have spoken honestly and candidly by confessing (in one way or another) that they do not understand how a brain could retrieve a memory. We get some similar candor in a recent book *Why Only Us? Language and Evolution* by the leading linguist Noam Chomsky and Professor Robert C. Berwick. Here is an excerpt (pages 50-51):

"The very first thing that any computer scientist would want to know about a computer is how it writes to memory and reads from memory....Yet we do not really know how this most foundational element of computation is implemented in the brain."

The complete lack of any workable theory for how memory recall can occur so quickly is admitted by neuroscientist David Eagleman, who states the following:

"Memory retrieval is even more mysterious than storage. When I ask if you know Alex Ritchie, the answer is immediately obvious to you, and there is no good theory to explain how memory retrieval can happen so quickly."

I offer this ResearchGate.net web page as Exhibit A that modern neuroscientists have no understanding at all as to how a brain could instantly retrieve a memory. The lack of any credible theory of how instantaneous memory retrieval could occur is one of the major reasons for rejecting the claim that the brain stores memories. Many other such reasons are discussed at this site.

On the "How Stuff Works" site, which often has pretentious and dogmatic answers in which writers pretend to understand things they don't understand, we have a five-page answer with the title "How Human Memory Works." The author is the neuroscientist Richard C. Mohs. Engaging in speculation for which he provides no references, evidence or citations, Mohs states the following:

"Each part of the memory of what a 'pen' is comes from a different region of the brain. The entire image of 'pen' is actively reconstructed by the brain from many different areas. Neurologists are only beginning to understand how the parts are reassembled into a coherent whole."

The last sentence gives away that Mohs isn't actually referring to something that is known here, and we have no actual evidence that such a claim is true. If Mohs' speculation were true, it would make it many times harder to explain a memory retrieval -- for explaining instantaneous retrieval from "many different areas" would be harder than explaining instantaneous retrieval from a single area.

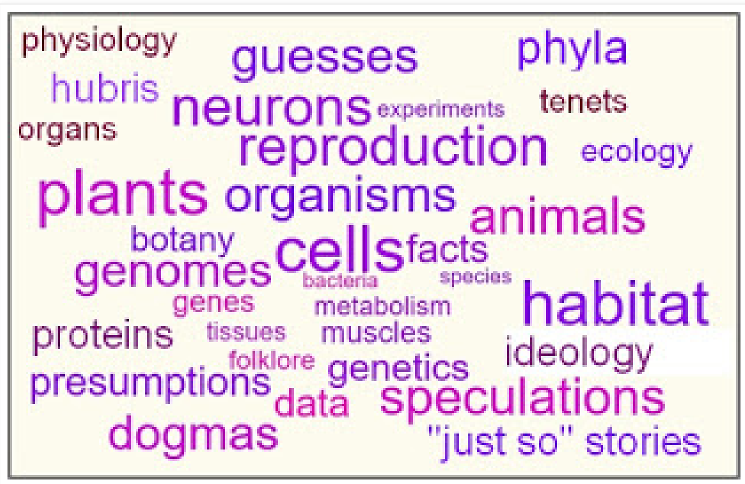
At the end of the first page, Mohs promises, "On the next page, you'll learn how encoding works and the brain activity involved in retrieving a memory." But the pages that follow do nothing to explain such things. The page entitled "Memory encoding" does nothing to explain how a brain could possibly translate conceptual knowledge or episodic memories into neural states, a gigantic unsolved difficulty as great as the difficulty of explaining memory recall. No neuroscientist has a coherent detailed theory on this matter, and Mohs certainly does not state one. On the page entitled "Memory Retrieval," Mohs writes about 500 words that do nothing to explain how such a thing could occur in the brain. He presents no theory and no speculation, and says nothing specific about the brain.

Our neuroscientists do not understand how a brain could encode a memory, do not understand how a brain could instantly retrieve a memory, and do not understand how a brain could store a memory for decades despite rapid protein turnover in synapses which should prevent stored memories from lasting in synapses for even as long as a month. If a neuroscientist ever gives you the impression he understands such things, it's a sham or a bluff, or a case of self-deception in which someone has deluded himself into thinking he understands something he doesn't.

Recently I had a good example of the type of memory recall that is inexplicable through any theory of neural recall. Turning to the TCM channel, I saw for the first time the 1951 movie *The People Against O'Hara.* The movie was in its middle, and there was a scene in which a witness delivered testimony. Looking at the actor, I instantly identified him as the little-known actor William Campbell. But I had only seen William Campbell in two other movies or TV shows, those being two *Star Trek* episodes made in 1967. I was able to instantly identify him even though he looked 16 years younger than I had ever seen him, and even though I should have by all rights forgot his name (a name I cannot recall thinking about, reading about or hearing about in the thirty years previous to today).

I had a similar experience on another day in 2019. Watching a Dirk Bogarde movie, I read a short biography of him which mentioned his appearance in a 1950's film called *Doctor in the House*. This caused me to recall some memories of watching a British TV series *Doctor in the House*, which ran from 1969 to 1970, and which I watched in American reruns from 1973 to 1974. Although I hadn't seen the series in 45 years, and hadn't thought about it or read about it in 45 years, I was able to recall some very precise details about it. I recalled that one of the characters (not the lead character) was named Dick Stuart-Clarke, and I was able to recall an exact memory of his appearance: tall, always well-dressed, thin, blonde brushed back hair, a handsome rather oval face with a slightly pointy noise and a frequent smirk. I cannot recall seeing any image of the person playing this character in the 45 years prior to this recollection. A check on the Internet and youtube.com (which has full episodes of the series) confirmed that my recollections were exactly correct, as were my other recollections of the series.

No one will ever be able to explain how such instantaneous recollection of very obscure memories (not accessed in decades) could occur if memories are stored in the brain.



Modern biology word-cloud

This post is a kind of Exhibit A suggesting that scientists have no understanding of how a brain could retrieve a memory. For an Exhibit B suggesting the same thing, read the post here.

at July 21, 2019   No comments:

Labels: memory recall

Saturday, July 6, 2019

He Had Half a Brain and Above Normal Intelligence

Discussing hemispherectomy operations in which half of a brain is removed to stop seizures, the paper here states, "Others, (Ogden, 1988; Riva & Gazzaniga, 1986; Vargha-Khadem et al., 1997a; Verity, 1982) have reported excellent, even normal linguistic abilities after hemispherectomy of either side" of the brain. An interesting scientific paper is entitled, "When only the right hemisphere is left: Studies in language and communication." The study gives us an in-depth analysis of a subject named BL who as a child had half of his brain removed (the left half) in a hemispherectomy operation to reduce seizures. The paper tells us that BL has "above normal intelligence" and that he graduated from college with a bachelor's degree in business and sociology. In a battery of tests of memory and language, the subject showed normal results, with only slight, subtle deficits. He scored above-average on a few memory-related tests, such as the Boston Naming Test and the Famous Names and Faces test. We are told, "Regarding speech, language, and communicative function, BL's performance appears grossly normal in pronunciation, grammar, semantics, and usage."

Referring to patients who had half of their brains removed in hemispherectomy operations, the paper states, "The numerous observations on cognitively intact persons hemispherectomized in childhood bring to mind the report of Lorber (1983) on hydrocephalic adults, whose brains are constituted of only a thin layer of cerebral tissue, and yet who enjoy normal or superior motor and cognitive abilities." Talking about the small effect of hemispherectomy operations in which half of a brain is removed, a doctor states, "When you take out half of their brain in one sitting it’s as if they weren’t touched."

In 2019 doctors were surprised to discover that a 60-year-old man had only half a brain. He was missing the left half of his brain. But the man had got a university degree in engineering (one of the most intellectually demanding subjects), and the man stated, "I have lived a normal life, nothing worried me at all." He had successfully worked as an engineer in a factory.

Facts such as these help to debunk dogmas such as the dogma that the brain is the source of our minds and the storage place of our memories. There are many facts and reasons that lead to such a conclusion. Below are some of them.

1. As shown in the many examples given here, here, here, here and here, contrary to the predictions of materialism, human minds can operate very well despite tremendous damage to the brain, caused by injury, disease or surgery. For example, removing half of a person's brain in the operation known as hemispherectomy produces little change in memory or cognitive abilities. There have been quite a few cases of people (such as Lorber's patients) who were able to think and speak very well despite having lost more than 60% of their brain due to disease. Such cases argue powerfully that the human mind is not actually a product of the brain or an aspect of the brain.
2. Although it is claimed that memories are stored in the brain (specifically in synapses), there is no place in the brain that is a plausible storage site

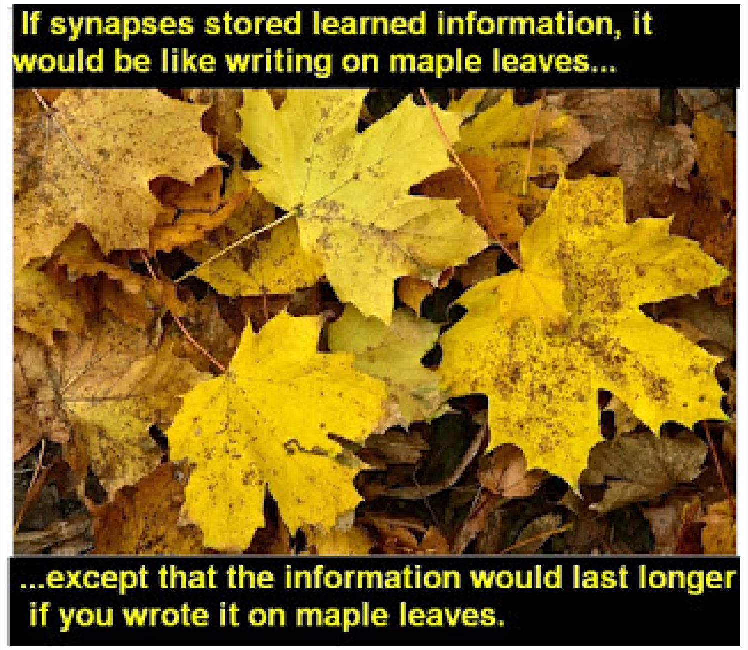
for human memories that can last for 50 years or longer. The proteins that make up both synapses and dendritic spines are quite short-lived, being subject to very high molecular turnover which gives them an average lifetime of only a few weeks. Both synapses and dendritic spines are a"shifting sands" substrate absolutely unsuitable for storing memories that last reliably for decades.

3. It is claimed that memories are stored in brains, but humans are able to instantly recall accurately very obscure items of knowledge and memories learned or experienced decades ago; and the brain seems to have none of the characteristics that would allow such a thing. The recall of an obscure memory from a brain would require some ability to access the exact location in the brain where such a memory was stored (such as the neurons near neuron# 8,124,412,242). But given the lack of any neuron coordinate system or any neuron position notation system or anything like an indexing system or addressing system in the brain, it would seem impossible for a brain to perform anything like such an instantaneous lookup of stored information from some exact spot in the brain.
4. If humans were storing their memories in brains, there would have to be a fantastically complex translation system (almost infinitely more complicated than the ASCII code or the genetic code) by which mental concepts, words and images are translated into neural states. But no trace of any such system has ever been found, no one has given a credible detailed theory of how it could work, and if it existed it would be a "miracle of design" that would be naturally inexplicable.
5. Contrary to claims that minds are merely an aspect of brains or a product of brains, we know from near-death experiences that human minds can continue to operate even after hearts have stopped and brains have shut down. As discussed here, such experiences often include observations of hospital details or medical details that should have been impossible if a mere hallucination was the cause of the experience.
6. If human brains actually stored conceptual and experiential memories, the human brain would have to have both a write mechanism by which exact information can be precisely written, and a read mechanism by which exact information can be precisely read. The brain seems to have neither of these things. There is nothing in the brain similar to the "read-write" heads found in computers.
7. We understand how physical things can produce physical effects (such as an asteroid producing a crater), and how mental things can produce mental effects (such as how a belief can give rise to another belief or an emotion). But no one has the slightest idea how a physical thing could ever produce a mental effect. As discussed here, no one has any understanding of how a brain or neurons in a brain could produce anything like a thought or an idea.
8. We know from our experience with computers the type of things that an information storage and retrieval system uses and requires. The human brain seems to have nothing like any of these things.
9. As discussed here, humans can form new memories instantly, at a speed much faster than would be possible if we were using our brains to store such memories. It is typically claimed that memories are stored by "synapse strengthening" and protein synthesis, but such things do not work fast enough to explain the formation of memories that can occur instantly.
10. As discussed here, human brains do not show signs of working harder during thinking or memory recall, contrary to what we would expect if such effects were being produced by brains.
11. Contrary to the idea that human memories are stored in synapses, the density of synapses sharply decreases between childhood and early

adulthood. We see no neural effect matching the growth of learned memories in human.

12. There are many humans with either exceptional memory abilities (such as those with hyperthymesia who can recall every day of their adulthood) or exceptional thinking abilities (such as savants with incredible calculation abilities). But such cases do not involve larger brains, very often involve completely ordinary brains, and quite often involve damaged brains, quite to the contrary of what we would expect from the "brains make minds" assumption.
13. The very strong laboratory evidence for psi (most notably extrasensory perception) shows that humans have abilities that cannot be explained by neural activity, and that must involve some higher consciousness reality beyond the brain.
14. Results from the animal kingdom are inconsistent with claim that minds are made from brains and memories stored in brains. For example, animals such as crows with very small brains (and no cerebral cortex) perform astonishingly well on mental tests; elephants with brains four times larger than ours are not nearly as smart as us; and flatworms that have been taught things and then decapitated can still remember what they learned, after regrowing a head.
15. Well-documented evidence for apparitions provides evidence that the human mind is not merely the result of brain activity. Such evidence includes (1) more than 100 cases of people who saw an apparition of someone they did not know had died, only to very soon learn that the corresponding person had died (as discussed here, here, here and here); (2) many additional cases of apparitions seen by multiple observers, contrary to the explanation of hallucination (discussed here and here); (3) many other cases of death-bed apparitions as discussed here and documented by researchers such as Haraldsson and Osis.
16. Contrary to claims that the brain is the source of human thinking and memory recall, a full analysis of the signal delaying factors in the human brain (such as synaptic delays and synaptic fatigue) shows that signals in the brain cannot be traveling fast enough to explain human thinking and human memory recall which can occur instantaneously.
17. The human brain experiences extremely severe levels of signal noise, so much signal noise that we should not believe that it is the brain that is producing human memory recall that can occur massively and flawlessly for people such as Hamlet actors and Wagnerian tenors.

These things all indicate that our minds and memory (or paranormal phenomena) must be the result of some spiritual or immaterial aspect of man or some soul aspect of man, in direct contradiction to the position of materialism that such a thing does not exist.



at July 06, 2019 No comments:

Labels: hemispherectomy, high mental function despite large brain damage

Tuesday, June 11, 2019

The Truth About Neurons and Synapses

NEURONS AND SYNAPSES ARE:

Very slow	Synaptic delays, synaptic fatigue and the slower transmission speed of dendrites should prevent brain signals in the cortex from traveling at much more than a snail's pace of about a centimeter per second.
Very volatile and unstable	Synapses and dendritic spines are made of proteins with lifetimes of only a few weeks or less, and individual synapses and individual dendritic spines don't last for years, unlike memories lasting decades.
Very noisy	There are many types of noise in neurons and synapses which should strongly inhibit reliable signal transmission.
Not addressable	There is no position location system in the brain by which some exact neural location could be looked up by using its address, to achieve fast recall.
Signal-suppressive	A synapse in the cortex will transmit a signal with a likelihood of between .1 and .5, which means brain signals are constantly being suppressed.
Disorganized	Neurons are like the spaghetti mess in a huge cafeteria pot, and are not highly grouped into organizational units like letters in a book or computer components.
Indistinct	No one has discovered any distinctive marks or signs of encoded information in neurons or synapses other than the DNA information about the same in every cell.
Neither readable nor writable	No one has been able to specify how episodic memory information could be written to or read from neurons or synapses.
Largely dispensable	There are many medical cases of people suffering little damage to their minds or memory even though they lost very much of their brains, as much as 50% or 75% or more.
For supporting information, see www.headtruth.blogspot.com	

We see above some of the reasons for thinking the human brain is not the source of the human mind, and is not the storage place of human memories. Click on the links in the left column for posts that support these claims.

The image below restates the same information:

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For supporting information, see www.headtruth.blogspot.com	

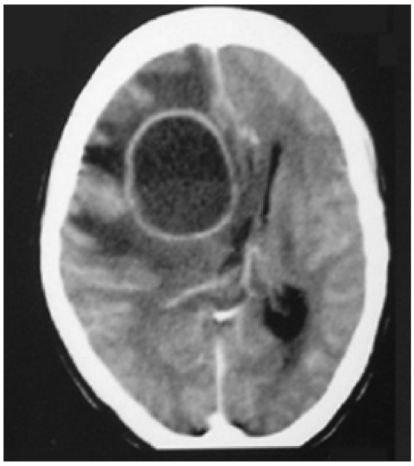
at June 11, 2019 No comments:

Sunday, May 26, 2019

More Evidence That Neuron Loss Has Little Effect on Cognition

The claim that the human mind is produced by the human brain has always been a speech custom of scientists, rather than an idea that has been established by observations. No one has any idea of how neurons might produce human mental phenomena such as abstract thinking and imagination. Contrary to the predictions of the idea that brains make minds, there are a huge number of case histories showing that human minds suffer surprisingly little damage when massive brain injury or loss of brain tissue occurs. I have published three long posts (here, here, and here) citing many such cases, including cases of epilepsy patients who had little loss of intelligence or memory after they lost half of their brains in a hemispherectomy operation to stop seizures, and patients who had above-average or near-average intelligence despite loss of most of their brains. I will now cite some additional cases of minds little affected by huge brain damage, cases I have not mentioned before.

The cases I will discuss are mainly referred to as abscesses. An abscess is an area of the brain that has experienced necrosis (cell death) because of infection or injury. A medical source refers to an abscess as "an area of necrosis," and another medical source defines necrosis as "the death of body tissue." If you do a Google image search for "abscess," you will see that a brain abscess generally appears as a dark patch in a brain scan. It is roughly correct to refer to an abscess as a brain hole, although the hole is a filled hole, filled mainly with pus, dead cells and fluid. An image of an abscess is below.



The two cases in the quoted paragraph below are reported on page 78 of the book *From the Unconscious to the Conscious* by physician Gustave Geley. You can read the book here. Astonishingly, Geley refers in the first sentence to a man who lived a year "without any mental disturbance" despite a great big brain abscess that left him with "a brain reduced to pulp":

"M. Edmond Perrier brought before the French Academy of Sciences at the session of December 22nd, 1913, the case observed by Dr R. Robinson; of a man who lived a year, nearly without pain, and without any mental disturbance, with a brain reduced to pulp by a huge purulent abscess. In July, 1914, Dr Hallopeau reported to the Surgical Society an operation at the Necker Hospital, the patient being a young girl who had fallen out of a carriage on the Metropolitan Railway. After trephining, it was observed that a considerable portion of cerebral substance had been reduced literally to pulp. The wound was cleansed, drained, and closed, and the patient completely recovered."

The following report (quite contrary to current dogmas about brains) was made in a Paris newspaper of a session of the Academy of Sciences on March 24, 1917, and is quoted by Geley on page 79 of his book:

"He mentions that his first patient, the soldier Louis R , to-day a gardener near Paris, in spite of the loss of a very large part of his left cerebral hemisphere (cortex, white substance, central nuclei, etc.), continues to develop intellectually as a normal subject,in despite of the lesions and the removal of convolutions considered as the seat of essential functions. From this typical case, and nine analogous cases by the same operator, known to the Academy, Dr Guepin says that it may now safely be concluded:
(i). That the partial amputation of the brain in man is possible, relatively easy, and saves certain wounded men whom received theory would regard as condemned to certain death, or to incurable infirmities.
(2). That these patients seem not in any way to feel the loss of such a cerebral region."

On page 80 of Geley's book we have the following astonishing case involving an abscess in the brain. We are told the boy had "full use of his intellectual faculties" despite a huge brain abscess and a detachment "which amounted to real decapitation":

"The first case refers to a boy of 12 to 14 years of age, who died in full use of his intellectual faculties although the encephalic mass was completely detached from the bulb, in a condition which amounted to real decapitation. What must have been the stupefaction of the operators at the autopsy, when, on opening the cranial cavity, they found the meninges heavily charged with blood, and a large abscess involving

nearly the whole cerebellum, part of the brain and the protuberance. Nevertheless the patient, shortly before, was known to have been actively thinking. They must necessarily have wondered how this could possibly have come about. The boy complained of violent headache, his temperature was not below 39 °C. (io2.2°F.) ; the only marked symptoms being dilatation of the pupils, intolerance of light, and great cutaneous hyperesthesia. Diagnosed as meningo-encephalitis."

On page 81 we learn of the following equally astonishing case involving a patient who "thought as do other men" despite having three large brain abscesses, each as large as a tangerine:

"A third case, coming from the same clinic, is that of a young agricultural labourer, 18 years of age. The post mortem revealed three communicating abscesses, each as large as a tangerine orange, occupying the posterior portion of both cerebral hemispheres, and part of the cerebellum. In spite of these the patient thought as do other men, so much so that one day he asked for leave to settle his private affairs. He died on re-entering the hospital."

These cases are quite consistent with more modern cases reported in recent decades, cases in which we also see very little loss of function despite massive brain damage. A 2015 scientific paper looked at 162 cases of surgery to treat brain abscess, in which parts of the brain undergo the cell death known as necrosis, often being replaced with a yellowish pus. The article contains quite a few photos of people with holes in their brains caused by the abscesses, holes in their brains of various sizes. The paper says that "complete resolution of abscess with complete recovery of preoperative neuro-deficit was seen in 80.86%" of the patients, and that only about 6% of the patients suffered a major functional deficit, even though 22% of the patients had multiple brain abscesses, and 30% of the abscesses occurred in the frontal lobe (claimed to be the center of higher thought).

Interestingly, the long review article on 162 brain abscesses treated by brain surgery make no mention at all of amnesia or any memory effects, other than to tell us that "there was short-term memory loss in 5 cases." If our memories really are stored in our brain, how come none of these 162 cases of brain abscesses seem to have shown an effect at all on permanent memories?

Similarly, a scientific paper on 100 brain abscess cases (in which one fourth of the patients had *multiple* brain abscesses) makes no mention of any specific memory effect or thinking effect. It tells us that most of the patients had "neurological focal deficits," but that's a vague term that doesn't tell us whether intellect or memory was affected. (A wikiepdia.org article says that such a term refers to "impairments of nerve, spinal cord, or brain function that affects a specific region of the body, e.g. weakness in the left arm, the right leg, paresis, or plegia.") The paper tells us that after treatment "80 (83.3%) were cured, eight (8.3%) died (five of them were in coma at admission), seven had a relapse of the abscess," without mentioning any permanent loss of memory or mental function in anyone.

Another paper discusses thousands of cases of brain abscesses, without mentioning any specific thinking effects or memory effects. Another paper refers to 49 brain abscess patients, and tells us that "the frontal lobe was the most common site," referring to the place that is claimed to be a "seat of thought" in the brain. But rather than mentioning any great intellectual damage caused by these brain holes, the paper says that 39 of the patients “recovered fully or had minimal incapacity,” and that five died.

In 1994 Simon Lewis was in his car when it was struck by a van driving at 75 miles per hour. The crash killed Lewis' wife, and “destroyed a third of his right hemisphere” according to this press account. Lewis remained in coma for 31 days, and then awoke. Now, many years later, according to the press account, “he actually has an IQ as high as the one he had before the crash.” In 1997, according to the press account, Lewis had an IQ of 151, which is 50% higher than the average IQ of 100. How could someone be so smart with such heavy brain damage, if our brains are really the source of our minds?

These cases are merely a small part of the evidence that large brain damage very often produces only very small effects on mind and memory. The three posts here and here and here give many other cases along the same lines, some suggesting even more dramatically that a large fraction of the brain (often as much as 50% and sometimes as much as 80%) can be lost or removed without causing much memory loss or preventing fairly normal mental function and memory function. The facts of neuroscience do not match the dogmas of neuroscientists, who make unwarranted “brains store memories” and “brains make minds” claims that are in conflict with facts such as medical case histories of high brain damage with little mind damage, the short lifetimes of the proteins that make up synapses, the low signal transmission reliability of noisy synapses, and the failure of scientists to detect any sign of encoded information (other than DNA gene information) in brains.

A study published in December, 2018 attempted to draw a link between neural parameters (such as cortical thickness and neuron size) and intelligence. The study failed to present any convincing evidence for such a thing. The study involved only a few dozen subjects, and the neurons analyzed were a few dozen neurons arbitrarily chosen. Given the freedom to make 100 comparisons chosen as you wish from a mass of data, you can produce weak correlations suggesting whatever hypothesis you favor. An example of the very weak correlations in the paper is Figure 2D in the paper, which attempts to show a correlation between cortical thickness and IQ. But if you click on the "see more" link, you will see the correlation measure (R squared) is only .15, which is basically no real evidence of a correlation (as explained here), particularly in a sample size so small. When there is good evidence for a correlation, you have an R squared such as .5 or .7. Similarly weak correlations (with an R squared average of only .19) are presented in 4 other graphs.

But there is in the paper evidence that conflicts with the whole idea that brains produce minds. That evidence is found in Table 1, which lists the IQ scores of people with serious brain tumors requiring surgery. The IQ tests were taken shortly before the surgery, and tell us about the intelligence of the people after their brains were devastated by tumors. Here are the IQ scores of the people with brain tumors: 88, 119, 88, 107, 125, 84, 110, 97, 77, 83, 102, 99, 82, and 114. This gives us an average of 98, which is only very slightly smaller than the average IQ of 100. The figures are not what we would expect from the claim that the brain produces intelligence, and the figures are consistent with the hypothesis that brain tumors do not have a large effect on intelligence. Similar results are found in this paper, in which 49 brain tumor patients were found (in pre-surgical IQ tests) to have an average IQ of 95.4. We can easily account for the slightly-below-average scores by simply assuming that in these brain tumor patients there would often be visual perception problems, muscular coordination problems, psychological distress, and head pain problems, which would tend to slightly decrease scores in pencil-and-paper IQ tests, without there actually being a decrease in intelligence.

Discussing hemispherectomy operations in which half of a brain is removed to stop seizures, the paper here states, "Others, (Ogden, 1988; Riva & Gazzaniga, 1986; Vargha-Khadem et al., 1997a; Verity, 1982) have reported excellent, even normal linguistic abilities after hemispherectomy of either side" of the brain. An interesting scientific paper is entitled, "When only the right hemisphere is left: Studies in language and communication." The study gives us an in-depth analysis of a subject named BL who had half of his brain removed (the left half) in a hemispherectomy operation to reduce seizures. The paper tells us that BL is "above normal intelligence" and that he graduated from college with a double major in business and sociology. In a battery of tests of memory and language, the subject showed normal results, with only slight, subtle defecits. He scored above-average on a few memory-related tests, such as the Boston Naming Test and the Famous Names and Faces test. We are told, "Regarding speech, language, and communicative function, BL's performance appears grossly normal in pronunciation, grammar, semantics, and usage."

A study such as this helps to debunk dogmas such as the dogma that the brain is the source of our minds. You can read about many similar cases by following the links above. Referring to patients who had half of their brains removed in hemispherectomy operations, the paper states, "The numerous observations on cognitively intact persons hemispherectomized in childhood bring to mind the report of Lorber (1983) on hydrocephalic adults, whose brains are constituted of only a thin layer of cerebral tissue, and yet who enjoy normal or superior motor and cognitive abilities." Talking about the small effect of hemispherectomy operations in which half of a brain is removed, a doctor states, "When you take out half of their brain in one sitting it's as if they weren't touched." When will our neuroscientists start putting two and two together to reach the conclusion that is taught by such observational facts?

at May 26, 2019 No comments:

Labels: high mental function despite large brain damage

Thursday, April 11, 2019

Synaptic Delays Mean Brain Signals Must Move at a Snail's Pace

Scientists have long advanced the claim that the human brain is the storage place for memories and the source of human thinking. But such claims are speech customs of scientists rather than things they have proven. There are numerous reasons for doubting such claims. One big reason is that the proteins in synapses have an average lifetime of only a few weeks, which is only a thousandth of the length of time (50 years or more) that humans can store memories. Another reason is that neurons and synapses are way too noisy to explain very accurate human memory recall, such as when a *Hamlet* actor flawlessly recites 1476 lines. Another general reason can be stated as follows: the human brain is too slow to account for very fast thinking and very fast memory retrieval.

Consider the question of memory retrieval. Given a prompt such as a person's name or a very short description of a person, topic or event, humans can accurately retrieve detailed information about such a topic in one or two seconds. We see this ability constantly displayed on the long-running television series *Jeopardy*. On that show, contestants will be given a short prompt such as "This opera by Rossini had a disastrous premier," and within a second after hearing that, a contestant may click a buzzer and then a second later give an answer mentioning *The Barber of Seville*. Similarly, you can play with a well-educated person a game you can call "Who Was I?" You just pick random names of actual people from the arts or history, and require the person to identify the person within about two seconds. Very frequently a person will succeed. We can imagine a session of such a game, occurring in only ten seconds:

John: Marconi.
Mary: Invented the radio.
John: Magellan.
Mary: First to sail around the globe.
John: Peter Falk.
Mary: A TV actor.

We can also imagine a visual version of this game, in which you identify random pictures of any of 1000 famous people. The answers would often be just as quick.

The question is: how could a brain possibly achieve retrieval and recognition so quickly? Let us suppose that the information about some person is stored in some particular group of neurons somewhere in the brain. Finding that exact tiny storage location would be like finding a needle in a haystack, or like finding just the right index card in a swimming pool full of index cards. It would also be like opening the door of some vast library with a million volumes and instantly finding the exact volume you were looking for.

There are certain design features that a system can have that will allow for very rapid retrieval of information. One of these features is an indexing system. An indexing system requires a position notation system, in which the exact position of some piece of information can be recorded. An ordinary textbook has both of these things. The position notation system is the page numbering system. The indexing system is the index at the back of the book. But the brain has neither of these features. There is nothing in the brain like a position notation system by which the exact position of some tiny group of neurons can be identified. The brain has no neuron numbers, and a brain has no coordinate system similar to street names in a city or Cartesian coordinates in a grid. Lacking any such position notation system, the brain has no indexing system (something that requires a position notation system).

So how is it that humans are able to recall things instantly? It seems that the brain has nothing like the speed features that would make such a thing possible. You can't get around such a difficulty by claiming that each memory is stored everywhere in the brain. There would be two versions of such an idea. The first would be that each memory is entirely stored in every little spot of the brain. That makes no more sense than the idea of a library in which each page contains the information in every page of every book. The second version of the idea would be that each memory is broken up and scattered across the brain. But such an idea actually worsens the problem of explaining memory retrieval, as it would only be harder to retrieve a memory if it is scattered all over your brain rather than in a single little spot of your brain.

We also cannot get around this navigation problem by imagining that when you are asked a question, your brain scans all of its stored information. That doesn't correspond to what happens in our minds. For example, if someone asks me, "Who was Teddy Roosevelt," my mind goes instantly to my memories of Teddy Roosevelt, and I don't experience little flashes of knowledge about countless other people, as if my brain were scanning all of its memories.

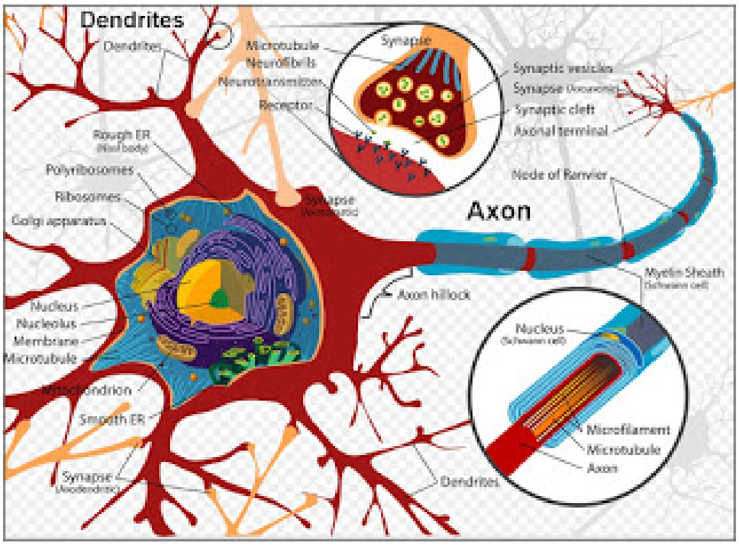
When we consider the issue of decoding encoded information, we have an additional strong reason for thinking that the brain is way too slow to account for instantaneous recall of learned information. In order for knowledge to be stored in a brain, it would have to be encoded or translated into some type of neural state. Then, when the memory is recalled, this information would have to be decoded: it would have to be translated from some stored neural state into a thought held in the mind. This requirement is the most gigantic difficulty for any claim that brains store memories. Although they typically maintain that memories are encoded and decoded in the brain, no neuroscientist has ever specified a detailed theory of how such encoding and decoding could work. Besides the huge difficulty that such a system of encoding and decoding would require a kind of "miracle of design" we would never expect for a brain to ever have naturally acquired (something a million times more complicated than the genetic code), there is the difficulty that the decoding would take quite a bit of time, a length of time greater than the time it takes to recall something.

So suppose I have some memory of who George Patton was, stored in my brain as some kind of synapse or neural states, after that information had somehow been translated into synapse or neural states using some encoding scheme. Then when someone asks, "Who was George Patton?" I would have to not only find this stored memory in my brain (like finding a needle in a haystack), but also translate these synapse or neural states back into an idea, so I could instantly answer, "The general in charge of the Third Army in World War II." The time required for the decoding of the stored information would be an additional reason why instantaneous recall could never be happening if you were reading information stored in your brain. The decoding of neurally stored memories would presumably require protein synthesis, but the synthesis of proteins requires minutes of time.

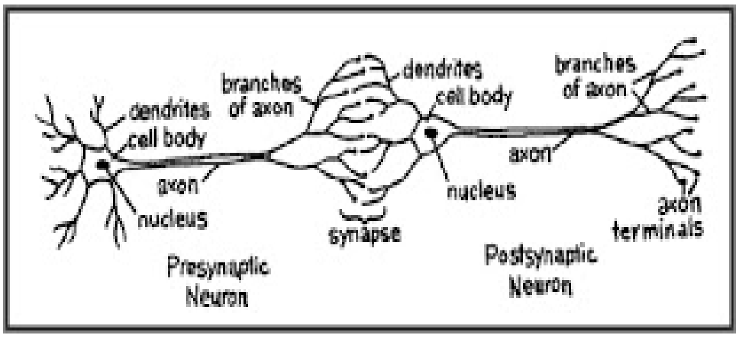
There is another reason for doubting that the brain is fast enough to account for human mental activity. The reason is that the transmission of signals in a brain is way, way too slow to account for the very rapid speed of human thought and human memory retrieval.

Information travels about in a modern computer at a speed thousands of time faster than nerve signals travel in the human brain. If you type in "speed of brain signals" into the Google search engine, you will see in large letters the number 286 miles per hour, which is a speed of 128 meters per second. This is one of many examples of dubious information which sometimes pops up in a large font at the top of the Google search results. The particular number in question is an estimate made by an anonymous person who quotes no sources, and one who merely claims that brain signals "can" travel at such a speed, not that such a speed is the average speed of brain signals. There is a huge difference between the average speed at which some distance will be traveled and the maximum speed that part of that distance can be traveled (for example, while you may briefly drive at 40 miles per hour while traveling through Los Angeles, your average speed will be much, much less because of traffic lights).

A more common figure you will often see quoted is that nerve signals can travel in the human brain at a rate of about 100 meters per second. But that is the maximum speed at which such a nerve signal can travel, when a nerve signal is traveling across what is called a myelinated axon. Below we see a diagram of a neuron. The axons are the tube-like parts in the diagram below.



The less sophisticated diagram below makes it clear that axons make up only part of the length that brain signals must travel.



There are two types of axons: myelinated axons and non-myelinated axons (myelinated axons having a sheath-like covering shown in blue in the diagram above). According to this article, non-myelinated axons transmit nerve signals at a slower speed of only .5-2 meters per second (roughly one meter per second). Near the end of this article is a table of measured speed of nerve signals traveling across axons in different animals; and in that table we see a variety of speeds varying between .3 meters per second (only about a foot per second) and about 100 meters per second.

But from the mere fact that nerve signals can travel across myelinated axons at a maximum speed of about 100 meters per second, we are not at all entitled to conclude that nerve signals typically travel from one region of the brain to another at 100 meters per second. For nerve signals must also travel across dendrites and synapses, which we can see in the diagrams above. It turns out that nerve signal transmission is much slower across dendrites and synapses than across axons. To give an analogy, the axons are like a road on which you can travel fast, and the dendrites and synapses are like traffic lights or stop signs that slow down your speed.

According to neuroscientist Nikolaos C Aggelopoulos, there is an estimate of 0.5 meters per second for the speed of nerve transmission across dendrites (see here for a similar estimate). That is a speed 200 times slower than the nerve transmission speed commonly quoted for myelinated axons. According to Bratislav D. Stefanovic, MD, the conduction speed across dendrites is between .1 and 15 meters per second. Such a speed bump seems more important when we consider a quote by UCLA neurophysicist Mayank Mehta: "Dendrites make up more than 90 percent of neural tissue." Given such a percentage, and such a conduction speed across dendrites, it would seem that the average transmission speed of a brain must be only a small fraction of the 100 meter-per-second transmission in axons.

Besides this "speed bump" of the slower nerve transmission speed across dendrites, there is another "speed bump": the slower nerve transmission speed across synapses (which you can see in the top "close up" circle of the first diagram above). There are two types of synapses: chemical synapses and electrical synapses. The parts of the brain allegedly involved in thought and memory have almost entirely chemical synapses. (The sources here and here and here and here and here refer to electrical synapses as "rare." The neurosurgeon Jeffrey Schweitzer refers here to electrical synapses as "rare." The paper here tells us on page 401 that electrical synapses -- also called gap junctions -- have only "been described very rarely" in the neocortex of the brain. This paper says that electrical synapses are a "small minority of synapses in the brain.")

We know of a reason why transmission of a nerve signal across chemical synapses should be relatively sluggish. When a nerve signal comes to the head of a chemical synapse, it can no longer travel across the synapse electrically. It must travel by neurotransmitter molecules diffusing across the gap of the synapse. This is much, much slower than what goes on in an axon.

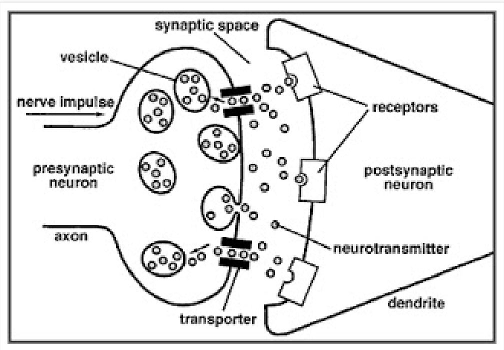


Diagram of a synapse

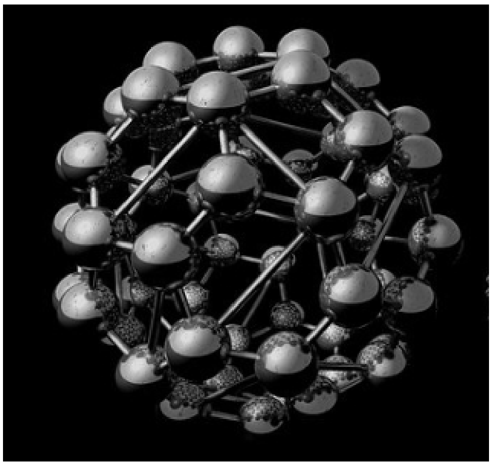
There is a scientific term used for the delay caused when a nerve signal travels across a synapse. The delay is called the *synaptic delay*. According to this 1965 scientific paper, most synaptic delays are about .5 milliseconds, but there are also quite a few as long as 2 to 4 milliseconds. A more recent (and probably more reliable) estimate was made in a 2000 paper studying the prefrontal monkey cortex. That paper says, "the synaptic delay, estimated from the *y*-axis intercepts of the linear regressions, was 2.29" milliseconds. It is very important to realize that this synaptic delay is *not* the total delay caused by a nerve signal as it passes across different synapses. The synaptic delay is the delay caused each and every time that the nerve signal passes across a synapse.

Such a delay may not seem like too much of a speed bump. But consider just how many such "synaptic delays" would have to occur for, say, a brain signal to travel from one region of the brain to another. It has been estimated that the brain contains 100 trillion synapses (a neuron may have thousands of them). So it would seem that for a neural signal to travel from one part of the brain to another part of the brain that is a distance away only 5% or 10% of the length of the brain, that such a signal would have to endure many thousands of such "synaptic delays" requiring a total of quite a few seconds of time.

An average male human brain has about 1300 cubic centimeters. Let's try to calculate the minimum number of synapses that would have to be sequentially traversed in order for a neural signal to travel through a volume of only 1 cubic centimeter (.39 of an inch).

If there are 100 trillion synapses in a brain of 1300 cubic centimeters, then the number of synapses in this volume of 1 cubic centimeter would be roughly 100 trillion divided by 1300, which gives 77 billion. (This page gives an estimate of 418 billion synapses per cubic centimeter, but notes that estimates of synapse density vary; so let's just stick with the smaller number.)

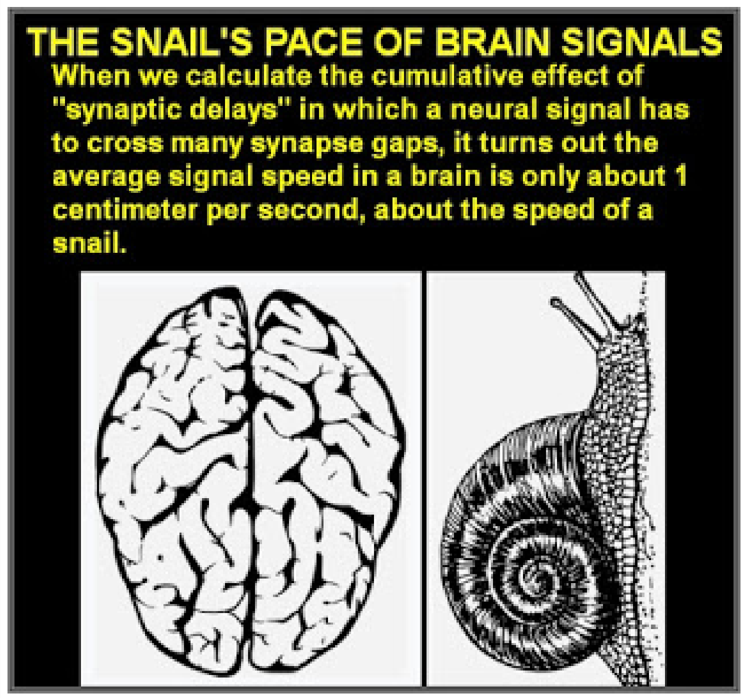
It would be a big mistake to assume that a neural signal would have to *sequentially* traverse all those 77 billion synapses. To traverse the shortest path across this area, the signal would have to merely pass through a number of synapses that is roughly the cube root of the total number of synapses in this volume (the number that you would have to multiply by itself three times to get the total number of synapses in this volume). Similarly, if we imagine a ball with 64 equally spaced connected nodes, including nodes in the center, something rather like the ball shown below, then it is clear that the shortest path between any one node at the outer edge of the ball to another node on the opposite end of the ball would require that you traverse a number of nodes that is at least the cube root of 64, which is 4.



So to roughly compute the shortest series of synapses that would have to be traversed for a brain signal to travel though this 1 cubic centimeter volume, we can take the cube root of 77 billion (the number that multiplied by itself three different times equals 77 billion). The cube root of 77 billion is 4254. So it seems that to traverse the shortest path through a volume of 1 cubic centimeter containing 77 billion synapses, traveling a distance of about 1 cubic centimeter, a neural signal would have to pass sequentially through a path containing at least 4000 different synapses (along with other neural elements such as dendrites).

To calculate how long this traversal would take across a 1 cubic centimeter region of the brain, considering only the dominant delay factor of synaptic delays, we can simply multiply this number of 4000 by the synaptic delay (the time needed for the signal to cross a single synaptic gap). Using the smallest estimate of the synaptic delay (an estimate from 1965 of about .5 millisecond), and ignoring the more recent year 2000 estimate of 2.29 milliseconds for the synaptic delay, this gives us a total time of 4000 multiplied by .5 millisecond. This gives us a total time of two seconds (2000 milliseconds) for how long it would take a nerve signal to travel across one cubic centimeter of brain tissue. The velocity of nerve signal speed we get from this calculation is a speed of less than 1 centimeter per second (it's actually a speed of a half a centimeter per second).

Take careful note that this speed is more than 10,000 times slower than the "100 meters per second" figure that is given by some experts when they are asked about how fast a brain signal travels. Such an expert answer is very misleading, because it only calculates the fastest speed that a nerve signal can travel inside the brain, while it is traveling through the fastest tiny parts of the brain (myelinated axons), not the average speed of such a brain signal as it passes through different types of brain tissue and many different synapses. It turns out that because of the "speed bump' of synaptic delays, the average speed of a nerve signal traveling though the brain should be about 20,000 times slower than "100 meters per second" -- a slowpoke speed of about a half of a centimeter per second. That's half the maximum speed at which a snail can move. If I had used the year 2000 estimate of the synaptic delay (2.29 milliseconds), I would have got a speed estimate for brain signals that is only about .125 centimeters per second, which is one eighth the speed of a moving snail.



This calculation is of the utmost relevance to the question of whether the brain is fast enough to account for extremely rapid human thinking and instantaneous memory retrieval. Based on what I have discussed, it seems that signal transmission across regions of the brain should be very slow -- way too slow to account for very fast thinking and instantaneous recall and recognition.

Many a human can calculate as fast as he or she can recall. For example, the Guinness world record web site tells us, "Scott Flansburg of Phoenix, Arizona, USA, correctly added a randomly selected two-digit number (38) to itself 36 times in 15 seconds without the use of a calculator on 27 April 2000 on the set of Guinness World Records in Wembley, UK." Such speed cannot be explained as the activity of a brain in which signals literally move at a less than a snail's pace.

To give another example, In 2004 Alexis Lemaire was able to calculate in his head the 13th root of this number:

85,877,066,894,718,045, 602,549,144,850,158,599,202,771,247,748,960,878, 023,151, 390,314,284,284,465,842,798,373,290,242,826,571,823,153, 045,03 0,300,932,591,615,405,929,429,773,640,895,967,991,430,381,763,526,613,35 7,308,674,592,650,724,521,841,103,664,923,661,204,223

In only 77 seconds, according to the BBC, Lemaire was able to state that it is the number 2396232838850303 which when multiplied by itself 13 times equals the number above. Here we have calculation speed far beyond anything that could be possible if calculation is done by a brain in which signals travel at less than a snail's pace.

In this matter it seems our neuroscientists have acted as if they were afraid to put two and two together. They have measured the speed of brain signal transmission in axons, dendrites and synapses. But I find a curious avoidance in neuroscience literature of the basic topic of the average time it should take a signal to travel across one region of the brain to another. It's like our neuroscientists are afraid to do the math which might lead them to the conclusion that signals cannot travel from one random brain region to another nearby region at a rate of more than an inch a second. For if they were to do such math, their claim that brains are the source of our thinking and recall would be debunked.

Echoing part of what I have said here, a textbook says "the cumulative synaptic delay may exceed the propagation time along the axons." But why aren't scientists more explicit, by telling us that this cumulative synaptic delay will actually exceed the propagation time along the axons by a factor of more than 1000, leading to "snail's pace" brain signals? Another source vaguely tells us that "cumulative synaptic delay would affect the speed of information processing at every level of cognitive complexity" without mentioning what a crippling effect this would be if our brains were doing thinking and recall.

I may note whenever a neuroscientist answers a question such as "how fast do brain signals travel" by mentioning only the fastest rate at which a brain signal can travel through the fastest little parts of the brain (through a myelinated axon), such as neuroscientists typically do, such an answer is either deceptive or very clumsy. It's like answering the question "how fast can you travel across Manhattan" by citing the maximum speed limit on any Manhattan cross-street such as 42nd Street, without considering all the delays caused by traffic lights. Synaptic delays are comparable to traffic light delays, and they are a factor that must be calculated when realistically considering how fast a brain signal typically travels inside the brain.

It is interesting that both this 1979 scientific paper and this 2008 scientific paper estimate the number of synapses in the human cortex as being about a billion per cubic millimeter, which equals a trillion per cubic centimeter. This is 10+ times greater than the 77 billion per cubic centimeter figure I was using above. The more synapses, the more speed bumps, and the slower the brain signal. If I had done the brain speed calculation specifically for cortex tissue (the supposed center of higher thought), the calculation would have come up with a brain signal speed very much slower than the half a centimeter per second result that was reached.

To sum up, we have several gigantic reasons for thinking that brains must be too slow to account for instantaneous recall:

(1) Finding the exact little spot where a memory was stored would be like finding a needle in a haystack, given the lack of any indexing system or position coordinate system in the brain.
(2) Decoding stored memories from encoded neural states would take additional time that would make neural memory recall much less than instantaneous.
(3) The "snail's pace" speed of brain signals (greatly slowed by synaptic delays) would prevent an instantaneous recall of memories and stored information such as humans often have.

The slowness of the brain is one of many neuroscience reasons for believing that the brain cannot be the storage place of our memories, and cannot be the source of our thinking and consciousness. Human mentality must be primarily a psychic or spiritual or non-biological reality rather than a neural reality.

I can imagine various ways in which a person could try to rebut some of the argumentation in this post, Someone could simply say that we know that signals must travel very fast in a brain, because humans are able to recall things instantly or recognize things instantly. But we do not at all know that recognition or recall are actually effects produced by the brain, and we have good reasons for doubting that they are (such as the short lifetimes of synapse proteins and the fact that the high noise levels in brains and synapses is incompatible with the fact that humans such as Hamlet actors can flawlessly recall very large bodies of memorized information). So we cannot use the speed of recognition or recall to deduce the speed of brain signals.

Another way you could try to rebut this post would be to cite some expert who estimated how fast signals move about in a brain. But further analysis would generally show that such an estimate was not derived from a calculation of all the low-level factors (such as synaptic delay) affecting the speed of brain signals, but was simply a calculation based on the assumption that brains must pass about signals at the speed at which humans recognize or recall things or respond to things. We cannot use such circular reasoning or "begging the question" when considering this matter. The only intelligent way to calculate the speed of a brain signal is to do a calculation based on low-level things (such as synaptic delays) that we definitely know, rather than starting out making grand assumptions about the mind and brain that are unproven and actually discredited by the very low-level facts (such as the length of synaptic delays) that should be examined.

Although neuroscientists typically claim that synapses are where memories are stored in the brain, there are four ways in which the characteristics of synapses are telling us that thinking and memory is not brain-caused:

(1) Synapses show no signs of having stored information, and their main structural feature (the disorganized little blob or bag that is the synaptic knob or head) seems like pretty much the last type of structure we'd expect to see in something storing information for decades.
(2) Synapses are unstable units undergoing spontaneous remodeling, and synapses consist of proteins with average lifetimes of only a few weeks, only a thousandth of the maximum length of time that humans store memories.
(3) Synapses are very noisy, so noisy that one expert tells us that a signal passing through a synapse "makes it across the synapse with a probability like one half, or even less," making synapses unsuitable as reliable transmitters of memory information that humans such as Wagnerian tenors can recall abundantly with 100% accuracy. Given such noise levels, which would seem to have the effect of rapidly extinguishing brain signals, there would seem to be good reason for suspecting that it is effectively impossible for brain signals to travel more than a centimeter or an inch without vanishing or becoming mere tiny traces of their original strength.
(4) The most common type of synapse is slow, and although the synaptic delay in a single synapse is only about a millisecond, when we calculate the cumulative synaptic delay we find that brain signals must be slower than a snail's pace, way too slow to explain instantaneous recall and fast thinking.

In fact, if some designer of the human body had specifically designed something to tell us (by its characteristics) that our brains cannot be the source of our fast thinking and instantaneous memory, it's rather hard to imagine anything that would do a better job of telling us that than our signal-slowing, very noisy, unstable synapses. Our synapses are telling us (by their characteristics) that thinking and memory is not brain-caused, but our neuroscientists (trapped in ideological enclaves of dogma and reigning speech customs) aren't listening to what our synapses are telling us.

Postscript: I may note that you do not get a much faster estimate for the speed of brain signals if you calculate the speed from one neuron to the nearest neuron, rather than the speed through a cubic centimeter. The speed is the same snail's pace I have calculated, because the signal will always have to pass through synapses that are the dominant slowing factor.

There is an entirely different method you could use to calculate the speed of signals inside the brain, using not estimates of the number of synapses per cubic centimeter, but instead the average distance between neurons. This paper mentions an average distance of about 26 micrometers between neurons in a rat cortex, and it says, "we believe that the parameter of 26 µm [micrometers] average distance between neurons is also a valid assumption in the human brain." I assume that by "average distance between neurons" this source means the average distance between two adjacent neurons. Below are some calculation figures that we get if we use this average distance figure, and we use a synaptic delay estimate that is about the average of the .5 millisecond and 2.29 millisecond estimates quoted above.

Average distance between neurons in micrometers	26
This distance in centimeters	0.0026
Synaptic delay in milliseconds	1
Time needed to cross distance above (in seconds), considering only the synaptic delay	.001
Total distance that could be traversed by a brain signal in a second	1000*0.0026 centimeter=2.6 centimeter
Signal speed between adjacent neurons in centimeters per second	2.6

Using this method, we get a result in the same ballpark as the result calculated by my first method. The first method found that brain signals travel at a rate of about .5 centimeters per second, and this method finds that brain signals travel at about 2.6 centimeters per second, which is about an inch per second. Either way, this speed is way too slow to account for instantaneous recall and very rapid thinking.

A most-realistic estimate of brain signal speed would also take into account two other factors ignored in the calculations above (and also ignored by neuroscientists when discussing the speed of brain signals):
(1) The noise in synapses, and the fact that in the cortex, signal transmission across synapses is highly unreliable. A scientific paper says, "In the cortex, individual synapses seem to be extremely unreliable: the probability of transmitter release in response to a single action potential can be as low as 0.1 or lower." Considered over a large section of brain tissue, this unreliability would be equivalent to a big additional slowing factor, and might well lead to speed estimates much lower than I have made here.
(2) Synaptic fatigue, a temporary inability of the head or vesicle of a synapse to send a signal, because of a depletion of neurotransmitters. Referring to synaptic fatigue, one paper states the following:

By contrast, following neurotransmission, synaptic vesicle membranes are internalized within seconds, and the recycled synaptic vesicles can be reloaded with neurotransmitter within 1–2 minutes.

This paper mentions a much shorter "timescale of vesicle recovery" of 800 milliseconds, but even that would be a large slowing factor, making it all the more unlikely that brain signals inside the cortex can regularly travel about at much more than about a centimeter per second.

There are two other factors I didn't mention in my original post, both tending to further slow the speed of a signal from one end of the brain to another:

(1) **Tortuosity**: the fact that a shortest path between two different brain areas is typically a sinuous, snake-like path rather than a straight line (tortuosity is the technical term for such a thing).
(2) **Folding of cerebral tissue**: the surface area of cerebral tissue is much larger than you might think by looking at the top of a head; and a brain signal can't travel a straight line between these folds.

So below is a list of all of the factors that must be considered when considering the true speed of signals between two opposite areas of the brain:
(1) The speed of transmission through dendrites, which can be 200 or more times slower than the "100 meters per second" estimate based on transmission through axons.
(2) Synaptic delays, which end up being a huge slowing factor because so many synapses must be traversed.
(3) Synaptic unreliability or noise, the fact that a signal is often transmitted with only between 10% to 50% likelihood, a factor that is typically ignored but which has a huge impact on effective speed.
(4) Synaptic fatigue, the fact that a synapse will so often need a rest period after firing, a period that can be more than a minute.
(5) Tortuosity, the fact that nerve signals must travel through sinuous paths that are not straight lines.
(6) Folding of cortex tissue, a further slowing factor.

Every one of these factors is ignored by 95% of discussions of brain signal speed in the popular press.

A 2011 LiveScience.com article is entitled "Speed of Brain Cell Chatter Clocked for the First Time." Buried within the article is a fact that corroborates what I have said in this post. The article discusses an experiment in which scientists clocked signal speed in mouse brains, by tagging neurotransmitters with a fluorescent protein. The article reports, "On average, it takes about five seconds for the cells to collect up the neurotransmitters and this timeframe didn't vary much between a cell's different synapses." This is the only speed figure given by the article. Since the article was talking about a mouse brain (no larger than about two centimeters across), this is exactly the "snail's pace" signal transmission rate that I have claimed in this post, a pace of roughly one centimeter per second.

at April 11, 2019 No comments:

Labels: brain signal speed, memory recall

Head Truth

The huge case for thinking minds do not come from brains

Saturday, September 21, 2019

The Dubious Dogma That Brains Make Decisions

Neuroscientists like to claim that thoughts and ideas come from your brain, that your memories are stored in your brain, and that when you remember you are retrieving information from your brain. I have discussed in other posts why such claims are not well founded in observations, and why there are strong reasons for rejecting or doubting all such claims. In this post I will discuss another dogmatic claim made about the brain: the claim that the brain is the source of human decisions. I will discuss eight reasons for thinking that this claim is no better founded than dogmatic claims about the brain being the storage place of memories or the source of human abstract thoughts.

Reason #1: Scientists have no understanding of how neurons could make a decision.

When they try to present low-level explanations for a how a brain could do some of the things that they attribute to brains, our neuroscientists falter and fail. An example is their complete failure to credibly explain either how memories could be encoded in neural states, how memories could be permanently stored in brains, or how memories could be instantly recalled by brains. Neuroscientists also cannot credibly explain how a person could make a decision when faced with multiple choices.

When I did a Google search for "what happens in the brain when a decision is made," I got a bunch of articles with confident sounding titles. But reading the stories I read mainly what sounded like bluffing, hype, promissory sounds, and the kind of talk someone uses to persuade you he understands something he doesn't actually understand (along with some references to brain scanning studies that aren't robust for reasons discussed later in this post). At no one point in these articles do we ever reach someone who makes us think, "This guy really understands how a brain could reach a decision."

Let us consider a simple example. Joe says to himself, “Today I can either go to the library or go to see a movie.” He then decides to go to the library, and then starts walking towards the library.

To explain this neurally, we would have to explain several different things:

Item 1: How Joe's brain could hold two different ideas, the idea about the possibility of going to the movie, and the idea of going to the library.
Item 2: The appearance in Joe's brain of a third idea, an idea that he will go today to the library.
Item 3: Some neural act that causes his muscles to move in a way corresponding to his idea about going to a library.

The first two of these things cannot be credibly explained through any low-level explanation involving neurons or synapses. See my post “No One Understands How a Brain Could Generate Ideas” for a discussion of the failure of neuroscientists to present any credible explanations of how brains could

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- Your Physical Structure Did Not Arise Bottom-Up, So Why Think Your Mind Did?
- The Brain Seems to Have No Mechanism for Reading or Writing Memories
- No One Understands How a Brain Could Generate Ideas
- 30 Reasons for Rejecting the Theory of Neural Memory Storage
- Groupthink and Peer Pressure Make It Taboo for Neuroscientists to Put Two and Two Together
- Synaptic Delays Mean Brain Signals Must Move at a Snail's Pace
- Brain Dogmas Versus Case Histories That Refute Them
- In Neuroscience Papers Bluffing Is More Common Than Candor
- Young Age of Languages Contradicts Claims of Neural Storage of Linguistic Information

generate ideas. In that post, I cite some “expert answers” pages on which the experts address exactly the question of how a brain could generate ideas, and sound exactly as if they have no understanding of such a thing.

On one of the “expert answers” pages that I cite, we have this revealing answer:

“ *'How does the 'brain' forms new ideas?' is the wrong question. We don't actually know how the brain codes* old *ideas.”*

That is correct, which means that neither Item 1 in my list above can be explained neurally, nor Item 2. Since we do not understand how a brain could either hold ideas or form new ideas, we do not have any understanding of how a brain could make a decision.

Reason #2: Hemispherectomy patients can still make decisions just fine.

Hemispherectomy is an operation done on patients with severe epileptic seizures. In an hemispherectomy operation, half of the brain is removed. I can find no studies that have specifically studied decision-making ability in hemispherectomy patients. However, I have cited here and here and here and here scientific papers that show results for intelligence tests taken “before” and “after” a hemispherectomy operation. Such papers show, surprisingly, that removing half of a brain has little effect on intelligence as measured in IQ tests.

Written IQ tests are typically tests of not just intelligence but also decision making ability. For example, the Wechsler IQ test is by far the most common one used by scientists, and it is a multiple-choice test. Every single time a person has to pencil in one of the little ovals in a multiple-choice test, he has to make a decision. So standard IQ tests are very much tests of not just intelligence but also decision-making ability (which may be considered an aspect of intelligence).

Since IQ tests done on hemispherectomy patients show little damage to IQ scores after removing half of a brain, we can only conclude that removing half of a brain has little or no effect on decision making ability. We would not expect such a thing to be true if your brain is what makes your decisions.

Reason #3: Some people who lost most of their brains could still make decisions normally.

Cases of removal of half of the brain by surgical hemispherectomy are not at all the most dramatic cases of brain damage known to us. There are cases of patients who lost almost all of their brains due to diseases such as hydrocephalus, a disease that converts brain tissue to a watery fluid. Many such cases were studied by the physician John Lorber. He found that most of his patients were actually of above-average intelligence. Similarly, a French person working as a civil servant was found in recent years to have almost no functional brain.

Such cases seem to show that you can lose more than 75% of your brain and still have a normal decision making ability. This argues against claims that your brain is what is making your decisions.

Reason #4: Split brain patients don't have their decision making harmed.

The two hemispheres of the brain are connected by a set of thick fibers called the corpus callosum. In rare operations this set of fibers is surgically severed. The result is what called a split-brain patient. Despite the erroneous claims that are sometimes made about this topic, the fact is that such an operation absolutely does not result in anything like a split personality or a split consciousness or a split mind. Such an operation does not result in two minds causing conflicting decisions.

The scientific paper here (entitled "The Myth of Dual Consciousness in the Brain") sets the record straight, as did a scientific study published in 2017. The research was done at the University of Amsterdam by Yair Pinto. A press release entitled "Split Brain Does Not Lead to Split Consciousness" stated, "The researchers behind the study, led by UvA psychologist Yair Pinto, have found strong evidence showing that despite being characterised by little to no communication between the right and left brain hemispheres, split brain does not cause two independent conscious perceivers in one brain." Their study (entitled "Split brain: divided perception but undivided consciousness") can be read here. "We have shown that severing the cortical connections between the two brain hemispheres does not seem to lead to two independent conscious agents within one brain," the researchers said.

In 2014 the wikipedia.org article on split-brain patients stated the following:

"*In general, split-brained patients behave in a coordinated, purposeful and consistent manner, despite the independent, parallel, usually different and occasionally conflicting processing of the same information from the environment by the two disconnected hemispheres...Often, split-brained patients are indistinguishable from normal adults*."

In the video here we see a split-brain patient who seems like a pretty normal person, not at all someone with "two minds." And at the beginning of the video here the same patient says that after such a split-brain operation "you don't notice it" and that you don't feel any different than you did before – hardly what someone would say if the operation had produced "two minds" in someone. And the video here about a person with a split brain from birth shows us what is clearly someone with one mind, not two. In these interviews, every single time the split-brain patients answer questions normally, they are showing their ability to make decisions normally. The mere act of answering questions always involves decisions about what to say and how to say it.

But this is not at all what we should expect from the assumption that the brain is the source of our decisions. If that assumption were true, a split-brain operation should cause two independent sources of decision-making that would have a tendency to conflict with each other.

Reason #5: "Decision zig-zag" is almost never observed in pressure situations, but we would expect it to be very common if different parts of the brain (or halves of the brain) were causing decisions.

Here's a quick mental test I'd like you to try. If you can answer all the questions *real quickly*, in a *small number of seconds*, it will tend to show you're a smart person who can think fast. Try it.

1. Pick a color.
2. Pick a number between 1 and 10.
3. Pick a planet.
4. Pick a continent.
5. Pick a city.

Did you skip the test? No fair. It's easy -- go back and try it.

Now, if you are like 90% of my readers, you were able to do this exercise real quickly, in less than 10 or 15 seconds. But we would not expect such a thing to be possible if your brain was making your decisions. For in that case, we

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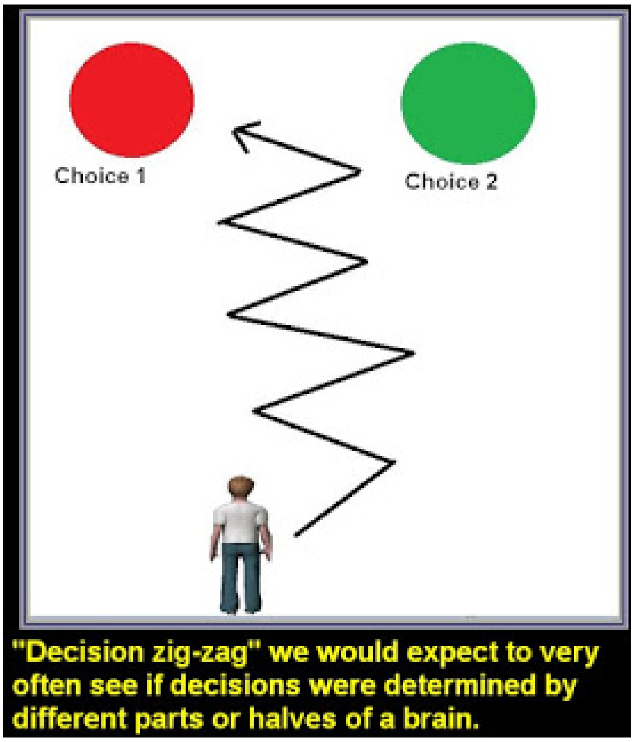
would expect that different parts of the brain would be coughing up different decisions, leading to a result rather like this:

Pick a color? Uh, red -- no green - no blue - okay, red!
Pick a number? Uh, 8! No, 6 ! No -- uh, 4! No, 2!
Pick a planet? Merc -- no Jupiter -- no, Earth, no wait...
Pick a continent? North -- no South -- no Eur -- no Afri -- no Asia!
Pick a city? New ... uh, no Shang... no Paris -- oops, no Moscow!

As mentioned above, people who have half of their brains removed in hemispherectomy operations can make decisions normally. It therefore cannot be maintained that a decision requires a full brain. If you think that brains make decisions, you are forced to the idea that part of a brain (half a brain or less) can make a decision. But such an idea makes us ask: should not then people be overwhelmed by conflicting decision signals, sent by different parts of a brain?

Consider the organization of the brain. There are two identical halves. Under the hypothesis that a half of a brain or less can make a decision, we would therefore expect to see very often something that we can call "decision zig-zag." This would involve behavior in which an organism was flipping back and forth between two possible decisions, as if two physical areas of the brain were conflicting with each other, coming to separate decisions. We would expect to see this particularly often in "coin flip" kind of decisions in which one choice is not obviously better than another.



But we rarely see such behavior in humans, whenever there is time pressure. It is true that given some important choice, and given the luxury of time to deliberate, a person may kind of go back-and-forth in his mind about what to do. For example, if you are accepted by two different colleges, you may kind of go back-and-forth in your mind, first favoring one choice, then another. But whenever there is a tight time pressure, and people know there is only a very short time for a decision, humans typically behave with very little indecision.

Scores on standardized tests such as SAT tests are an excellent gauge of how very infrequently high-performing humans engage in "decision zig-zag" under pressure situations. In the reading and writing part of an SAT test, a student has to answer more than 100 questions in less than two hours. The questions

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are multiple choice questions, so doing the test requires making 100 decisions, each a decision about which of the choices to select. Each question typically requires 30 seconds or more of reading. There is very little time for indecision. Every one who performs very well on the test (in the 90th percentile or higher) is making 100 or more decisions (about which answer to choose) with very little indecision. Under such pressure situations, humans do not at all perform like they would perform if different halves or different parts of your brain were sending you different signals about what to do. Humans instead act like beings with a single unified mind. It would seem that if different parts or halves of a brain were determining what decision to make, there would be so much indecision and "decision zig-zag" that the average SAT score in the US would be at least 200 points lower than it is.

Reason #6: There is no particular region of the brain that seems to be crucial to non-muscular decision making.

Some particular regions of the brain have been strongly associated with particular functions. For example, we know that the brain stem is strongly associated with autonomic activity that keeps the heart and lungs working. Any major damage to the brain stem usually causes death. We also know that the visual cortex is strongly associated with vision. But no strong associations have been established between any part of the brain and calm non-muscular decision making. By "non-muscular decision making" I mean the type of thing that goes on when you silently pick a number between 1 and 10 or silently choose in the morning what you will eat for dinner.

To get an idea of how weak is the neuroscience case that your brain makes decisions, we can look at an article in Psychology Today entitled "The Neuroscience of Making a Decision." After referring to some brain region that might be involved in addiction, which has no general relevance to the issue of whether brains make decisions, we are referred to a study claiming that the striatum is involved in decision-making. It's a study used that only 7 rats, Since this is less half of the minimum number of animals per study group recommended for a modestly convincing result, the study provides no good evidence for a neural involvement in decision making.

Then the Psychology Today article refers to a brain-scanning study attempting to show that regions called the dorsolateral prefrontal cortex and the ventromedial prefrontal cortex have something to do with decision making. These are the two regions that are most commonly cited as being involved in decision making. A brain scanning study could only give robust evidence for some region being heavily involved in some activity if it were to show a strong percent signal change, rather than the weak signal change of only 1% or less that brain scanning studies typically show. In this case, the study does not even give a figure for the percent signal change. So it does not provide any robust evidence that the the dorsolateral prefrontal cortex or the ventromedial prefrontal cortex have something to do with decision making

Our Psychology Today article then concludes, having provided no real evidence that there is any such thing as a "neuroscience of decision making."

This study examined six patients with damage to the dorsolateral prefrontal cortex, and found that they had an average IQ of 104, above the average of 100. Since filling out a written IQ test requires many cases of decision making (in regard to the answer given), such a result is incompatible with claims that the dorsolateral prefrontal cortex is some part of the brain particularly involved in decision making. This study says, "We have studied numerous patients with bilateral lesions of the ventromedial prefrontal (VM) cortex" and that "most of these patients retain normal intellect, memory and problem-solving ability in laboratory settings." The meta-analysis here says that the ventromedial prefrontal cortex is the region of the brain "most commonly

- memory recall
- memory storage
- morphogenesis
- natural selection
- near death experiences
- neural noise
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- nonneuralism
- optogenetics
- panpsychism
- precognition
- prefrontal cortex
- remote viewing
- savants
- scientist misconduct
- source of thoughts
- split-brain operation
- synapse theory of memory
- top-down theory of mind
- visual recognition

implicated in moral decision making," but says that there is a "lack of a significant cluster of activation" in this area, meaning that it doesn't actually light up more during brain scans.

Failing to report any actual figures for percent signal changes (the number we need to know to judge whether some area of the brain is more involved in an activity), the same meta-analysis notes differences between its findings and the findings of other studies, highlighting how much these brain scan studies tend to conflict with each other. We read the following:

"As previously stated, Bzdok et al. (2012) found a cluster of activation in the rTPJ (BA 39), which we did not find. Another discrepancy between our ME activation clusters and Bzdok et al.'s (2012) for moral cognition are that they found a cluster of activation in the left amygdala, which we did not find. Also, Bzdok et al. (2012) reported activation in the precuneus, which was not found to be a cluster of significant activation for the ME experiments in our analysis."

Another example of a report of a supposed "neuroscience of decision making" is a Neuroscience News article here entitled, "Researchers Discover Decision Making Center of Brain." We again have a reference to a mere brain scanning study. But this time the study has a graph that gives us the percent signal change that we need to judge whether robust evidence has been found. The graph shows that the percent signal change picked up by the brain scanning is only about a fraction of one percent, about 1 part in 300. That's no good evidence for anything, and could easily be the result of pure chance fluctuations.

Similarly weak results are found in this study, trying to use brain scanning to find some region of the brain more involved in decision making. The graph shows that the percent signal change picked up the brain scanning is only about a fraction of one percent, about 1 part in 300. That's no good evidence for anything, and could easily be the result of pure chance fluctuations.

In Figure 3 of the study here, we get a brain scanning result for the percent signal change in activity for the dorsolateral prefrontal cortex. The graph shows a signal change of only about 1 part in 300 (about .3 percent). That's no good evidence for anything, and could easily be the result of pure chance fluctuations.

Most of the studies that claim to show neural correlates of decision making are mainly finding either neural correlates of emotion (which can often be entangled with decision making) or neural correlates of muscle activation (often paired with decision making). When I do a Google search for "neural correlates of motionless decision making," I am unable to find a single study testing such a thing.

Reason #7: There is no convincing evidence of some type of change of brain state when a calm non-muscular decision is made.

By looking at brain scans, it is impossible to reliably predict when anyone made a non-muscular decision. We should not be fooled by a certain type of brain scanning experiment with the following characteristics:

(1) The study will not be pre-registered, and will not publish in advance a specification of some particular type of brain activation signal that it is looking for (in some very specific little part of the brain) as a sign of when someone made a decision.
(2) The study will scan the brains of people as they made some decision in their minds.

(3) Scientists will then examine the brain scans, looking for some particular tiny area of the brain that was more a tiny bit more active when the decisions were made.
(4) The study will involve only a small number of subjects, maybe 10, 15, 20 or 25.

Let me explain why this type of study is not at all good evidence for anything. In any random brain there will be random fluctuations in activity from moment to moment. Let us suppose a researcher has the freedom to compare any of 200 different little areas of the brain, looking for some area that has an increase in activity during some particular moment (such as when a decision is made). We would expect that purely by chance there would be some area that would show a tiny bit more activity during the particular moment being studied, even if it is not your brain that is making a decision. Similarly, if I use a machine that can detect minute fluctuations in temperature in the livers of 20 people while they are making a decision, and I have the freedom to check 200 different little regions of the liver, I will probably be able to find some tiny liver region which (purely by chance) had a minutely higher temperature when some decision was made. But this would do nothing to show that livers make decisions.

A discussion of this issue can be found around page 23 of the technical paper here, where we read the following:

"With a plausible population correlation of 0.5, a 1000-voxel whole-brain analysis would require 83 subjects to achieve 80% power. A sample size of 83 is five times greater than the average used in the studies we surveyed: collecting this much data in an fMRI experiment is an enormous expense that is not attempted by any except a few major collaborative networks."

In other words, brain imaging studies tend to use only a fraction of the sample size they need, given the techniques they typically use. It is possible to do a reliable study with a small sample size, if you limit the analysis to only one small tiny area of the brain. But that is almost never done.

On page 33 the paper above states the following, giving us a strong reason for skepticism about brain scanning studies:

"In short, our exploration of power suggests that across-subject whole-brain correlation experiments are generally impractical: without adequate multiple comparisons correction they will have false positive rates approaching 100%, with adequate multiple comparisons correction they require 5 times as many subjects than what the typical lab currently utilizes."

The study here is an example of the type of unconvincing study I have just discussed. The authors scanned brains, looking for change in signal strength corresponding to whether some type of decision was made. Having the freedom to check any of 200 or more brain regions (since their study was not a pre-registered study announcing its intention to look in only one little place in the brain), the authors found one or two tiny regions where there is an extremely small greater activation when a decision was made. The difference in signal strength (as reported in Figure 1 and figure 2) was only about .1 of 1 percent, which is about 1 part in 1000. But we would expect a result as good as that by chance, because of random variations in little parts of the brain, even if brains do not actually make decisions. So the study does nothing at all to provide evidence that brains are making decisions. The study say it did "whole brain analyses", but it used only 32 subjects, only a small fraction of the 83 subjects recommended above for a mere 1000-voxel "whole brain analysis" study.

On page 68 of the book "Casting Light on the Dark Side of Brain Imaging," we read about another problem in brain scanning studies:

"Take a guess at how many ways we can analyze data from a single brain scan. Theoretically countless, practically at least 69,000 ways....Brain imaging data usually requires between 6 and 10 steps of general data preparation and analysis. Researchers can perform any of these steps in a variety of ways....Different choices in data processing and analysis can lead to widely divergent results: small variations can quickly sum to form large discrepancies. In some cases, researchers may run many variations of an analysis, but only report results that support their hypothesis. This practice can lead to biased publications that overestimate true effects."

Here is the kind of thing we would like to have in order to have convincing evidence of greater brain activity when a non-muscular decision is made:

(1) There would have to be many replicated pre-registered studies that all showed that some particular region of the brain activated at a substantially higher level when a decision was made (more than just a fraction of 1 percent).
(2) In the pre-registration declarations, published prior to the collection of any data, the study authors would have to announce that they were studying only one small region of the brain to see whether it activates more during decision making, rather than giving themselves the freedom to check any brain region they wanted in a "fishing expedition" kind of approach to produce signal variations we would expect by chance.
(3) In the same pre-registration declarations, published prior to the collection of any data, the study authors would have to commit to one exact method of data analysis, precisely spelled out, thereby depriving themselves of the freedom to keep "slicing and dicing" the brain scan data until they got a result supporting their hypothesis.

Nothing like this has occurred. Instead we have a succession of little brain scan studies (usually with low statistical power) showing minute less-than-one-percent activation increases in some region that differs from study to study, studies in which researchers are free to look for some minute signal deviation in any brain region, and free to try dozens of data analysis methods until something that can be called a neural correlation coughs up. The results of such studies are what what we would expect to get by chance even if brains are not actually making decisions.

In short, we have no robust evidence that brains make decisions. Nature never told us that decisions are made by brains. It is merely neuroscientists who told us such a thing, without ever having adequate evidence for such a claim.

Reason #8: Humans can make decisions many times more quickly than they would make if decisions were being made by brains subject to several severe signal slowing factors and severe signal noise.

Humans can make decisions very, very fast. Every time some one drives in the city, he is making important decisions very quickly, such as whether to brake at a particular moment. Every time some one speaks very quickly in conversation, he is making many instantaneous decisions about what words to use. People such as quarterbacks and soccer players, standardized test takers, chess players in special "speed" matches, and players of the Jeopardy TV show are making decisions at a very fast speed, often instantaneously.

If you tried my previous selection game, you probably made decisions at a rate of about one decision per one or two seconds (each time you picked one of the possibilities, you were making a decision on what to pick). If it took you 15 seconds to do that test, about two-thirds of that was reading and memory recall; and you were making a decision at a rate of about one decision per second. A baseball hitter typically makes a decision (on whether to swing) in only a small fraction of a second. According to this scientific paper, "The average speech rate of adults in English is between 150 and 190 words per minute (Tauroza and Allison 1990), although in conversation this figure may rise considerably, reaching 200 wpm (Walker 2010; Laver 1994)." Someone speaking in conversation at 200 words per minute is making decisions at a rate of three per second, each a decision on which word to use.

But we have strong reasons for believing that brains should not be fast enough for instantaneous decisions. The "100 meters per second" claim often made about brain signal speed is not at all accurate, as it completely ignores very serious slowing factors such as the 200-times-slower speed of transmission through dendrites, the very serious slowing factor caused by cumulative synaptic delays, and the additional very serious slowing factor caused by what is called synaptic fatigue. A realistic calculation of brain signal speed (such as I have made here) leads to the conclusion that brains should be far too slow to allow extremely rapid or instantaneous decisions, and that if a brain were making a non-muscular decision (not involving a reflex), it should take at least five or ten seconds for any such decision.

We also know that the brain has multiple sources of very severe signal noise, as discussed here. It would seem that all this noise would be a huge factor preventing different parts of a brain from reaching a single decision quickly, just as it would greatly decrease the chance of a classroom of 30 people reaching the same decision very quickly if all of the people were blaring different podcasts, videos and rock songs from their smartphones.

An intelligent hypothesis about human decision making is that it comes from an immaterial aspect of human beings, what is commonly called a soul or spirit. A neuroscientist will protest that it is forbidden to postulate some important reality that we cannot directly see. Such a rule is not at all followed in general by scientists. Astrophysicists and cosmologists nowadays are constantly claiming that most of the universe consists of important realities we cannot see, what they call dark matter and dark energy -- both things that have never been directly observed by any method.

at September 21, 2019 No comments:

Labels: decisions

Sunday, August 18, 2019

30 Reasons for Rejecting the Theory of Neural Memory Storage

The claim that memories are stored in brains is merely a speech custom of scientists, not at all something that scientists have established through observations or experiments. This claim is not at all intuitively obvious, or even a claim suggested to us by our own bodies. When I use my hand to retrieve an apple from a table, my body does two things to tell me that my hand is involved in this retrieval. The first thing is that I can see my hand touching the apple, and the second is that I can feel my fingers touching the apple. But when I retrieve a memory such as a memory of my youth, my body does nothing at all to suggest to me that my brain has achieved this retrieval. I do not at all have a head sensation that is correlated with such a memory retrieval.

We often read news stories (triggered by scientific papers) trying to suggest or insinuate that memories are stored in brains. But such reports are not very convincing, for they typically suffer from one or more of the many flaws discussed at great length in my posts "The Building Blocks of Bad Science Literature" and "Why So Much of Neuroscience News Is Unreliable."

I will now discuss 30 reasons for doubting the claim that human memories are stored in the brain. In this post when I refer to memories, I mean episodic and conceptual memories, the type of memories you can recall while being motionless. I am not referring to anything along the lines of what is sometimes called "muscle memory," such as muscular skills that you learn when you learn how to ride a bicycle.

Reason #1: Synapses (the reputed storage place of memories) and dendritic spines are made up of proteins that are very short-lived, having average lifetimes only about a thousandth of the maximum length of time humans can retain memories.

The modern neuroscientist typically claims that synapses are where memories are stored. A synapse has no characteristic at all that should cause anyone to suspect that a memory is stored in it. If neuroscientists suggest synapses are where memories are stored, it's only because they have no other more plausible candidate in the brain for a substrate of memory.

We do know of several important characteristics that synapses have which should cause us to reject the claim that memories are stored in synapses. One is that synapses are made up of proteins that are very short-lived. The average lifetime of a synapse protein is only a few weeks. There are more than a thousand proteins used in synapses, and fewer than five have been determined to have a lifetime of more than a month. It has not been proven that any synapse protein has a lifetime of more than a year. But old people can remember things for 50 years or longer. Astonishingly, the maximum length of time that people can remember things is about 1000 times longer than the average lifetime of a synapse protein. If the proteins in synapses have short lifetimes, it seems impossible that synapses could be storing memories for 50 years. Similarly, you couldn't store your childhood recollections for 50 years if you wrote them on maple leaves that crumble away after a few months.

Dendritic spines (structures that synapses can connect to) are made up of proteins just as short-lived as the proteins in synapses. The 2018 study here precisely measured the lifetimes of more than 3000 brain proteins from all over the brain, and found not a single one with a lifetime of more than 75 days (figure 2 shows the average protein lifetime was only 11 days).

Reason #2: Synapses and dendritic spines do not have anything like the lifetimes they would need to have to account for 50-year-old memories.

The previous discussion was about the lifetime of proteins inside synapses and dendritic spines. Now let us consider: how long do synapses and dendritic spines last as particular structural units? Synapses connect to bump-like dendrite protrusions called dendritic spines. But those spines have lifetimes of less than 2 years.

Dendritic spines last no more than about a month in the hippocampus, and less than two years in the cortex. This study found that dendritic spines in the hippocampus last for only about 30 days. This study found that dendritic spines in the hippocampus have a turnover of about 40% each 4 days. This 2002 study found that a subgroup of dendritic spines in the cortex of mice brains (the more long-lasting subgroup) have a half-life of only 120 days. A paper on dendritic spines in the neocortex says, "Spines that appear and persist are rare." While a 2009 paper tried to insinuate a link between dendritic spines and memory, its data showed how unstable dendritic spines are. Speaking of dendritic spines in the cortex, the paper found that "most daily formed spines have an average lifetime of ~1.5 days and a small fraction have an average lifetime of ~1–2 months," and told us that the fraction of dendritic spines lasting for more than a year was smaller than 1 percent. A

2018 paper has a graph showing a 5-day "survival fraction" of only about 30% for dendritic spines in the cortex. A 2014 paper found that only 3% of new spines in the cortex persist for more than 22 days. Speaking of dendritic spines, a 2007 paper says, "Most spines that appear in adult animals are transient, and the addition of stable spines and synapses is rare." A 2016 paper found a dendritic spine turnover rate in the neocortex of 4% every 2 days. A 2018 paper found only about 30% of new and existing dendritic spines in the cortex remaining after 16 days (Figure 4 in the paper).

Synapses also don't last long enough to store memories lasting decades. Below is a quote from a scientific paper:

"A quantitative value has been attached to the synaptic turnover rate by Stettler et al (2006), who examined the appearance and disappearance of axonal boutons in the intact visual cortex in monkeys.. and found the turnover rate to be 7% per week which would give the average synapse a lifetime of a little over 3 months."

You can read Stettler's paper here. You can google for “synaptic turnover rate” for more information. The paper here says the half-life of synapses is "from days to months."

So we have two types of instability in regard to synapses and dendritic spines. One is the internal instability caused by rapid protein turnover inside synapses and dendritic spines, and another is the larger structural instability caused by the fact that individual synapses (and the dendritic spines they may connect to) don't last for more than a few years. Either one of these facts is sufficient to rule out the claim that synapses or dendritic spines are storing memories for decades. Similarly, you would know that someone could not store information for decades if he wrote it on fallen maple leaves that he placed on a picnic table in his back yard. The first reason would be that the leaves would crumble after a year, and the second reason would be that the wind would blow away the leaves at least once a month.

Reason #3: Although claimed to be caused by “synapse strengthening,” humans can form new memories instantly, far faster than the much longer time needed for synapses to strengthen.

How is it that a synapse could store a memory? Our neuroscientists never give a precise to this answer, and never even give an exact speculation as to precisely how synapses could possibly store an episodic experience such as, say, your experience of hitting a home run in the big ball game. All that neuroscientists do is to make vague claims in this regard, typically the claim that memories are stored when synapses are strengthened. This idea makes no sense. We know that when information is stored, symbolic tokens are written. There is no proven case of any information ever being stored by an act of mere strengthening.

Moreover, we know of an exact reason why memories cannot be stored through some act of synapse strengthening. It is the fact that synapse strengthening requires a synthesis of proteins, which takes minutes. But it is not at all true that a person requires minutes to form a new memory. If someone shoots a person standing next to you, you will instantly form a permanent new memory that you will never forget. There is no neuroscience theory of the formation of memories in the brain that is consistent with the fact that humans can form permanent new memories instantly.

Reason #4: People who have hemispherectomy operations (in which half of the brain is surgically removed) seem to have relatively small loss of memories.

Hemispherectomy is a surgical procedure in which half of the brain is removed. The procedure can be performed on young children suffering from seizures, with surprisingly little negative impact. But this scientific paper also tells us on page 3 that "Although most hemispherectomies are performed on young children, adults are also operated on with remarkable success." Very interestingly, we are told that when half of their brains are removed in these operations, "most patients, even adults, do not seem to lose their long-term memory such as episodic (autobiographic) memories." The paper tells us that Dandy, Bell and Karnosh "stated that their patient's memory seemed unimpaired after hemispherectomy," the removal of half of their brains. We are also told that Vining and others "were surprised by the apparent retention of memory after the removal of the left or the right hemisphere of their patients." These facts are entirely inconsistent with claims that memories are stored in the brain.

Reason #5: Humans such as Wagnerian tenors and Hamlet actors are able to perfectly recall very large bodies of memorized information, but this should not be possible if recall occurs using synapses that transmit signals with a low reliability of only 10% to 50%.

There are certain physical facts that have gigantic implications, and it is our duty to fully contemplate the implications of such facts. For example, the fact that carbon dioxide levels in the atmosphere are rising each year is a fact with gigantic implications that we must pay attention to. One simple fact with gigantic implications is the fact that synapses inside the human cortex do not reliably transmit signals. It has been found that synapses inside the cortex transmit brain signals with a reliability of between 10% and 50%. A scientific paper says, "In the cortex, individual synapses seem to be extremely unreliable: the probability of transmitter release in response to a single action potential can be as low as 0.1 or lower."

This little fact has the most gigantic implications. It means that it cannot be that a memory is transferred reliably from the sensory areas of the brain or hippocampus to the cortex of the brain to be stored in the cortex, for in passing through the cortex the brain signals would be all distorted and mangled by the low signal reliability. It is not at all true that a memory would have to pass through only one cortex synapse before being stored in the cortex. The signal would have to pass through many synapses, each with a transmission probability of between 10% and 50%. It would seem that only a tiny trace of the original signal would be left by the time the memory was stored. Similarly, if you recalled memories using your brain, every time that you tried to recall something, there would be an equally strong signal mangling effect. When your brain tried to pass recalled information by passing it through multiple synapses, each with a low probability of successful transmission, no more than a trace of the stored memory would be recalled.

But we know that such a thing is not happening during many cases of human memory recall. While it is possible for you to remember a trace of some distant memory, there are very many people who recall with 100% accuracy very large bodies of memorized information. For example, most of the times time an actor goes on stage to play Hamlet, he successfully recalls with 100% accuracy 1476 lines of dialog (and a similar feat occurs when Wagnerian tenors sing roles such as Siegfried and Tristan). Even greater recall is shown by some Muslims who can recall all 6000+ verses of their holy book. Such feats of recall should be impossible if we are using our brains to remember things. The information would have to be passing many times through synapses with poor reliability (between 10% and 50%), which would prevent the accurate recall of very large bodies of information.

Reason #6: A brain storage of memories would require massive amounts of information encoding, but no one has ever found any sign of encoded

information in the brain other than the genetic information in DNA.

Scientists have published innumerable papers on memory that used "encoding" in their title. Encoding refers to a supposed translation effect in which information in our minds is translated so that it can be stored in our brains. But the existence of all these papers does not actually establish that any such thing as memory encoding actually occurs. In the past scientists published innumerable papers and essays on caloric, phlogiston and the interplanetary ether, none of which is now believed to exist. And scientists in recent decades have published many thousands of papers on supersymmetry, superstrings, and dark matter, none of which has been proven to exist. The vast majority of papers that use "encoding" in their title are simply papers about human memory experiences and experiments, papers that do nothing at all to show that perceptual experiences or learning are translated into neural states. The term "encoding" is often used in such papers to give a hard-science aura to research that is purely psychological. No scientist has ever provided convincing evidence that experiences or conceptual learning are actually translated or encoded in some way that allows them to be stored as neural states.

We know exactly the type of observation that would be made if an encoding of memory information were to occur in a brain. Scientists would see some type of mysterious repeated symbols in brain tissue, signs that some translation or encoding scheme was being used. But no such things have been found. If memories were stored in brains, there would be two levels of potential discovery. In the first level, scientists would merely see some mysterious encoded information that they did not understand, but which they were sure was encoded information because of a repetition of symbols. At this level scientists would be like students of ancient Egypt looking at hieroglyphics before scholars knew how to translate hieroglyphics. At a second level of discovery, scientists would actually be able to read such encoded information, and successfully translate it, so that memories could be read from brain tissue in a lab. Neither one of these levels has been reached. Scientists have not seen any sign at all of encoded memory information in the brain. But it is hard to imagine how there could not be such a sign if our memories were actually being stored in our brains.

Reason #7: No one has ever been able to read memory information from any type of brain outside of his own body.

There is encoded genetic information in the nucleus of most cells, information which is pretty much the same in every cell, and is not memory information. That information was discovered in 1953. Since 1953 our technology has grown enormously. But there is still not a single case of anyone ever reading a memory from any brain (human or animal) outside of his own body. Scientists have never been able to read a memory by scanning a living person's brain, or scanning some brain tissue. Do not be fooled by press accounts that sometimes grossly exaggerate scientific experiments, and give us headlines such as “Scientists invent mind-reading device.” Such experiments (typically trying to read neural correlates of visual perception) do not actually involve thought reading, and do not at all involve a reading of stored information in the brain.

Reason #8: In the case of Lorber's patients and the case of the French civil servant, we have cases of people with fairly normal memory function but only very small amounts of functional brain tissue.

Inside a normal brain are tiny structures called lateral ventricles that hold brain fluid. In a French civil servant's case, the ventricles had swollen up like balloons, until they filled almost all of the man's brain. When the 44-year-old man was a child, doctor's had noticed the swelling, and had tried to treat it. Apparently the swelling had progressed since childhood. The man was left with what the Reuters story calls “little more than a sheet of actual brain tissue.”

But this same man, with almost no functioning brain, had been working as a French civil servant, and had his IQ tested to be 75, higher than that of a mentally retarded person. The Reuters story says: “A man with an unusually tiny brain managed to live an entirely normal life despite his condition, caused by a fluid buildup in his skull.” The case was written up in the British medical journal *The Lancet* (link).

In 1980 John Lorber, a British neurologist, recounted a similar case of a brain filled with fluid. “There's a young student at this university,” said Lorber, “who has an IQ of 126, has obtained a first-class honors degree in mathematics, and is socially completely normal. And yet the boy has virtually no brain.” According to Lorber, “We saw that instead of the normal 4-5 centimeter thickness of brain tissue...there was just a thin layer of mantle measuring a millimeter or so. His cranium is filled mainly with cerebrospinal fluid.” Lorber found other similar cases. Here is a link discussing his work.

According to the scientific paper published here, Lorber's findings have been confirmed by others:

"John Lorber reported that some normal adults, apparently cured of childhood hydrocephaly, had no more than 5% of the volume of normal brain tissue. While initially disbelieved, Lorber's observations have since been independently confirmed by clinicians in France and Brazil."

Such cases show that someone can have fairly normal memory function despite losing almost all of his brain tissue. These cases provide further evidence against claims that brains store memories.

Reason #9: There is little evidence that strokes and traumatic brain injury (which occur more than a million times in the US every year) cause retrograde amnesia, and no clear evidence that memory loss in Alzheimer's or dementia correlates with neuron loss.

If our memories were stored in our brains, what we would expect is that people would often get amnesia after a stroke or traumatic brain injury. But such a thing seems to happen only very rarely, so rarely that is hard to reliably postulate any causal relation. A scientific paper says, "Reports of amnesic syndrome due to unilateral stroke have appeared infrequently." The paper lists some new cases which it claims are new examples, but when we read the examples we find typically only mild things like an inability to recall a daughter's phone number. Speaking of strokes, the paper says, "There have been two reported cases of persistent amnesia following unlitateral infarctions in which there were no other neurological deficits," indicating the rarity of such a thing. The paper also says that of a group of 68 patients who had brain infarctions, there were no cases of amnesia. Talking about strokes, this paper says, "Amnesia as the main symptom of acute ischemic cerebral events is rare, mostly transient, and easily mistaken for TGA [transient global amnesia]." Serious forms of amnesia (such as losing all memories for years of experience) is very rare, as you can see by doing a Google search for "amnesia is rare."

But what about Alzheimer's disease? Isn't Alzheimer's a "brain shriveling" or "brain shrinking" affair? Here the public has been misled by visuals that compare a normal brain and a shriveled Alzheimer's brain. The actual evidence for greater-than-normal neuron loss in Alzheimer's disease is slim, and people with good memories sometimes have just as much neuron loss as those with Alzheimer's. In 2017 there was a news story entitled, "New Discovery Suggests Neuron Death Does Not Kickstart Dementia." The story reported this:

"The leading theory in Alzheimer's disease is that memory loss is the result of neuron death and nerve ending damage, which lead to memory loss, are caused by the formation of toxic protein clumps in the brain, called tau tangles and beta-amyloid plaques. But a new, small study challenges this theory, showing that the loss of neurons in brains of people with dementia is actually very small."

The news story quotes a scientist saying the following:

"Much to our surprise, in studying the fate of eight neuronal and synaptic markers in our subjects' prefrontal cortices, we only observed very minor neuronal and synaptic losses. Our study therefore suggests that, contrary to what was believed, neuronal and synaptic loss is relatively limited in Alzheimer's disease."

After telling us on page 35 that "there are many reports of people carefully diagnosed...as clearly having the clinical symptoms of dementia and yet showing no evidence of brain pathology," a book gives this quote from a neuroscientist named Robert Terry:

"Over the years, investigators have sought assiduously for lesions or tissue alterations in the Alzheimer's brain which...might at least correlate with clinical determinants of the disease severity....Despite 30 years of such efforts, clinico-pathologic correlations have been so weak or entirely lacking that determination of the proximate, let alone the ultimate, cause of Alzheimer's disease (AD) has not been possible."

Reason #10: In cases of retrograde amnesia (a problem in recall of past memories), episodic memories older than some particular date are preserved, which is the opposite of what we would expect if memories are stored in our brains.

Retrograde amnesia (an inability to recall old memories) is rare. In almost all cases of it, a person's childhood memories are preserved. Sometimes a person will lose only the last few years of memories, or lose only adult memories. For example, an 80-year-old man suddenly lost memories of the last 60 years of his life; and the 33-year-old man described here lost only the last 10 years of his memories.

The tendency of retrograde amnesia to affect younger memories more strongly than older memories is called Ribot's Law. The Wikipedia article on it says, "Ribot's law states that following a disruptive event, patients will show a temporally graded retrograde amnesia that preferentially spares more distant memories," and also states, "A large body of research supports the predictions of Ribot's law."

We know that the proteins that make up synapses and dendritic spines have average lifetimes of only a few weeks, and that the synapses and dendritic spines themselves are subject to spontaneous remodeling that makes them unstable, giving them lifetimes less than a few years. Given such realities, if memories were stored in brains, the ones that you would lose first are the oldest memories, since there would be so much more time for such memories to physically deteriorate. Similarly, if words were written on leaves, the older the writing was, the smaller the chance that it would survive. But according to Ribot's Law, exactly the opposite is the case, and people are much more likely to lose younger memories than older memories.

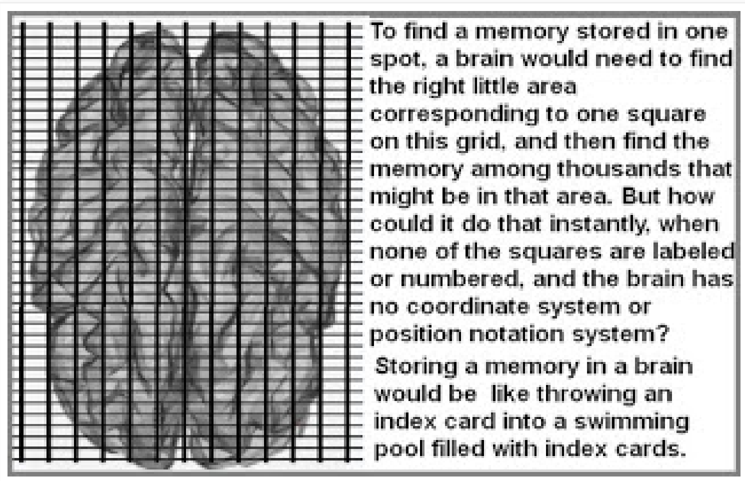
Reason #11: People can recall things instantly, but there is no way to

explain how a brain could instantly navigate to just the right tiny spot where some memory was stored, which would be like instantly finding a needle in a haystack.

One of the most powerful arguments against the claim that brains store memories is what I call the navigation argument. This argument can be simply stated like this: a long-term memory cannot be stored in some particular part of the brain, because there could be no way in which your brain could ever instantly find the exact location where such a memory was stored.

Let's consider a simple case. You hear the name of a movie star. You then instantly recall what that person looks like, and see a faint image of that person in your “mind's eye.” But how could this ever happen, if the memory of that person is stored in some particular tiny part of your brain? In such a case, you would need to know or find the exact place in the brain where that memory was stored. But there would be no way for your brain to do such a thing. It would be like trying to find one particular needle in a skyscraper-sized stack of needles.

We know that indexing can make possible very fast retrieval of information such as occurs in database systems. But the brain has no sign of having any indexing system. An indexing system can only occur if there exists an addressing system or a position notation system (for example, a book has the position notation system called page numbering, and the index at the back of the book leverages that position notation system). Brains have neither an indexing system nor an addressing system nor the position notation system that is a prerequisite for an indexing system. There are no neuron numbers and no neural coordinate system that a brain might use to allow fast, indexed retrieval of a memory. So there's no way to explain how instant recall could occur if you are retrieving memories from your brain.



Reason #12: The cumulative effect of synaptic delays (a delay caused by the time needed for a signal to travel across a synaptic gap) means that brains should be far too slow to account for instantaneous memory recall.

Scientists have been guilty of many misstatements about the speed of brain signals. When such a topic is discussed, we typically hear only about the speed of signal transmission in axons, the fastest tiny parts inside the brains. What our scientists fail to tell us about are the very serious "speed bumps" that we know must occur when brain signals travel, such as the much slower speed of transmission of a signal through dendrites. One such slowing factor is what is called synaptic delay. Synaptic delay is a delay of between about .5 millisecond and 2 milliseconds when a brain signal travels across a small gap in a chemical synapse. The problem is that a brain signal would need to pass over very many of these synaptic gaps every time a brain signal travels a centimeter. When you do some math estimating the number of synaptic delays that would occur when a brain signal is traveling over a centimeter, such as I have done here, you reach the conclusion that an average brain signal should not be able to travel at a speed much faster than about 1 or 2 centimeters per second. This means that brain signals should be far too slow to account for the instantaneous memory recall that humans very often have.

Reason #13: Synaptic fatigue (a delay caused after a synapse has fired) should make brains far too slow to account for instantaneous memory recall.

Besides synaptic delay, which occurs each and every time a brain signal crosses the gap in a chemical synapse, there is another very serious slowing factor involving synapses: what is called synaptic fatigue. Synaptic fatigue is a temporary inability of a synapse to transmit brain signals, an inability that occurs just after the synapse has successfully transmitted a brain signal. What happens is that the neurotransmitters in one end of the synapse diffuse over to the other end of the synaptic gap, causing a depletion of available neurotransmitters, preventing the same transmission from re-occurring immediately. Just as a penis cannot keep firing sperm continually, and needs a rest period, a synapse cannot keep firing continually, and needs a rest period. This rest period has been estimated as being between a full second and many seconds.

Such a delay must have an enormous effect on the effective speed at which brain signals can travel in a brain, and also must have a very strong negative effect on the reliability of brain signal transmission. This is another huge reason for believing that the human brain is far too slow to account for instantaneous and very accurate memory recall that humans often demonstrate. By analogy, think of how slow and unreliable your television would be if a particular pixel area on your screen had to take a rest for a second or more each time that it transmitted a few pixels. Under such conditions, you would never get information in anything like an accurate real-time basis.

Reason #14: No one has ever advanced a credible detailed theory of how human learned knowledge and episodic memories could be translated into neural states or synapse states.

If a brain were to store memories, it would have to do encoding. Encoding is supposedly some translation that occurs so that a memory can be physically stored in a brain, so that it might last for years. The problem is that human memories include incredibly diverse types of things, and we have no idea how any of these things could be stored as neural states or synapse states. Consider only a few of the types of things that can be stored in a human memory:

- Memories of daily experiences, such as what you were doing on some day
- Facts you learned in school, such as the fact that Lincoln was shot at Ford's Theater
- Sequences of numbers such as your social security number
- Sequences of words, such as the dialog an actor has to recite in a play
- Sequences of musical notes, such as the notes an opera singer has to sing
- Abstract concepts that you have learned
- Memories of particular non-visual sensations such as sounds, food tastes, smells, pain, and physical pleasure
- Memories of how to do physical things, such as how to ride a bicycle

- Memories of how you felt at emotional moments of your life
- Rules and principles, such as “look both ways before crossing the street”
- Memories of visual information, such as what a particular person's face looks like

How could all of these very different types of information ever be translated into neural states so that a brain could store them? No neuroscientist has ever presented a precise theory credibly explaining how such a thing could possibly occur.

You may better appreciate this difficulty if you consider what goes on when a computer stores information. Let's imagine you speak, "I saw a bird" into a voice recognition system in your computer, and press a button to store this sentence. Here are some of the things that go on:

(1) First, sounds are converted into letters, using a voice recognition system and the scheme known as the English alphabet.
(2) Then the alphabet letters are converted into decimal numbers using the scheme known as the ASCII system (a scheme requiring a full page to state, as you can see here).
(3) Then these decimal numbers are converted to binary numbers using a decimal-to-binary conversion algorithm.
(4) Finally binary numbers (a sequence such as 01010111010) is written to your hard driven using a system in which particular magnetic marks stand for binary numbers.

To discuss what happens when you store a photo on your disk, I would have to discuss details of equal complexity, but this task would require a whole other intricate encoding scheme that does not use the ASCII system, but some other protocol such as a very specific color-to-number protocol. But how could a brain ever do such encoding requiring so many complicated translation systems and protocols, when your brain presumably doesn't have anything like the ASCII system lying around for it to use, or anything like a color-to-number protocol, or a decimal-to-binary conversion algorithm? We cannot imagine that the brain evolved such protocols 10,000 years ago, for they would have to be based on the English alphabet, which has only existed (in either its current or earlier form) for less than a thousand years.

Reason #15: The brain does not seem to have any mechanism for writing a memory.

If we are to believe that memories are stored in a brain, we would need to believe that the brain has some system for writing memories. We know exactly how computers write information. For example, on a portable computer is a spinning disk, and when the computer needs to write some information, a little unit called a read-write head moves to the right position on the disk, and transfers information.

But we know of nothing similar in the brain. The brain seems to have no mechanism whatsoever for writing memory information to some particular place.

Reason #16: The brain does not seem to have any mechanism for reading a memory.

On a typical portable computer, a read-write head handles both the job of reading information from a hard drive, and the job of writing information. There is nothing like this in the brain, nor does there seem to be anything like some brain component that accomplishes the job of reading information from some part of the brain.

So imagine that your brain has some memory information stored in one particular place. How could that information be read? There is no component at all in the brain that moves around to different places when something is recalled. It is not at all true that when you remember something, there is some part of the brain (or even anything like a "gang of molecules") that moves to some specific location, reads information, and that carries that information to some other place. So how is it that a brain could ever read a memory stored in it? Our scientists have no explanation.

For lack of a better idea, neuroscientists often speculate that "synaptic patterns" store memories, suggesting that the arrangement of synapses might somehow be some code that specifies memories. But we might note that the brain has nothing at all like a synapse pattern reader, so such an idea cannot be correct.

Reason #17: There is so much noise in the brain (with each neuron bombarded by signals from thousands of other neurons) that if a brain were to somehow read a stored memory, it would quickly be drowned out by all of the neural noise.

We may use the term *signal drowning* for what happens when there are so many signals from so many sources that a particular signal is effectively drowned out. Such signal drowning would occur in a malfunctioning television which showed the signal from every cable TV channel all at once, or a malfunctioning radio which played simultaneously the music and words from every AM station at the same time. It would seem that in the cortex there would have to be exactly such signal drowning, because each neuron emits a signal very frequently (about once per second or more), and each neuron is connected directly to more than a thousand other neurons.

Such a fact is a big reason for thinking your brain does not store your memories. For lack of a better idea, our scientists speculate that long-term memories are stored in the cortex. But it should not be that a brain signal representing sensory information could even travel to the cortex to be stored, because signal drowning would very quickly drown out the signal. It also should not be that a memory can be retrieved from some particular part of the brain, because such a retrieved memory could only move about as a brain signal, and before the brain signal could travel more than a few centimeters, signal drowning would wipe out the signal.

Reason #18: The brain shows no sign of looking different or acting different or working harder when a memory is recalled.

If you are retrieving memories from your brain when you recall something, we would expect that there would be detectable signs of such brain activity. But we cannot detect anything different in our bodies when we are working hard to remember something. When the heart works harder, we get a noticeable physical sign of this: an increased heart beat that can be noticed by checking your pulse. But when we work hard to retrieve memories (at a time such as when we take a school examination), we have no sensation of anything in our head working harder.

Some would claim that brains do show signs of working harder during recall, but that they are subtle signs that can only be picked up by brain scanners. This is not correct. Brain scanning studies actually provide no evidence that brains are working harder or doing anything different doing human recall activity. As discussed here, such studies often make use of dubious statistical methods, too-small sample sizes, and presentation techniques in which very small signal differences are graphically depicted (in a misleading way) to look like big signal differences. The way to get to the real truth of any brain scanning study is to search for the phrase "percent signal change."

In this post, I cite 9 different neuroscience studies on the neural correlates of memory recall. In these studies, subjects had their brains scanned while the subjects were performing recall and recognition tasks. None of the 9 studies showed more than a 1.3% percent signal change, and the average percent signal change reported was much smaller than that: only about 1 part in 200 or part in 400. Such results do not show any real evidence of brains working harder during recall, and are quite consistent with the belief that you do not retrieve memories stored in your brain when you recall things. We would expect tiny variations such as 1 part in 200 to occur because of random variations in brain activity having nothing to do with a retrieval of memories.

Reason #19: Humans are able to recall extremely long sequences such as all of the lines of Hamlet, but the brain does not have any architecture that would seem to support sequential memorization.

An interesting feature of human memory is that it can display enormous sequential proficiency. Humans are not merely capable of recalling a large number of individual facts. Human are capable of exactly recalling extremely long sequences of text. We have one example in the case of actors who successfully memorize all 1476 lines of the role of Hamlet, in correct sequential order. An even more dramatic case is that of Muslims who memorize every single word of their holy book, a book with more than 6000 verses (each verse being roughly as long as a line).

But the brain seems to have no architecture that could conceivably support such an ability. Each neuron is connected to more than 1000 other neurons. This means that for a neuron, there is no "next neuron" or "previous neuron." So how could a sequence of 1476 lines or 6000+ lines ever be stored in a brain? We cannot at all imagine, for example, that individual words are stored on individual neurons, and that once the beginning neuron is found, that the brain keeps traveling along a chain-like route that constantly leads to the next neuron. With each neuron being connected to 1000+ other neurons, there never is a "next neuron" for a neuron. Given such a neural architecture, we can imagine no way in which very long sequences could ever be stored and retrieved.

Reason #20: There is no good evidence of any physical change in brains corresponding to an acquisition of a conceptual or episodic memory.

See the post here for a detailed discussion of some of the claims that have been made trying to persuade us that some neural mark of memory or learning has been found, and why such claims are not robust and convincing.

Reason #21: Outside of synapses and dendritic spines there is no place in the brain that could be a suitable storage place for memories lasting 50 years.

We have seen (in Reason #1 and Reason #2) why the theory that memories are stored in synapses or dendrtic spines is untenable (both are made up of proteins with an average lifetime of only .001 of the maximum time people can hold a memory, and neither synapses nor dendritic spines last for years). Is there any other place in the brain that might serve as a storage place for memories that last for 50 years or more? There is not.

The most common idea for a non-synaptic storage place for memories is the idea that memories may somehow be stored in DNA. But DNA has been exhaustively analyzed through huge multi-year projects such as the Human Genome Project and the ENCODE project, and no one has found any trace of human learned knowledge in DNA or a human episodic memory in DNA. We are aware of a severe semantic limitation in DNA. It uses a genetic code that limits DNA to specifying groups of amino acids. No one has detected any sign in DNA of some other code suitable for storing memories, one that would have to be thousands of times more complicated than the genetic code. If DNA stored memories, we would expect that different DNA molecules in the nucleus of cells would be very different, but they are pretty much all the same. When DNA molecules are read by a cell, this reading takes minutes, so DNA molecules cannot be the storage place of memories that we can instantly recall.

We also cannot believe that memories are stored in microtubules. A scientific paper tells us how short-lived brain microtubules are:

"Neurons possess more stable microtubules compared to other cell types (Okabe and Hirokawa, 1988; Seitz-Tutter et al., 1988; Stepanova et al., 2003). These stable microtubules have half-lives of several hours and co-exist with dynamic microtubules with half-lives of several minutes."

Reason #22: People with dramatically higher recall of episodic memories seem to have no larger brains or brain superiority that could explain this.

What is called hyperthymesia or Highly Superior Autobiographical Memory is a rare ability of someone to remember almost all of the things that have happened to him or her during adulthood. An article in the *Guardian* discussed the case of Jill Price:

"Price was the first person ever to be diagnosed with what is now known as highly superior autobiographical memory, or HSAM, a condition she shares with around 60 other known people. She can remember most of the days of her life as clearly as the rest of us remember the recent past, with a mixture of broad strokes and sharp detail. Now 51, Price remembers the day of the week for every date since 1980; she remembers what she was doing, who she was with, where she was on each of these days. She can actively recall a memory of 20 years ago as easily as a memory of two days ago, but her memories are also triggered involuntarily."

Under the hypothesis that memories are stored in brains, there is really no way to account for cases such as Jill Price, unless you imagine her with some gigantic head three or four times bigger than an ordinary head. But Jill Price has an ordinary head that is smaller than the average male head. No one has been able to find any dramatic difference in the brains of those with Highly Superior Autobiographical Memory. Some studies have claimed to find some tiny little difference, but anyone checking 100 different areas in two sets of brains will always be able to find some tiny difference somewhere. The people such as Jill Price who can remember almost everything that happened to them in adulthood have brains 99% identical to people who can remember only a small fraction of what happened to them in adulthood. Such a fact conflicts with the claim that memories are stored in brains.

Reason #23: People with damaged brains sometimes show types of memory recall superior to that of people with ordinary brains.

Under the theory that memories are stored in brains, we should expect that people with defective brains should be worse at remembering things. Although this is sometimes true, there are quite a few dramatic cases of people who had defective brains but greatly superior memory. If you do a Google search for "autistic savant," you will find a discussion of quite a few such cases. One dramatic case is that of HK, who was born after only 27 weeks, which is 13 weeks early. A scientific paper discusses HK's dramatically superior autobiographical memory:

"As can be seen in Figure 1,for dates between this first memory until his 10th year of life, HK shows a relatively steady increase in accuracy for autobiographical events. Accuracy takes a noticeable jump to near 90% in 2001 at age 11. From that point forward, HK's recollection of autobiographical events is near perfect."

The paper also gives us insight as to what it is like to have such a memory:

"He reports that he is able to relive memories in his mind as if they just happened. HK stated that everything about his memory, including sounds, smells, and emotions, are vividly re-experienced when he remembers a particular event in time...,He stated that there is no difference in the vividness of his recollection between events that occurred when he was five and events that he experienced within the past month."

The paper tells us that the volumetric analysis "reveals significantly reduced total tissue volume in HK" and that "a volumetric analysis of subcortical structures shows general reduction in subcortical volumes in HK (1019 mL) relative to controls (1249 ± 29 mL)." So the person with this miracle memory had a brain about 20% smaller. Similarly, the Guardian describes an interesting case of someone with a severe learning disability: "Blind and brain-damaged, Derek Paravicini is a musical marvel, able to play back any tune after one listen. " The same astonishing ability -- to flawlessly play back an entire song heard only once -- is also possessed by another brain-damaged person, Leslie Lemke. The wikipedia.org article on Leslie says he can play back a musical piece of "any length."

Cases such as these (greatly superior memory and substantial brain damage) are exactly the opposite of what we would expect, if it is true that memories are stored in the brain.

Reason #24: Humans can acquire detailed memories even when the brain has effectively shut down because the heart has stopped.

Experimental results on the cessation of brain electrical activity after heart stoppage are summarized on page 28 of this document. There we are told that Hossmann and Kleihues in 1973 tested with 200 cats and 21 monkeys, and found that EEG (a measure of the electrical activity in the brain) became "isoelectric" (in other words, a flat line) within 20 seconds following the stop of blood to the heart. We are also told that a result of the brain flat-lining within 15 seconds was produced in 1991 with 37 dogs (Stertz et. al.), with 143 cats (Hossmann, 1988), and with 10 monkeys (Steen et. al. 1985).

So under the theory that our memories are stored in our brains, we would not expect anyone to be recalling memories of what happened while their heart had stopped, except for experiences lasting only a few seconds. But, to the contrary, many people whose heart stopped report lengthy vivid experiences occurring during such a heart stoppage, what are called near-death experiences. These often involve minutes of mental experience.

Reason #25: If memories were stored in brains, there would need to be many hundreds of genes with the job of handling the gigantic chore of encoding memories into neural states; but no one has found even one such gene.

If human brains were to actually be translating thoughts and sensory experiences so that they can be stored as memory traces in the brain, such a gigantic job would require a huge number of genes – probably many times more than the 500 or so "tRNA" genes that are used for the very simple encoding job of translating DNA nucleotide base pairs into amino acids. But we see no sign of any such memory encoding genes in the human genome.

There is a study that claims to have found possible evidence of memory encoding genes, but its methodology is ridiculous, and involved the absurd procedure of looking for weak correlations between a set of data extracted from one group of people and another set of data retrieved from an entirely different group of people. See the end of this post for reasons we can't take the study as good evidence of anything. There is not one single gene that a scientist can point to and say, "I am sure this gene is involved in memory encoding, and I can explain exactly how it works to help translate human knowledge or experience into engrams or memory traces." But if human memories were actually stored in brains, there would have to be many hundreds of such genes.

Reason #26: There are no drugs that can produce retrograde amnesia.

If the brain stored memories, we would think it would be rather easy to make a drug that would produce temporary retrograde amnesia. Such a drug could simply mess with some chemistry in the brain that would be used if the brain was retrieving memories. But there is no drug that can cause retrograde amnesia. There is no drug that will even temporarily cause a person to stop remembering knowledge he acquired in school, or to stop recognizing friends and family.

Reason #27: There is substantial evidence that memories can long survive the decay and destruction of the brain.

There are many cases in the literature of parapsychology suggesting that human episodic memories can long survive the decay and destruction of a brain. Such cases include cases of mental mediumship and cases of past-life memories. In mental mediumship a medium will report communication with some unseen communicant who claims to have knowledge known only to a deceased person. The alleged communication will often include very specific and correct details that should have been unknown to the medium.

The case of Leonora Piper was a dramatic case in which such alleged paranormal communication seemed to again and again produce very specific episodic details correctly, details that should have been unknown to the medium. The case was investigated for decades by competent investigators, who found a high degree of accuracy and no evidence of fraud. The main investigator (Hodgson) started out as a complete skeptic, but became convinced of her authenticity after long investigation. In Chapter 6 of the book "100 Cases for Survival After Death," particularly case #63, you can read about some very impressive examples of evidence involving Leonora Piper. In case #75 of the same book, you can read about equally impressive results with the medium Gladys Osborne Leonard. Scientific tests of mediums in recent years suggest a real inexplicable paranormal phenomenon.

The most prominent researcher of past-life accounts was Ian

Stevenson, a professor and psychiatrist who documented very many cases of children who reported past-life memories, with the details often matching the details of previous lives that were discovered. For example, a young child might report being a particular person (in a previous life) who had particular parents living in some particular place, and having some particular type of death; and it would often be found that there was such a person with such parents living in that place who did die in such a way.

Cases such as these do not alone disprove the claim that the brain stores memories. But such cases are a point against such a claim. If there is evidence suggesting some memories can survive the death of an individual and the decay of the brain, this hints that human memories are not stored in brains, but somehow accumulated in some way that can allow for survival of memories beyond a person's death and the decay of his brain.

Reason #28: The time delay caused by a need to encode memories in a brain would prevent the instantaneous formation of memories that we often see in humans.

If the brain stored memories, it would need to do some elaborate encoding in which ideas, concepts and sensations are converted or translated into permanent memory traces. Neuroscientists who believe in a brain storage of memories have almost universally assumed that such encoding occurs. But if such encoding were to occur, it would seem to require significant time, almost certainly minutes. Electronic computers can instantly translate information from one form to another, but a biological translation would be much slower. Referring to a general type of biological activity not related to memory, an "expert answer" web page tells us that "Transcription and translation both occur on the time scale of 1 minute for a protein of typical length," and also notes that more complicated proteins take longer, with one (titin) requiring an hour for its transcription.

It seems that to do all of the biological work needed to translate episodic and conceptual memories into permanent neural traces, it would take a brain at least a few minutes to encode an average memory. But we know that humans can form new permanent memories instantly. The child who places a hand on a hot burner instantly forms a new permanent memory, as does someone who sees a person next to him being murdered. We can form new memories faster than we could if our brains were storing memories using encoding.

Reason #29: The time delay caused by a need to decode memories stored in a brain would prevent the instantaneous recall that humans routinely display.

Whenever information is stored in encoded form, that information can only be retrieved using a translation system that is the opposite of the original encoding. Such a system is called decoding. Here is an example. When you type some words that are stored on a computer hard drive, first the letters in the words are converted into decimal numbers such as 59, then the decimal numbers are converted into binary numbers such as 111011, and then the binary numbers are written to the hard drive. Such a process is an example of encoding. If you retrieve this information from your hard drive, the reverse occurs: first the binary numbers are read from the hard drive, then the binary numbers are converted into decimal numbers, and then the decimal numbers are converted into alphabetic characters. This is an example of decoding.

Since the brain is not electronic, and has to do things with relatively slow chemical methods, it would take time for a brain to decode information that had been stored in it through encoding. It would almost certainly take quite a few seconds (or possibly minutes) for a brain to decode information that had been stored in it using encoding. The comparable tasks of protein transcription and protein translation take a minute or more. But we do not experience such a delay. For example, if you say, "Gregory Peck," it takes me just one second to recall his face; and if you show me a photo of Kathryn Grayson, I'll tell you her name within two seconds.

Reason #30: Human memory information can exhibit high degrees of hierarchical organization, but the brain has no structure that could support such organization.

Let us consider the hierarchical nature of human memory and knowledge. We can imagine a conversation between two people.

Jack: What are some of the planets in the solar system?
Jill: Jupiter, Saturn, Earth, Mars, Venus and others.
Jack: So let's take Earth. What continents belong to it?
Jill: North America, South America, Asia, and others.
Jack: So what are some of the countries in North America?
Jill: Canada, the United States, Mexico, and others.
Jack: So what are some of the states in the United States?
Jill: New York, California, Florida and others.
Jack: And what are some of the cities in New York?
Jill: Albany, Buffalo, Syracuse, New York City and others.
Jack: And what are some of the boroughs in New York City?
Jill: Manhattan, Queens, Brooklyn and others.
Jack: And what are some of the streets in Manhattan?
Jill: Broadway, 42nd Street, and others.
Jack: And what are some of the buildings on 42nd Street?
Jill: Grand Central Terminal, the New York Public Library, and others.

Jill's answers might all be given from memory by a New York City resident such as myself. Such memory recalls show a hierarchical organization of information, in which someone repeatedly knows what database professionals call parent-child relationships. But it would seem that a brain could never allow information to be stored in a way supporting a hierarchical organization of information. The brain has no structural features that might support a hierarchical organization of information.

Consider how hierarchical information is stored in a computer. The fanciest way to store such information is through a relational database. Relational database have specific features (what are called primary keys and foreign keys) that support the hierarchical storage of information. A simpler way to store hierarchical information is through a file system, which allows you to create folders or directories that are children of a parent directory or folder. Hierarchical information can also be stored on a computer using the power of complex HTML tables or complex Microsoft Word tables.

But the brain seems to have no such features that might facilitate the storage of hierarchical information. Neurons and synapses are distributed rather uniformly throughout the brain, and are not grouped into neuron groups or synapse groups that show any type of structural organization that might reflect a hierarchical organization of information. A typical neuron is connected to a thousand or more other neurons. There is no way for a neuron or group of neurons to be the "parent neuron" or the "parent neuron group" of some other neuron of group of neurons. Neither neurons nor synapses nor dendritic spines seem to show any type of physical grouping or structural organization that might allow a hierarchical storage of information.

Conclusion

The evidence against the dogma that brains store memories seems overwhelming. But like fundamentalists continuing to advance some discredited dogma, our neuroscientists continue to spout the claim that our memories are stored in our brains. Such a claim is a social norm of the belief community that neuroscientists belong to, and straying from that norm is a taboo in that community.

This situation is rather like one we can imagine in a physician's office. Let's imagine a doctor who is examining a patient lying on a table. The doctor makes the following low-level observations:

(1) The doctor takes the patient's blood pressure, and finds that it is zero.
(2) The doctor takes the patient's pulse, and finds that it is zero beats per minute.
(3) The doctor strikes the patient's knee with a hammer, and observes no movement of the leg.
(4) The doctor takes the patient's temperature, and finds that it is 70 degrees, only room temperature.
(6) The doctor tries to gently move the patient's arm, but observes that it is stiff and immobile.

Let us suppose that the doctor then declares, "This patient is fine, and he will soon be talking and walking." That would be a case of reaching a high-level conclusion that is contrary to the low-level facts collected. Similarly, when our neuroscientists tell us that our memories are stored in our brains, they are stating a high-level conclusion that is contrary to the low-level facts neuroscientists have collected, the facts I have discussed in this post. Through such low-level facts, the brain is speaking to us in a very loud voice, saying, "I don't store memories; that isn't my job."

There are two reasonable alternative theories about where memories are stored. The first is that memories are stored in a non-neural and mysterious facility local to the human body. Such a thing is often called a soul or spirit. A soul or spirit might be completely immaterial, or it might consist of some subtle energy that humans do not yet understand. Given the fact that scientists are claiming that 70% of the universe consists of some subtle energy they do not understand and have never observed (what is called dark energy), it is unreasonable to exclude the possibility of some subtle energy associated with the human body.

A second reasonable possibility is that our memories are not stored locally in our bodies, but exist in some mysterious consciousness infrastructure or information infrastructure that is shared by humans and possibly other life-forms. Imagine a person playing some app on her smart-phone in which she collects her favorite photos of TV or movie stars. If you ask her, "Where are your celebrity photos stored?" she may say, "Inside my smart phone, of course." But such photos may not at all be stored inside her phone. Instead they may be stored "somewhere in the cloud," such as on some relational database server in a distant city. Similarly, our memories may be stored in some mysterious information infrastructure that humans are able to access. Just as an app user may have a login allowing him to access only his data, there may be some system restricting each of us to accessing only the memories that we deposited in such an infrastructure.

We do not at all know where are memories are stored, but the many reasons listed here argue very powerfully that our episodic and conceptual memories are not stored in our brains and cannot be stored in our brains.

at August 18, 2019   No comments:

Labels: memory encoding, memory recall, memory storage

Head Truth

The huge case for thinking minds do not come from brains

Friday, February 21, 2020

Fraud and Misconduct Are Not Very Rare in Biology

Without getting into the topic of outright fraud, we know of many common problems that afflict a sizable percentage of scientific papers. One is that it has become quite common for scientists to use titles for their papers announcing results or causal claims that are not actually justfied by any data in the papers. A scientific study found that 48% of scientific papers use "spin" in their abstracts. Another problem is that scientists may change their hypothesis after starting to gather data, a methodological sin that is called HARKing, which stands for Hypothesizing After Results are Known. An additional problem is that given a body of data that can be analyzed in very many ways, scientists may simply experiment with different methods of data analysis until one produces the result they are looking for. Still another problem is that scientists may use various techniques to adjust the data they collect, such as stopping data collection once they found some statistical result they are looking for, or arbitrarily excluding data points that create problems for whatever claim they are trying to show. Then there is the fact that scientific papers are very often a mixture of observation and speculation, without the authors making clear which part is speculation. Then there is the fact that through the use of heavy jargon, scientists can make the most groundless and fanciful speculation sound as if was something strongly rooted in fact, when it is no such thing. Then there is the fact that scientific research is often statistically underpowered, and very often involves sample sizes too small to be justifying any confidence in the results.

All of these are lesser sins. But what about the far more egregious sin of outright researcher misconduct or fraud? The scientists Bik, Casadevall and Fang attempted to find evidence of such misconduct by looking for problematic images in biology papers. We can imagine various ways in which a scientific paper might have a problematic image or graph indicating researcher misconduct:

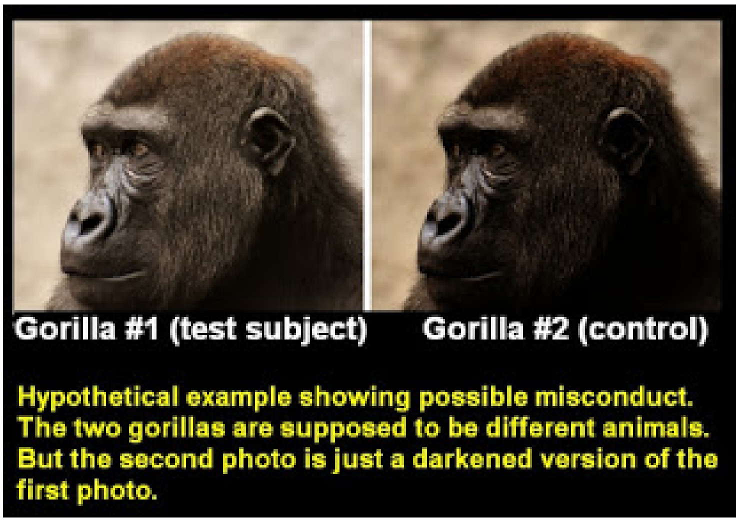
(1) A photo in a particular paper might be duplicated in a way that should not occur. For example, if a paper is showing two different cells or cell groups in two different photos, those two photos should not look absolutely identical, with exactly the same pixels. Similarly, brain scans of two different subjects should not look absolutely identical, nor should photos of two different research animals.
(2) A photo in a particular paper that should be different from some other photo in that paper might be simply the first photo with one or more minor differences (comparable to submitting a photo of your sister, adjusted to have gray hair, and labeled as a photo of your mother).
(3) A photo in a particular paper that should be original to that paper might be simply a duplicate of some photo that appeared in some previous paper by some other author, or a duplicate with minor changes.
(4) A photo in a particular paper might show evidence of being Photoshopped. For example, there might be 10 areas of the photo that are exact copies of each other, with all the pixels being exactly the same.
(5) A graph or diagram in a paper that should be original to that paper might

Translate

Select Language ▼

be simply a duplicate of some graph or diagram that appeared in some previous paper by some other author.

(6) A graph might have evidence of artificial manipulation, indicating it did not naturally arise from graphing software. For example, one of the bars on a bar graph might not be all the same color.



There are quite a few other possibilites by which researcher misconduct could be identified by examining images, graphs or figures. Bik, Casadevall and Fang made an effort to find such problematic figures. In their paper "The Prevalence of Inappropriate Image Duplication in Biomedical Research Publications," they report a large-scale problem. They conclude, "The results demonstrate that problematic images are disturbingly common in the biomedical literature and may be found in approximately 1 out of every 25 published articles containing photographic image data."

But there is a reason for thinking that the real percentage of research papers with problematic images or graphs is far greater than this figure of only 4%. The reason is that the techniques used by Bik, Casadevall and Fang seem like rather inefficient techniques capable of finding only a fraction of the papers with problematic images or graphs. They describe their technique as follows (20,621 papers were checked):

"Figure panels containing line art, such as bar graphs or line graphs, were not included in the study. Images within the same paper were visually inspected for inappropriate duplications, repositioning, or possible manipulation (e.g., duplications of bands within the same blot). All papers were initially screened by one of the authors (E.M.B.). If a possible problematic image or set of images was detected, figures were further examined for evidence of image duplication or manipulation by using the Adjust Color tool in Preview software on an Apple iMac computer. No additional special imaging software was used. Supplementary figures were not part of the initial search but were examined in papers in which problems were found in images in the primary manuscript."

This seems like a rather inefficient technique which would find less than half of the evidence for researcher misconduct that might be present in photos, diagrams and graphs. For one thing, the technique ignored graphs and diagrams. Probably one of the biggest possibilites of misconduct is researchers creating artificially manipulated graphs not naturally arising from graphing software, or researchers simply stealing graphs from other scientific papers. For another thing, the technique used would only find cases in which a single paper showed evidence for image shenanigans. The technique would do nothing to find cases in which one paper was inappropriately using an image or graph that came from some other paper by different authors. Also, the

- Vacillating Disarray of the Memory Trace Theorists
- Study Finds "Poor Overall Reliability" of Brain Scanning Studies
- "Brains Store Memories" Dogma Versus the Reality of Noisy Brains
- The Brain Has Nothing Like 7 Things a Computer Uses to Store and Retrieve Information
- Exhibit A Suggesting Scientists Don't Understand How a Brain Could Store a Memory
- The Dubious Dogma That Brains Make Decisions
- Long Article Tries to Show Neural Memory Storage, but Gives No Real Evidence for It
- How Evidence for ESP Undermines the “Minds Come From Brains” Dogma
- Gender Differences in Brains Help Discredit Prevailing Dogmas About Brains
- Study Finds Equal Brain Connectivity in All Mammals
- Some Reasons the Main Theory of Neural Memory Storage Is Unbelievable
- Scientists Can't Persuasively Explain How a Brain Could Instantly Retrieve a Memory
- The Lack of Evidence for Memory-Storage Engram Cells
- Candid Confessions of the Cognitive Experts
- Global Workspace Theory Sure Isn't an Explanation for Consciousness
- When Animals Cast Doubt on Dogmas About Brains
- Memories Can Form Many Times Faster Than the Speed of Synapse Strengthening
- The Guy with the Smallest Brain Had the Highest IQ
- He Had Half a Brain and Above Normal Intelligence
- The Truth About Neurons and Synapses
- A Diagram of Explanatory Dysfunction in Academia
- The Brain Shows No Sign of Working Harder During Thinking or Recall
- More Evidence of High Mental Function Despite Large Brain Damage
- The Lack of a Viable Theory of Neural Memory Encoding
- More Evidence That Neuron Loss Has Little Effect on Cognition
- Fraud and Misconduct Are Not Very Rare in Biology
- Reasons for Doubting Thought Comes from the Frontal Lobes or

technique ignored supplemental figures (unless a problem was found in the main figures). Such supplemental figures are often a signficant fraction of the total number of images and graphs in a scientific paper, and are often referenced in the text of a paper as supporting evidence. So they should receive the same scrutiny as the other images or figures in a paper.

I can imagine a far more efficient technique for looking for misconduct related to imagery and graphs. Every photo, every diagram, every figure and every graph in every paper in a very large set of papers on a topic (including supplemental figures) would be put into a database. A computer program with access to that database would then run through all the images, looking for duplicates or near-duplicates in the images, as well as other evidence of researcher misconduct. Such a program might also make use of "reverse image search" capabilities available online. Such a computer program crunching the image data could be combined with manual checks. Such a technique would probably find twice as many problems. Because the technique for detecting problematic images described by Bik, Casadevall and Fang is a rather inefficient technique skipping half or more of its potential targets, we have reason to suspect that they have merely shown us the tip of the iceberg, and that the actual rate of problematic images and graphs (suggesting researcher misconduct) in biology papers is much greater than 4% -- perhaps 8% or 10%.

A later paper ("Analysis and Correction of Inappropriate Image Duplication: the Molecular and Cellular Biology Experience") by Bik, Casadevall and Fang (along with Davis and Kullas) involved analysis of a different set of papers. The paper concluded that "as many as 35,000 papers in the literature are candidates for retraction due to inappropriate image duplication." They found that 6% of the papers "contained inappropriately duplicated images." They reached this conclusion after examining a set of papers in the journal *Molecular and Cellular Biology*. To reach this conclusion, they used the same rather inefficient method of their previous study I just cited. They state, "Papers were scanned using the same procedure as used in our prior study." We can only wonder how many biology papers would be found to be "candidates for retraction" if a really efficient (partially computerized) method was used to search for the image problems, one using an image database and reverse image searching, and one checking not only photos but also graphs, and one also checking the supplemental figures in the papers. Such a technique might easily find that 100,000 or more biology papers were candidates for retraction.

We should not be terribly surprised by such a situation. In modern academia there is relentless pressure for scientists to grind out papers at a high rate. There also seems to be relatively few quality checks on the papers submitted to scientific journals. Peer review serves largely as an ideological filter, to prevent the publication of papers that conflict with the cherished dogmas of the majority. There are no spot checks of papers submitted for publication, in which reviewers ask to see the source data or original lab notes or lab photographs produced in experiments. The problematic papers found by the studies mentioned above managed to pass peer review despite glaring duplication errors, indicating that peer reviewers are not making much of an attempt to exclude fraud. Given this misconduct problem and the items mentioned in my first paragraph, and given the frequently careless speech of so many biologists, in which they so often speak as if unproven claims or discredited claims are facts, it seems there is a significant credibility problem in academic biology.

In an unsparing essay entitled "The Intellectual and Moral Decline in Academic Research," PhD Edward Archer states the following:

"My experiences at four research universities and as a National Institutes of Health (NIH) research fellow taught me that the relentless pursuit of taxpayer

Prefrontal Cortex

- Why Most Animal Memory Experiments Tell Us Nothing About Human Memory
- Other Evidence of Human Paranormal Abilities
- Why Brains Are Not Suitable for Storing Long Sequences Like Humans Remember
- Why Brain Scans Don't Show Brains Make Minds
- Why Strokes, Alzheimer's Disease and Drunkenness Don't Prove the “Brains Make Minds” Dogma
- Synaptic Density Studies Contradict the Most Popular Memory Theory
- The Rare "Total Recall" Effect That Conflicts with Brain Dogmas
- Physical Connections Do Nothing to Explain Cognition
- The Sociological Reasons Why Bad Explanations Persist in Academia
- Split-Brain Cases Conflict with "Brains Make Minds" Dogma
- Why So Much of Neuroscience News Is Unreliable
- An Analogy Clarifying Why the "Brain Stores All Your Memories" Dogma Is Untenable
- Why Darwinism Fails to Explain the Human Mind
- What Is It That a Brain Does?
- Cloud Computing and a Non-Local Model of Consciousness
- Why We Do Not Understand the Origin of Complex Biological Innovations
- Our Minds May Arrive Top-Down Not Bottom-Up
- Fancy New Technology Fails to Prove Memory Dogmas
- The Argument for Determinism Collapses Once We Discard the "Minds Come from Brains" Dogma
- Animal Experiments Conflicting with the Dogma That the Brain Stores All Memories

About Me

Mark Mahin

www.markmahin.com

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funding has eliminated curiosity, basic competence, and scientific integrity in many fields. Yet, more importantly, training in 'science' is now tantamount to grant-writing and learning how to obtain funding. Organized skepticism, critical thinking, and methodological rigor, if present at all, are afterthoughts....American universities often produce corrupt, incompetent, or scientifically meaningless research that endangers the public, confounds public policy, and diminishes our nation's preparedness to meet future challenges....Universities and federal funding agencies lack accountability and often ignore fraud and misconduct. There are numerous examples in which universities refused to hold their faculty accountable until elected officials intervened, and even when found guilty, faculty researchers continued to receive tens of millions of taxpayers' dollars. Those facts are an open secret: When anonymously surveyed, over 14 percent of researchers report that their colleagues commit fraud and 72 percent report other questionable practices....Retractions, misconduct, and harassment are only part of the decline. Incompetence is another....The widespread inability of publicly funded researchers to generate valid, reproducible findings is a testament to the failure of universities to properly train scientists and instill intellectual and methodologic rigor. That failure means taxpayers are being misled by results that are non-reproducible or demonstrably false."

Justin T. Pickettt PhD has written a long illuminating post entitled "How Universities Cover Up Scientific Fraud." It states the following:

"I learned a hard lesson last year, after blowing the whistle on my coauthor, mentor and friend: not all universities can be trusted to investigate accusations of fraud, or even to follow their own misconduct policies. Then I found out how widespread the problem is: experts have been sounding the alarm for over thirty years. One in fifty scientists fakes research by fabricating or falsifying data....Claims that universities cover up fraud and even retaliate against whistleblowers are common....More than three decades ago, after spending years at the National Institutes of Health studying scientific fraud, Walter Stewart came to a similar conclusion. His research showed that fraud is widespread in science, that universities aren't sympathetic to whistleblowers and that those who report fraudsters can expect only one thing: 'no matter what happens, apart from a miracle, nothing will happen.' "

An Editor-in-Chief of the journal Molecular Brain has found evidence suggesting that a significant fraction of neuroscientists may not have the raw data backing up the claims in their scientific papers. He states the following:

"As an Editor-in-Chief of Molecular Brain, *I have handled 180 manuscripts since early 2017 and have made 41 editorial decisions categorized as 'Revise before review,' requesting that the authors provide raw data. Surprisingly, among those 41 manuscripts, 21 were withdrawn without providing raw data, indicating that requiring raw data drove away more than half of the manuscripts. I rejected 19 out of the remaining 20 manuscripts because of insufficient raw data. Thus, more than 97% of the 41 manuscripts did not present the raw data supporting their results when requested by an editor, suggesting a possibility that the raw data did not exist from the beginning, at least in some portions of these cases....We really cannot know what percentage of those manuscripts have fabricated data....Approximately 53% of the 227 respondents from the life sciences field answered that they suspect more than two-thirds of the manuscripts that were withdrawn or did not provide sufficient raw data might have..fabricated the data."*

at February 21, 2020 1 comment:

Labels: scientist misconduct

Tuesday, February 4, 2020

Blog Archive

Labels

When Animals Cast Doubt on Dogmas About Brains

These days our science news sources typically try to get us all excited about many a science study that is not worthy of our attention. But when a study appears that tells us something important, such a study will receive almost no attention if the study reports something that conflicts with prevailing dogmas about reality. So some recent not-much-there study involving zapping dead brain tissue got lots of attention in the press, but a far more important neuroscience study received almost no attention. The more important study was one that showed a rat with almost no brain had normal cognitive and memory capabilities.

The study was reported in the *Scientific Reports* sub-journal of the very prestigious journal *Nature,* and had the title "Life without a brain: Neuroradiological and behavioral evidence of neuroplasticity necessary to sustain brain function in the face of severe hydrocephalus." The study examined a rat named R222 that had lost almost all of its brain because of a disease caused hydrocephalus, which replaces brain tissue with a watery fluid. The study found that despite the rat having lost almost all of its brain, "Indices of spatial memory and learning across the reported Barnes maze parameters (A) show that R222 (as indicated by the red arrow in the figures) was within the normal range of behavior, compared to the age matched cohort." In other words, the rat with almost no brain seemed to learn and remember as well as a rat with a full brain.

This result should not come as any surprise to anyone familiar with the research of the physician John Lorber. Lorber studied many human patients with hydrocephalus, in which healthy brain tissue is gradually replaced by a watery fluid. Lorber's research is described in this interesting scientific paper. A mathematics student with an IQ of 130 and a verbal IQ of 140 was found to have "virtually no brain." His vision was apparently perfect except for a refraction error, even though he had no visual cortex (the part of the brain involved in sight perception).

In the paper we are told that of about 16 patients Lorber classified as having extreme hydrocephalus (with 90% of the area inside the cranium replaced with spinal fluid), half of them had an IQ of 100 or more. The article mentions 16 patients, but the number with extreme hydrocephalus was actually 60, as this article states, using information from this original source that mentions about 10 percent of a group of 600. So the actual number of these people with tiny brains and above-average intelligence was about 30. The paper states:

"[Lorber] described a woman with an extreme degree of hydrocephalus showing 'virtually no cerebral mantle' who had an IQ of 118, a girl aged 5 who had an IQ of 123 despite extreme hydrocephalus, a 7-year-old boy with gross hydrocephalus and an IQ of 128, another young adult with gross hydrocephalus and a verbal IQ of 144, and a nurse and an English teacher who both led normal lives despite gross hydrocephalus."

Sadly, the authors of the "Life without a brain" paper seemed to have learned too little from the important observational facts they recorded. Referring to part of the brain, they claim that "the hippocampus is needed for memory," even though their rat R222 had no hippocampus that could be detected in a brain scan. They stated, "It was not possible from these images of R222 to identify the caudate/putamen, amygdala, or hippocampus." Not very convincingly, the authors claimed that rat R222 had a kind of flattened hippocampus, based on some chemical signs (which is rather like guessing that some flattened roadkill was a particular type of animal).

But how could this rat with almost no brain have performed normally on the memory and cognitive tests? The authors appeal to a miracle, saying, "This

- memory recall
- memory storage
- morphogenesis
- natural selection
- near death experiences
- neural noise
- non-local consciousness
- nonneuralism
- optogenetics
- panpsychism
- precognition
- prefrontal cortex
- remote viewing
- savants
- scientist misconduct
- source of thoughts
- split-brain operation
- synapse theory of memory
- top-down theory of mind
- visual recognition

rare case can be viewed as one of nature's miracles." If you believe that brains are what store memories and cause thinking, you must regard cases such as this (and Lorber's cases) as "miracles," but when a scientist needs to appeal to such a thing, it is a gigantic red flag. Much better if we have a theory of the mind under which such results are what we would expect rather than a miracle. To get such a theory, we must abandon the unproven and very discredited idea that brains store memories and that brains create minds.

The Neuroskeptic blogger at Discovery magazine's online site mentions this rat R222, and the case of humans who performed well despite having the vast majority of their brain lost due to disease. Let's give him credit for mentioning the latter. But we shouldn't applaud his use of a trick that skeptics constantly employ: always ask for something you think you don't have.

This "keep moving the goalposts" trick works rather like this. If someone shows a photo looking like a ghost on the edge of a photo, say that it doesn't matter because the ghost isn't in the middle of the photo. If someone then shows you a photo that appears to show a ghost in the middle of the photo, say that it doesn't matter, because the photo isn't a 6-megabyte high resolution photo. If someone then shows you a 6-megabyte high resolution photo that appears to show a ghost in the middle of the photo, say that it doesn't matter, because it's just a photo and not a movie. If someone then shows you a movie of what looks like a ghost, say that it doesn't matter, because there were not multiple witnesses of the movie being made. If someone then shows you a movie of what looks like a ghost, the photography of which was observed by multiple witnesses, say that it doesn't matter, because the movie isn't a movie-theater-quality 35 millimeter Technicolor Panavision movie. If someone then shows you a movie-theater-quality 35 millimeter Technicolor Panavision movie of what looks like a ghost, the photography of which was observed by multiple witnesses, say that it doesn't matter, because the ghost wasn't levitating. If someone then shows you a movie-theater-quality 35 millimeter Technicolor Panavision movie of what looks like a levitating ghost, the photography of which was observed by multiple witnesses, say that it doesn't matter because the ghost wasn't talking. If someone then shows you a movie-theater-quality 35 millimeter Technicolor Panavision movie of what looks like a levitating talking ghost, the photography of which was observed by multiple witnesses, say that it doesn't matter, because the levitating talking ghost didn't explain the meaning of life to your satisfaction.

The Neuroskeptic uses such a technique when he writes the following:

"In the case of the famous human cases of hydrocephalus, the only evidence we have are the brain scans showing massively abnormal brain anatomy. There has never, to my knowledge, been a detailed post-mortem study of a human case."

If there were such an alleged "shortfall," it would be irrelevant, because we can tell perfectly well from a brain scan the degree of brain tissue loss when someone has lost most of their brain, as happened in the case of Lorber's patients and other hydrocephalus patients. Complaining about the lack of an autopsy study in such patients is like saying that you don't know that your wife lacks a penis, because no one did an autopsy study on her. Neuroskeptic's claim of no autopsy studies on hydocephalus patients is incorrect. When I do a Google search for "autopsy of hydrocephalus patient," I quickly find several studies which did such a thing, such as this one which reports that one of 10 patients with massive brain loss due to hydrocephalus was "cognitively unimpaired." Why did our Neuroskeptic blogger insinuate that such autopsy studies do not exist, when discovering their existence is as easy as checking the weather?

There are many animal studies (such as those of Karl Lashley) that conflict with prevailing dogmas about the brain. One such dogma is that the cerebral cortex is necessary for mental function. But some scientists once tried removing the cerebral cortex of newly born cats. The abstract of their paper reports no harmful results:

"The cats ate, drank and groomed themselves adequately. Adequate maternal and female sexual behaviour was observed. They utilized the visual and haptic senses with respect to external space. Two cats were trained to perform visual discrimination in a T-maze. The adequacy of the behaviour of these cats is compared to that of animals with similar lesions made at maturity."

Figure 4 of the full paper clearly shows that one of the cats without a cerebral cortex learned well in the T-maze test, improving from a score of 50 to almost 100. Karl Lashley did innumerable experiments after removing parts of animal's brains. He found that you could typically remove very large parts of an animal's brain without affecting the animal's performance on tests of learning and memory.

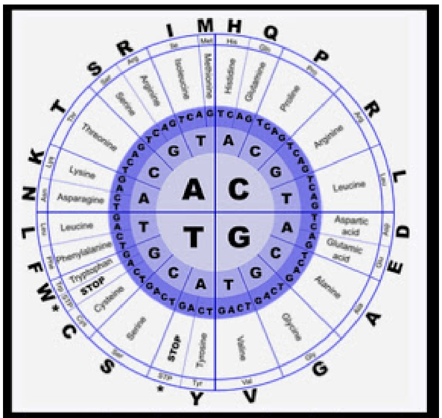
Ignoring such observational realities, our neuroscientists cling to their dogmas, such as the dogma that memories are stored in brains, and that the brain is the source of human thinking. Another example of a dubious neuroscience dogma is the claim that the brain uses coding for communication. A scientific paper discusses how common this claim is:

"A pervasive paradigm in neuroscience is the concept of neural coding (deCharms and Zador 2000): the query 'neural coding' on Google Scholar retrieved about 15,000 papers in the last 10 years. Neural coding is a communication metaphor. An example is the Morse code (Fig. 1A), which was used to transmit texts over telegraph lines: each letter is mapped to a binary sequence (dots and dashes)."

But the idea that the brain uses something like a Morse code to communicate has no real basis in fact. The paper quoted above almost confesses this by stating the following:

"Technically, it is found that the activity of many neurons varies with stimulus parameter, but also with sensory, behavioral, and cognitive context; neurons are also active in the absence of any particular stimulus. A tight correspondence between stimulus property and neural activity only exists within a highly constrained experimental situation. Thus, neural codes have much less representational power than generally claimed or implied."

That's moving in the right direction, but it would be more forthright and accurate to say that there is zero real evidence that neurons are using any type of code to represent human learned information, and that the whole idea of "neural coding" is just a big piece of wishful thinking where scientists are seeing what they hope to see, like someone looking at a cloud and saying, "That looks like my mother."



The genetic code is the only code known to be at work in a brain, and the same code is at work everywhere in the body.

at February 04, 2020 No comments:

Saturday, January 18, 2020

"Particle Experiences" and Other Dubious Ideas of Panpsychism

The book *Galileo's Error: Foundations for a New Science of Consciousness* by philosopher Philip Goff is a book with quite a few misfires. The biggest one is an extremely common one among today's philosophers. The error is to use the way-too-small term "problem of consciousness" in discussing current shortfalls in explaining the human mind.

What we actually have is an extremely large "problem of explaining human mental capabilities and human mental experiences" that is vastly larger than merely explaining consciousness. The problem includes all the following difficulties and many others:

1. the problem of explaining how humans are able to have abstract ideas;
2. the problem of explaining how humans are able to store learned information, despite the lack of any detailed theory as to how learned knowledge could ever be translated into neural states or synapse states;
3. the problem of explaining how humans are able to reliably remember things for more than 50 years, despite extremely rapid protein turnover in synapses, which should prevent brain-based storage of memories for any period of time longer than a few weeks;
4. the problem of how humans are able to instantly retrieve little accessed information, despite the lack of anything like an addressing system or an indexing system in the brain;
5. the problem of how humans are able to produce great works of creativity and imagination;
6. the problem of how humans are able to be conscious at all;
7. the problem of why humans have such a large variety of paranormal psychic experiences and capabilities such as ESP capabilities that have been well-established by laboratory tests, and near-death experiences that are very common, often occurring when brain activity has shut down;
8. the problem of how humans have such diverse skills and experiences as mathematical reasoning, moral insight, philosophical reasoning, and refined emotional and spiritual experiences;
9. the problem of self-hood and personal identity, why it is that we always continue to have the experience of being the same person, rather than just experiencing a bundle of miscellaneous sensations;

10. the problem of intention and will, how is it that a mind can will particular physical outcomes.

It is therefore a ridiculous oversimplification for philosophers to be raising a mere "problem of consciousness" that refers to only one of these problems, and to be speaking as if such a "problem of consciousness" is the only difficulty that needs to be tackled by a philosophy of mind. But that is exactly what Philip Goff does in his book. We have an indication of his failure to pay attention to the problems he should be addressing by the fact that (according to his index) he refers to memory on only two pages of his book, both of which say nothing of substance about human memory or the problems of explaining it. His index also contains no mention of insight, imagination, ideas, will, volition or abstract ideas. The book's sole mention of the problem of self-hood or the self is (according to the index) a single page referring to "self, as illusion." The book's sole reference to paranormal phenomena is a non-substantive reference on a single page. Ignoring the vast evidence for psi abilities, near-death experiences and other paranormal phenomena (supremely relevant to the philosophy of mind) is one of the greatest errors of academic philosophers of the past fifty years.

Imagine a baseball manager who has a "philosophy of winning baseball games" that is simply "make contact with the ball." If you had such a philosophy, you would be paying attention to only a very small fraction of what you need to be paying attention to in order to win baseball games. And any philosopher hoping to advance a credible philosophy of mind has to pay attention to problems vastly more varied than a mere "problem of consciousness" or problem of why some beings are aware.

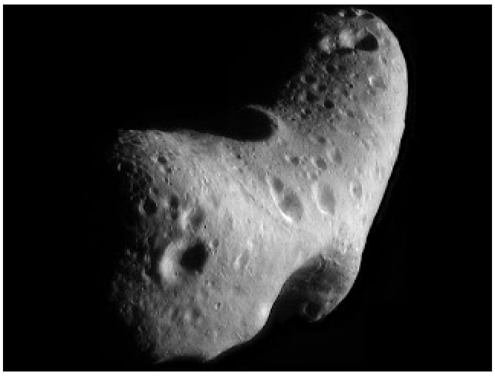
Goff's philosophical approach is to try and sell the old idea of panpsychism. Around for a very long time, panpsychism is the idea that consciousness is in everything or that consciousness is an intrinsic property of matter. A panpsychist may argue that just as mass is an intrinsic property of matter, consciousness is an intrinsic property of matter.

As shown by psychology textbooks that may run to 500 pages, the human mind (including memory) is an incredibly diverse and complicated thing, consisting of a huge number of capabilities and aspects. It has always been quite an error when people try to describe so complicated a thing as something simple and one-dimensional. This is what panpsychists have always done when they try to reduce the mind to the word "consciousness," which they then describe as a "property." A property is a simple aspect of something that can be described by a single number (for example, weight is a property of matter, and length is a property of matter, both of which can be stated as a single number). A mind is something vastly more complicated than a property.

Goff commits this same simplistic error by trying to shrink the human mind to the word "consciousness" throughout his book, and then telling us on page 23 that consciousness is a "feature of the physical world," and telling us on page 113 that "consciousness is a fundamental and ubiquitous feature of physical reality." When I look up "feature," I find that it is defined to mean the same thing as "property": "a distinctive attribue or aspect of something." Human minds are vastly more complicated than any mere "feature" or "property" or "aspect" or "attribute." We are being fed simplistic pablum when we are told that our minds are some "feature" or "aspect" or "property." If you've started out with the vast diversity and extremely multifaceted richness of the human mind, and somehow ended with up a one-dimensional word such as "feature" or "aspect" or "property," you've gone seriously wrong somewhere. Call it a shrinkage snafu.

So many professors act like masters of concealment by acting in so many ways to misrepresent the gigantic mental and biological complexity of human beings, as if they were so interested in covering up our complexities. And so we always have utterly misleading cell diagrams included in our biology textbooks, which make it look like there are only a few organelles per cell (the paper here tells us that there are typically hundreds or thousands of organelles per cell). And so we have "cell types" diagrams, which make it look as if there are only a few types of cells (the human body actually has hundreds of types of cells). And so we have the false myth that DNA is a blueprint or a recipe for making humans, false not only because of the lack of any such human specification in DNA, but also because of the naive error of speaking as if you could ever build an ever-changing supremely dynamic organism like a human (as internally dynamic as a very busy factory) through some mere recipe or mere blueprint like you would use to construct a static house or a static piece of food. And so we have the complexity-concealing claim that the vastly organized systemic arrangements of the human body can be explained by the "stuff piles up" idea of the accumulation of mutations (as if something as complex as a city could be explained by something like what we use to explain snow drifts). And so we have the frequent reality-denying assertions that mentally humans are "just another primate" or that other mammals are "just like us." And so you have the great complexity concealment of speaking as if a human mind was mere awareness or consciousness that could be described as a "property" or "feature."

Panpsychism creates the problem that we have to then end up believing that all kinds of inanimate things are conscious to some degree. If consciousness were to be some intrinsic property of matter, it would seem to follow that the more matter, the greater the consciousness. So we would have to believe that the large rocks in Central Park of New York City are far more conscious than we are. And we would also have to believe that the Moon is vastly more conscious than we are. But if such inanimate things are far more conscious than we are, why do they not give us the slightest indication that they are conscious? There is no sign of any intelligent motion in the comets or asteroids that travel through space. Instead they seem to operate according to purely physical principles, just exactly as if they had no consciousness whatsoever. That's why astronomers can predict very exactly how closely an asteroid will pass by our planet, and the exact day that it will pass by our planet. So it seems that Goff's claim on page 116 that panpsychism is “entirely consistent with the facts of empirical science” is not actually true. To the contrary, we see zero signs of any consciousness or will in any non-biological thing, no matter how great its size, contrary to what we would expect under the theory of panpsychism.



No sign of any Mind here (credit:NASA)

On page 113 Goff suggests that maybe it is just certain arrangements of matter that might be conscious. Goff isn't being terribly clear when he tells us on page on page 113, "Most panpsychists will deny that your socks are conscious, while asserting that they are ultimately composed of things that are conscious." So what does that mean, that the *threads* of your socks are conscious? If a panpsychist tries to defend his beliefs by denying that all material things are conscious, this actually pulls the legs from out under the table of panpsychism, depriving it of any small explanatory value it might have. Once you go from "all matter is conscious" to "only certain arrangements of matter," you still have the same problem in materialism, that there is no reason anyone can see why consciousness would appear from some particular arrangement of matter.

It would seem that the panpsychist has a kind of dilemma: either maintain that consciousness is an intrinisc property of matter (leaving you perhaps with some very small explanatory power, but many absurd consequences such as large rocks being more conscious than humans), or maintain that only special arrangements of matter are conscious (which would seem to remove any explanatory reason for believing in panpsychism in the first place).

On page 150 to 153 Goff shows himself to be an uncritical consumer of one of the biggest legends of neuroscience, that split-brain patients have a dual consciousness. They have no such thing, as we can discover by watching Youtube interviews with split-brain patients who clearly have a single self. A scientific study published in 2017 set the record straight on split-brain patients. The research was done at the University of Amsterdam by Yair Pinto. A press release entitled “Split Brain Does Not Lead to Split Consciousness” stated, “The researchers behind the study, led by UvA psychologist Yair Pinto, have found strong evidence showing that despite being characterised by little to no communication between the right and left brain hemispheres, split brain does not cause two independent conscious perceivers in one brain.” The actual facts about split-brain surgery are related here by a surgeon who has performed such an operation. He states this about split-brain patients:

"After the surgery they are unaffected in everyday life, except for the diminished seizures. They are one person after the surgery, as they were before."

Panpsychism does very little to help with the explanatory problems in the philosophy of mind. The main reason is that it does not help with more than one of the ten problems listed at the beginning of this post. For example, panpsychism is worthless in explaining how humans are able to instantly retrieve memories, or why humans are able to form abstract ideas.

In the last paragraph of the book, Goff makes a pitch that kind of follows that classic salesman's advice to “sell the sizzle not the steak.” He states the following (imagine some violins playing as you read this passage):

“*Panpsychism offers a way of 're-enchanting the universe.' On the panpsychist view, the universe is* like us*; we* belong *in it. We need not live exclusively in the human realm, ever more diluted by globalization and consumerist capitalism. We can live in nature, in the universe. We can let go of nation and tribe, happy in the knowledge that there is a universe that welcomes us.”*

But I fail to see any reason why a belief in panpsychism would produce any good change in human behavior. I can also imagine it having a bad effect. If you believe that all matter is conscious, you might have no particular guilt about killing someone. You might think to yourself: “He will still be conscious, even if I kill him, because all matter is conscious.” Similarly, if you believe that all matter is conscious, you might think it would be no great tragedy if all humanity were to become extinct, on the grounds that this would produce only a slight reduction in the total consciousness that exists in the universe (humanity having less than .0000000000000000000000000000000000001 of the universe's matter).

When panpsychists use simplistic shrinkage to describe mind as a mere "property" or "feature," it is like someone telling you that New York City is just a geographical coordinate, or like someone telling you that Brazil is just a pair of sounds someone can make with his mouth.

Scientific American has an interview with Goff about his book. Goff states the following;

"The basic commitment is that the fundamental constituents of reality—perhaps electrons and quarks—have incredibly simple forms of experience. And the very complex experience of the human or animal brain is somehow derived from the experience of the brain's most basic parts."

We can try to imagine such a whimsical possibility. A quark might have an experience of a dull, static existence stuck inside an atomic nucleus. An electron might have an experience of constantly whizzing around a nucleus at incredible speeds, like some person stuck on an amusement park ride. Or a neuron might have an experience of just sitting there motionless inside a brain. If there were billions or trillions or quadrillions of such tiny micro-experiences, they would never add up to anything like the experience of being a mobile thinking human free to walk around anywhere he wishes.

at January 18, 2020 No comments:

Labels: panpsychism

Saturday, December 7, 2019

The Guy with the Smallest Brain Had the Highest IQ

According to the theory that your brain creates your mind and stores your memories, we should expect that removal of half of the brain should have the most drastic effect on memory and intelligenc. But at the link here and the link here you can read about many cases showing a good preservation of memory and intelligence even after half a brain was removed to treat epileptic seizures.

There is a new study relating to the topic of intelligence and removal of half of the brain. Once again, the study reports facts shockingly inconsistent with standard claims that the brain is the source of the human mind. But the press reporting on this study is feeding us a kind of "cover story" trying to explain away the shocking result. Upon close inspection, this "cover story" falls apart.

The study involved brain scans of six patients who had half of their brains removed. Table S3 of the supplemental information of the study reveals that the intelligence quotients (IQ scores) of the six subjects were 84, 95, 91, 99, 96 and 80. So most of the six were fairly smart, even though half of their brains were gone. How could this be when half of their brains were missing?

In stories such as the story in Discover magazine, it is suggested that "brain rewiring" can explain such a thing. The story states the following:

"In a study published Tuesday in Cell Reports, scientists studied six of these patients to see how the human brain rewires itself to adapt after major surgery. After performing brain scans on the patients, the researchers found that the remaining hemisphere formed even stronger connections between different brain networks — regions that control things like walking, talking and memory — than in healthy control subjects. And the researchers suggest that these connections enable the brain, essentially, to function as if it were still whole."

The summary above is not accurate, as it tells a story that is not true for one of the six patients, as I will explain below. This hard-to-swallow story (repeated by the New York Times) is reassuring if you wish to keep believing that the brain is the source of your mind. The person who buys such a story can reassure himself kind of like this:

"How do people stay smart when you take out half of their brain? It's simple: the brain just rewires itself so that the half works as good as a whole. It acts kind of like a computer that reprograms itself to keep functioning like normal when you yank out half of its components."

We know of no machines ever built that have such a capability. All brains engage in some "brain rewiring" every year, so any mental effect can always be attributed to "brain rewiring." We cannot dream of how a brain could possibly be clever enough to rewire itself to perform just as well when half of its matter was removed.   When we take a close look at the data in the study, it shows that this "brain rewiring" story does not hold up for the smartest subject in the study.

In Table S4 of the study, we have measurements based on brain scanning, designed to show the level of connectivity in the brains of the six subjects. Some of the six subjects have a slightly higher average connectivity score, but it's not very much higher. The average connectivy scores for the controls with normal brains were .30 and .35. The average connectivity scores for the six patients with half a brain were .43, .45, .35, .30, .43, and .41. So it was merely true that the average brain connectivity score of the patients with half a brain was slightly higher than the normal controls. And when we look at another metric (the "max" score listed at the end of Table S4), we see that all of the half-brain subjects had lower "brain connectivity" scores than the controls. The "max" connectivy scores for the controls with normal brains were .90 and .74, but the "max" connectivity scores for the six patients with half a brain were only .57, .67, .49, .51, .63, and .62. So the evidence for greater brain connectivity or "nicely rewired brains" after removal of half a brain is actually quite thin.

Interestingly, the half-brain patient with the highest intelligence (labeled as HS4, with an IQ of 99) had an average brain connectivity score of only .30, which is the same as one of the group of controls with normal brains, and less than the brain connectivity of the other group of controls with normal brains. So the smartest person with half a brain (who had an IQ of 99) did not at all have any greater brain connectivity that can explain his normal intelligence with only half a brain. How can this subject HS4 have had a normal intelligence with only half a brain? In this case, favorable brain rewiring or greater brain connectivity cannot explain the result.   So the "cover story" of "their brains rewired to keep them smart" falls apart.

The half brain of subject HS4, IQ of 99, average brain wiring

The only way we can explain such results is by postulating that the human brain is not actually the source of the human mind. If the human brain is neither the source of the human mind nor the storage place of memories, we should not find any of the results mentioned in this post to be surprising.

Subject HS4 is not by any means the most remarkable case of a patient with half a brain and a good mind. The study here is entitled "Development of above normal language and intelligence 21 years after left hemispherectomy." After they removed the part of the brain claimed to be the "center of language," a subject developed "above normal" language and intelligence.

Then there is the case of Alex who did not start speaking until the left half of his brain was removed. A scientific paper describing the case says that Alex "failed to develop speech throughout early boyhood." He could apparently say only one word ("mumma") before his operation to cure epilepsy seizures. But then following a hemispherectomy (also called a hemidecortication) in which half of his brain was removed at age 8.5, "and withdrawal of anticonvulsants when he was more than 9 years old, Alex suddenly began to acquire speech." We are told, "His most recent scores on tests of receptive and expressive language place him at an age equivalent of 8–10 years," and that by age 10 he could "converse with copious and appropriate speech, involving some fairly long words." Astonishingly, the boy who could not speak with a full brain could speak well after half of his brain was removed. The half of the brain removed was the left half – the very half that scientists tell us is the half that has more to do with language than the right half.

What is also interesting in the new study is that when we cross-compare Figure 1 with Table S3 (in the supplemental information) we find that the patient with the largest brain (after the hemispherectomy operation) had the *lowest* IQ, and that the patient with the smallest brain had the *highest* IQ. In Figure 1 the brain of the subject with an IQ of 80 (subject HS6) looks much larger than the brain of the subject with an IQ of 99 (subject HS4). Such a result is not suprising under the hypothesis that your brain is not the source of your mind. It should also be not surprising to anyone who considers the fact that the brain of the Neanderthals (presumably not as smart as we modern humans) was substantially larger than the brain of modern humans.

at December 07, 2019 No comments:

Labels: hemispherectomy

Saturday, November 9, 2019

The Lack of Evidence for Memory-Storage Engram Cells

There are some very good reasons for thinking that long-term memories cannot be stored in brains, which include:

- the impossibility of credibly explaining how the instantaneous recall of some obscure and rarely accessed piece of information could occur as a neural effect, in a brain that is without any indexing system and subject to a variety of severe signal slowing effects;
- the impossibility of explaining how reliable accurate recall could occur in a brain subject to many types of severe noise effects;
- the short lifetimes of proteins in synapses, the place where scientists most often claim our memories are stored;
- the lack of any credible theory explaining how memories could be translated into neural states;
- the complete failure to ever find any brain cells containing any encoded information in neurons or synapses other than the genetic information in DNA;
- the lack of any known read or write mechanism in a brain.

But scientists occasionally produce research papers trying to persuade us that memories are stored in a brain, in cells that are called "engram cells." In this post, I will discuss why such papers are not good examples of experimental science, and do not provide any real evidence that a memory was stored in a brain. I will discuss seven problems that we often see in such science papers. The "sins" I refer to are merely methodological sins rather than moral sins.

Sin #1: assuming or acting as if a memory is stored in some exact speck-sized spot of a brain without any adequate basis for such a "shot in the dark" assumption.

Scientists never have a good basis for believing that a particular memory is stored in some exact tiny spot of the brain. But a memory experiment will often involve some assumption that a memory is stored in one exact spot of the brain (such as some exact spot of a cubic millimeter in width). For example, an experimental study may reach some conclusion (based on inadequate evidence) about a memory being stored in some exact tiny spot of the brain, and then attempt to reactivate that memory by electrically or optogenetically stimulating that exact tiny spot.

The type of reasoning that is used to justify such a "shot in the dark" assumption is invariably dubious. For example, an experiment may observe parts of a brain of an animal that is acquiring some memory, and look for some area that is "preferentially activated." But such a technique is as unreliable as reading tea leaves. When brains are examined during learning activities, brain regions (outside of the visual cortex) do not actually show more than a half of 1% signal variation. There is never any strong signal allowing anyone to be able to say with even a 25% likelihood that some exact tiny part of the brain is where a memory is stored. If a scientist picks some tiny spot of the brain based on "preferential activation" criteria, it is very likely that he has not picked the correct location of a memory, even under the assumption that memories are stored in brains. Series of brains scans do not show that some particular tiny spot of the brain tends to repeatedly activate to a greater degree when some particular memory is recalled.

Sin #2: Either a lack of a blinding protocol, or no detailed discussion of how an effective technique for blinding was achieved.

Randomization and blinding techniques are a very important scientific technique for avoiding experimenter bias. For example, what is called the "gold standard" in experimental drug studies is a type of study called a double-blind, randomized experiment. In such a study, both the doctors or scientific staff handing out pills and the subjects taking the pills do not know whether the pills are the medicine being tested or a placebo with no effect.

If similar randomization and blinding techniques are not used in a memory experiment, there will be a high chance of experimenter bias. For example, let's suppose a scientist looks for memory behavior effects in two groups of animals, the first being a control group having no stimulus designed to affect memory, and the second group having a stimulus designed to affect memory. If the scientist knows which group is which when analyzing the behavior of the animals, he will be more likely to judge the animal's behavior in a biased way, so that the desired result is recorded.

A memory experiment can be very carefully designed to achieve this blind randomization ideal that minimizes the chance of experimenter bias. But such a thing is usually not done in memory experiments purporting to show evidence of a brain storage of memories. Scientists working for drug trials are very good about carefully designing experiments to meet the ideal of blind randomization, because they know the FDA will review their work very carefully, rejecting the drug for approval if the best experimental techniques were not used. But neuroscientists have no such incentive for experimental rigor.

Even in studies where some mention is made of a blinding protocol, there is very rarely any discussion of how an *effective* protocol was achieved. When dealing with small groups of animals, it is all too easy for a blinding protocol to be ineffective and worthless. For example, let us suppose there is one group of 10 mice that have something done to their brains, and some other control group that has no such done thing. Both may be subjected to a stimulus, and their "freezing behavior" may be judged. The scientists judging such a thing may be supposedly "blind" to which experimental group is being tested. But if a scientist is able to recognize any physical characteristic of one of the mice, he may actually know which group the mouse belongs to. So it is very easy for a supposed blinding protocol to be ineffective and worthless. What is needed to have confidence in such studies is not a mere mention of a blinding protocol, but a detailed discussion of exactly how an *effective* blinding protocol was achieved. We almost never get such a thing in memory experiments. The minority of them that refer to a blinding protocol almost never discuss in detail how an *effective* blinding protocol was achieved, one that really prevented scientists from knowing something that might have biased their judgments.

For an experiment that judges "freezing behavior" in rodents, an effective blinding protocol would be one in which such freezing was judged by a person who never previously saw the rodents being tested. Such a protocol would guarantee that there would be no recognition of whether the animals were in an experimental group or a control group. But in "memory engram" papers we never read that such a thing was done. To achieve an effective blinding protocol, it is not enough to use automated software for judging freezing, for such software can achieve biased results if it is run by an experimenter who knows whether or not an animal was in a control group.

Sin #3: inadequate sample sizes, and a failure to do a sample size calculation to determine how large a sample size to test with.

Under ideal practice, as part of designing an experiment a scientist is supposed to perform what is called a sample size calculation. This is a calculation that is supposed to show how many subjects to use per study group to provide adequate evidence for the hypothesis being tested. Sample size calculations are included in rigorous experiments such as experimental drug trials.

The PLOS paper here reported that only one of the 410 memory-related neuroscience papers it studied had such a calculation. The PLOS paper reported that in order to achieve a moderately convincing statistical power of .80, an experiment typically needs to have 15 animals per group; but only 12% of the experiments had that many animals per group. Referring to statistical power (a measure of how likely a result is to be real and not a false alarm), the PLOS paper states, "no correlation was observed between textual descriptions of results and power." In plain English, that means that there's a whole lot of BS flying around when scientists describe their memory experiments, and that countless cases of very weak evidence have been described by scientists as if they were strong evidence.

The paper above seems to suggest that 15 animals per study group is needed. But In her post "Why Most Published Neuroscience Findings Are False," Kelly Zalocusky PhD calculates (using Ioannidis's data) that the median effect size of neuroscience studies is about .51. She then states the following, talking about statistical power:

"To get a power of 0.2, with an effect size of 0.51, the sample size needs to be 12 per group. This fits well with my intuition of sample sizes in (behavioral)

neuroscience, and might actually be a little generous. To bump our power up to 0.5, we would need an n of 31 per group. A power of 0.8 would require 60 per group."

So the number of animals per study group for a moderately convincing result (one with a statistical power of .80) is more than 15 (according to one source), and something like 60, according to another source. But the vast majority of "memory engram" papers do not even use 15 animals per study group.

Sin #4: a high occurrence of low statistical significance near the minimum of .05, along with a frequent hiding of such unimpressive results, burying them outside of the main text of a paper rather than placing them in the abstract of the paper.

Another measure of how robust a research finding is the statistical significance reported in the paper. Memory research papers often have marginal statistical significance close to .05.

Nowadays you can publish a science paper claiming a discovery if you are able to report a statistical significance of only .05. But it has been argued by 72 experts that such a standard is way too loose, and that things should be changed so that a discovery can only be claimed if a statistical significance of .005 is reached, which is a level ten times harder to achieve.

It should be noted that it is a big misconception that when you have a result with a statistical significance (or P-value) of .05, this means there is a probability of only .05 that the result was a false alarm and that the null hypothesis is true. This paper calls such an idea “the most pervasive and pernicious of the many misconceptions about the P value.”

When memory-related scientific papers report unimpressive results having a statistical significance such as only .03, they often make it hard for people to see this unimpressive number. An example is the recent paper “Artificially Enhancing and Suppressing Hippocampus-Mediated Memories.” Three of the four statistical significance levels reported were only .03, but this was not reported in the summary of the paper, and was buried in hard-to-find places in the text.

Sin #5: using presumptuous or loaded language in the paper, such as referring in the paper to the non-movement of an animal as “freezing” and referring to some supposedly "preferentially activated" cell as an "engram cell."

Papers claiming to find evidence of memory engrams are often guilty of using presumptuous language that presupposes what they are attempting to prove. For example, the non-movement of a rodent in an experiment is referred to by the loaded term "freezing," which suggests an animal freezing in fear, even though we have no idea whether the non-movement actually corresponds to fear. Also, some cell that is guessed to be a site of memory storage (because of some alleged "preferential activation" that is typically no more than a fraction of 1 percent) is referred to repeatedly in the papers as an "engram cell," which means a memory-storage cell, even though nothing has been done to establish that the cell actually stores a memory.

We can imagine a psychology study using similar loaded language. The study might make hidden camera observations of people waiting at a bus stop. Whenever the people made unpleasant expressions, such expressions would be labeled in the study as "homicidal thoughts." The people who had slightly more of these unpleasant expressions would be categorized as "murderers." The study might say, "We identified two murderers at the bus stop from their increased display of homicidal expressions." Of course, such ridiculously loaded, presumptuous language has no place in a scientific paper. It is almost as bad for "memory engram" papers to be referring so casually to "engram cells" and "freezing" when neither fear nor memory storage at a specific cell has been demonstrated. We can only wonder whether the authors of such papers were thinking something like, "If we use the phrase *engram cells* as much as we can, maybe people will believe we found some evidence for engram cells."

Sin #6: failing to mention or test alternate explanations for the non-movement of an animal (called “freezing”), explanations that have nothing to do with memory recall.

A large fraction of all "memory engram" papers hinge on judgments that some rodent engaged in increased "freezing behavior," perhaps while some imagined "engram cells" were electrically or optogenetically stimulated. A science paper says that it is possible to induce freezing in rodents by stimulating a wide variety of regions. It says, "It is possible to induce freezing by activating a variety of brain areas and projections, including the hippocampus (Liu et al., 2012), lateral, basal and central amygdala (Ciocchi et al., 2010); Johansen et al., 2010; Gore et al., 2015a), periaqueductal gray (Tovote et al., 2016), motor and primary sensory cortices (Kass et al., 2013), prefrontal projections (Rajasethupathy et al., 2015) and retrosplenial cortex (Cowansage et al., 2014).”

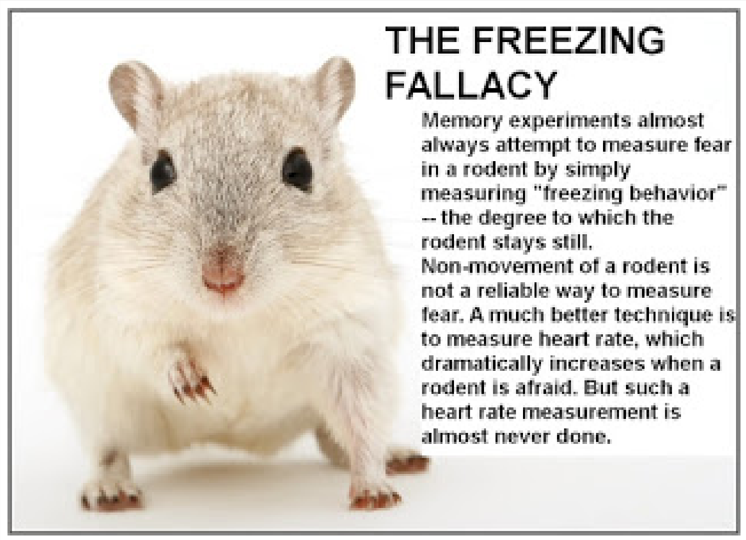
But we are not informed of such a reality in quite a few papers claiming to supply evidence for an engram. In such studies typically a rodent will be trained to fear some stimulus. Then some part of the rodent's brain will be stimulated when the stimulus is not present. If the rodent is nonmoving (described as "freezing") more often than a rodent whose brain is not being stimulated, this is hailed as evidence that the fearful memory is being recalled by stimulating some part of the brain. But it is no such thing. For we have no idea whether the increased freezing or non-movement is being produced merely by the brain stimulation, without any fear memory, as so often occurs when different parts of the brain are stimulated.

If a scientist thinks that some tiny part of a brain stores a memory, there is an easy way to test whether there is something special about that part of the brain. The scientists could do the "stimulate cells and test fear" kind of test on multiple parts of the brain, only one of which was the area where the scientist thought the memory was stored. The results could then be compared, to see whether stimulating the imagined "engram cells" produced a higher level of freezing than stimulating other random cells in the brain. Such a test is rarely done.

Sin #7: a dependency on arbitrarily analyzed brain scans or an uncorroborated judgment of "freezing behavior" which is not a reliable way of measuring fear.

A crucial element of a typical "memory engram" science paper is a judgment of what degree of "freezing behavior" a rodent displayed. The papers typically equate non-movement with fear coming from recall of a painful stimulus. This doesn't make much sense. Many times in my life I saw a house mouse that caused me or someone else to shreik, and I never once saw a mouse freeze. Instead, they seem invariably to flee rather than to freeze. So what sense does it make to assume that the degree of non-movement ("freezing") of a rodent should be interpreted as a measurement of fear? Moreover, judgments of the degree of "freezing behavior" in mice are too subjective and unreliable.

Fear causes a sudden increase in heart rate in rodents, so measuring a rodent's heart rate is a simple and reliable way of corroborating a manual judgment that a rodent has engaged in increased "freezing behavior." A scientific study showed that heart rates of rodents dramatically shoot up instantly from 500 beats per minute to 700 beats per minute when the rodent is subjected to the fear-inducing stimuli of an air puff or a platform shaking. But rodent heart rate measurements seem to be never used in "memory engram" experiments. Why are the researchers relying on unreliable judgments of "freezing behavior" rather than a far-more-reliable measurement of heart rate, when determining whether fear is produced by recall? In this sense, it's as if the researchers wanted to follow a technique that would give them the highest chance of getting their papers published, rather than using a technique that would give them the most reliable answer as to whether a mouse is feeling fear.



Another crucial element of many "memory engram" science papers is analysis of brain scans. But there are 1001 ways to analyze the data from a particular brain scan. Such flexibility almost allows a researcher to find whatever "preferential activation" result he is hoping to find.

Page 68 of this paper discusses how brain scan analysis involves all kinds of arbitrary steps:

"The time series of voxel changes may be motion-corrected, coregistered, transformed to match a prototypical brain, resampled, detrended, normalized, smoothed, trimmed (temporally or spatially)...Furthermore, each of these steps can be done in a number of ways, each with many free parameters that experimenters set, often arbitrarily....The wholebrain analysis is often the first step in defining a region of interest in which the analyses may include exploration of time courses, voxelwise correlations, classification using support vector machines or other machine learning methods, across-subject correlations, and so on. Any one of these analyses requires making crucial decisions that determine the soundness of the conclusions."

The problem is that there is no standard way of doing such things. Each study arbitrarily uses some particular technique, and it is usually true that the results would have been much different if some other brain scan analysis technique had been used.

Examples of Such Shortcomings

Let us look at a recent paper that claimed evidence for memory engrams. The paper stated, “Several studies have identified engram cells for different memories in many brain regions including the hippocampus (Liu et al., 2012; Ohkawa et al., 2015; Roy et al., 2016), amygdala (Han et al., 2009; Redondo et al., 2014), retrosplenial cortex (Cowansage et al., 2014), and prefrontal cortex (Kitamura et al., 2017).” But the close examination below will show that none of these studies are robust evidence for memory engrams in the brain.

Let's take a look at some of these studies. The Kitamura study claimed to have "identified engram cells" in the prefrontal cortex is the study "Engrams and circuits crucial for systems consolidation of a memory." In Figure 1 (containing multiple graphs), we learn that the number of animals used in different study groups or experimental activities were 10, 10, 8, 10, 10, 12, 8, and 8, for an average of 9.5. In Figure 3 (also containing multiple subgraphs), we have even smaller numbers. The numbers of animals mentioned in that figure are 4, 4, 5, 5, 5, 10, 8, 5, 6, 5 and 5. None of these numbers are anything like what would be needed for a moderately convincing result, which would be a minimum of 15 animals per study group. So the study is very guilty of Sin #3. The study is also guilty of Sin #2, because no detailed description is given of an effective blinding protocol. The study is also guilty of Sin #4, because Figure 3 lists two statistical significance values of "< 0.05" which is the least impressive result you can get published nowadays. Studies reaching a statistical significance of less than 0.01 will always report such a result as "< 0.01" rather than "<0.05." The study is also guilty of Sin #7, because it relies on judgments of freezing behavior of rodents, which were not corroborated by something such as heart rate measurements.

The Liu study claimed to have "identified engram cells" in the hippocampus of the brain is the study "Optogenetic stimulation of a hippocampal engram activates fear memory recall." We see in Figure 3 that inadequate sample sizes were used. The number of animals listed in that figure (during different parts of the experiments) are 12, 12, 12, 5, and 6, for an average of 9.4. That is not anything like what would be needed for a moderately convincing result, which would be a minimum of 15 animals per study group. So the study is guilty of Sin #3. The study is also guilty of Sin #7. The experiment relied crucially on judgments of fear produced by manual assessments of freezing behavior, which were not corroborated by any other technique such as heart-rate measurement. The study does not describe in detail any effective blinding protocol, so it is also guilty of Sin #2. The study is also guilty of Sin #6. The study involved stimulating certain cells in the brains of mice, with something called optogenetic stimulation. The authors have assumed that when mice freeze after stimulation, that this is a sign that they are recalling some fear memory stored in the part of the brain being stimulated. What the authors neglect to tell us is that stimulation of quite a few regions of a rodent brain will produce freezing behavior. So there is actually no reason for assuming that a fear memory is being recalled when the stimulation occurs.

The Ohkawa study claimed to have " identified engram cells" in the hippocampus of the brain is the study "Artificial Association of Pre-stored Information to Generate a Qualitatively New Memory." In Figure 3 we learn that the animal study groups had a size of about 10 or 12, and in Figure 4 we learn that the animal study groups used were as small as 6 or 8 animals. So the study is guilty of Sin #3. Because the paper used a "zap their brains and look for freezing" approach, without discussing or testing alternate explanations for freezing behavior having nothing to do with memory, the Ohkawa study is also guilty of Sin #6. Judgment of fear is crucial to the experimental results, and it was done purely by judging "freezing behavior," without measurement of heart rate. So the study is also guilty of Sin #7. This particular study has a few skimpy phrases which claims to have used a blinding protocol: "Freezing counting experiments were conducted double blind to experimental group." But no detailed discussion is made of how an effective blinding protocol was achieved, so the study is also guilty of Sin #2.

The Roy study claimed to have "identified engram cells" in the hippocampus of the brain is the study "Memory retrieval by activating engram cells in mouse models of early Alzheimer's disease." Looking at Figure 1, we see that the study groups used sometimes consisted of only 3 or 4 animals, which is a joke from any kind of statistical power standpoint. Looking at Figure 3, we see the same type of problem. The text mentions study groups of only "3 mice per group," "4 mice per group," and "9 mice per group," and "10 mice per group." So the study is guilty of Sin #3. Although a blinding protocol is mentioned in the skimpiest language, no detailed discussion is made of how an effective blinding protocol was achieved, so the study is also guilty of Sin #2. Some of the results reported have a statistical significance of only "<.05," so the study is guilty of Sin #4.

The Han study (also available here) claimed to have "identified engram cells" in the amygdala is the study "Selective Erasure of a Fear Memory." In Figure 1 we see a larger-than average sample size was used for two groups (17 and 24), but that a way-too-small sample size of only 4 was used for the corresponding control group. You need a sufficiently high number of animals in all study groups, including the control group, for a reliable result. The same figure tells us that in another experiment the number of animals in the study group were only 5 or 6, which is way too small. Figure 3 tells us that in other experiments only 8 or 9 mice were used, and Figure 4 tells us that in other experiments only 5 or 6 mice were used. So this paper is guilty of Sin #3. No mention is made in the paper of any blinding protocol, so this paper is guilty of Sin #2. Figure 4 refers to two results with a borderline statistical significance of only "< 0.05," so this paper is also guilty of Sin #4. The paper relies heavily on judgments of fear in rodents, but these were uncorroborated judgments based on "freezing behavior," without any measure of heart rate to corroborate such judgments. So the paper is also guilty of Sin #7.

The Redondo study claimed to have "identified engram cells" in the amygdala is the study "Bidirectional switch of the valence associated with a hippocampal contextual memory engram." We see 5 or 6 results reported with a borderline statistical significance of only "< 0.05," so this paper is guilty of Sin #4. No detailed description is given of how an effective blinding protocol was achieved, and only the skimpiest mention is made of blinding, so this paper is guilty of Sin #2. The study used only "freezing behavior" to try to measure fear, without corroborating such a thing by measuring heart rates. So the paper was guilty of Sin #7. The study involved stimulating certain cells in the brains of mice, with something called optogenetic stimulation. The authors have assumed that when mice freeze after stimulation, that this is a sign that they are recalling some fear memory stored in the part the brain being stimulated. What the authors neglect to tell us is that stimulation of quite a few regions of a rodent brain will produce freezing behavior. So there is actually no reason for assuming that a fear memory is being recalled when the stimulation occurs. So the study is also guilty of Sin #6.

The Cowansage study claimed to have "identified engram cells" in the retrosplinial cortex of the brain is the study "Direct Reactivation of a Coherent Neocortical Memory of Context." Figure 2 tells us that only 12 mice were used for one experiment. Figure 4 tells us that only 3 and 5 animals were used for other experiments. So this paper is guilty of Sin #3. No detailed description is given of how an effective blinding protocol was achieved, and only the skimpiest mention is made of blinding, so this paper is guilty of Sin #2. It's a paper using the same old "zap rodent brains and look for some freezing behavior" methodology, without explaining why such results can occur for reasons having nothing to do with memory recall. So the study is guilty of Sin #6. Some of the results reported have a statistical significance of only "<.05," so the study is guilty of Sin #4.

So I have examined each of the papers that were claimed as evidence for memory traces or engrams in the brain. Serious problems have been found in every one of them. Not a single one of the studies made a detailed description of how an effective blinding protocol was executed. All of the studies were guilty of Sin #7. Not a single one of the studies makes a claim to have followed some standardized method of brain scan analysis. Whenever there are brain scans we can say that the experiments merely chose one of 101 possible ways to analyze brain scan data. Not a single one of the studies has corroborated "freezing behavior" judgments by measuring heart rates of rodents to determine whether the animals suddenly became afraid. But all of the studies had a depenency on either brain scanning, uncorroborated freezing behavior judgments, or both. The studies all used sample sizes far too low to get a reliable result (although one of them used a decent sample size to get part of its results).

The papers I have discussed are full of problems, and do not provide robust evidence for any storage of memories in animal brains. There is no robust evidence that memories are stored in the brains of any animal, and no robust evidence that any such thing as an "engram cell" exists.

The latest press report of a "memory wonder" produced by scientists is a claim that scientists implanted memories in the brains of songbirds. For example, the Scientist magazine has an article entitled, "Researchers Implant Memories in Zebra Finch Brains." The relevant scientific study is hidden behind a paywall of Science magazine. But by reading the article, we can get enough information to have the strongest suspicion that the headline is a bogus brag.

Of course, the scientists didn't actually implant musical notes into the brains of birds. Nothing of the sort could ever occur, because no one has the slightest idea of how learned or episodic information could ever be represented as neural states. The scientists merely gave little bursts of energy into the brains of some birds. The scientists claimed that the birds who got shorter bursts of energy tended to sing shorter songs. "When these finches grew up, they sang adult courtship songs that corresponded to the duration of light they'd received," the story tells us. Of course, it would be not very improbable that such a mere "duration similarity" would occur by chance.

It is very absurd to be describing such a mere "duration similarity" as a memory implant. It was not at all true that the birds sung some melody that had been artifically implanted in their heads. The scientists in question have produced zero evidence that memories can be artificially implanted in animals. From an example like this, we get the impression that our science journalists will uncritically parrot any claim of success in brain experiments with memory, no matter how glaring are the shortcomings of the relevant study.

There is no robust evidence for engram cells, and those who have tried to present evidence for memory storage cells have never been able to articulate a coherent detailed theory about how human memory experiences or human learned knowledge could ever be translated into neural states or cell states. The engram theorist is therefore like a person who claims there is evidence for a city floating way up in the sky, but who is unable to tell you how a city could be floating in the air.

at November 09, 2019 No comments:

Labels: memory storage

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Head Truth

The huge case for thinking minds do not come from brains

Tuesday, June 16, 2020

Study Finds "Poor Overall Reliability" of Brain Scanning Studies

For decades neuroscientists have been trying to use brain imaging to get evidence that particular regions of the brain cause particular mental effects. The technique they use typically works like this:

(1) Put a small number of subjects in an MRI brain scanner, and either have them do some mental task or expose them to some kind of mental stimulus.
(2) Use the brain scanner to make images of the brain during such activity.
(3) Then analyze the brain scans, looking for some area of higher activation.

Often sleazy and misleading techniques are used to present the data from such studies. Techniques are very often used that make very small differences in brain signal strength look like very big differences. A discussion of such techniques, which I call "lying with colors" can be read here.

Claims that particular regions of the brain show larger activity during certain mental activities are typically not well-replicated in followup studies. A book by a cognitive scientist states this (page 174-175):

"The empirical literature on brain correlates of emotion is wildly inconsistent, with every part of the brain showing some activity correlated with some aspect of emotional behavior. Those experiments that do report a few limited areas are usually in conflict with each other....There is little consensus about what is the actual role of a particular region. It is likely that the entire brain operates in a coordinated fashion, complexly interconnected, so that much of the research on individual components is misleading and inconclusive."

An article on neursosciencenews.com states the following:

"Small sample sizes in studies using functional MRI to investigate brain connectivity and function are common in neuroscience, despite years of warnings that such studies likely lack sufficient statistical power. A new analysis reveals that task-based fMRI experiments involving typical sample sizes of about 30 participants are only modestly replicable. This means that independent efforts to repeat the experiments are as likely to challenge as to confirm the original results."

There have been statistical critiques of brain imaging studies. One critique found a common statistical error that “inflates correlations.” The paper stated, “The underlying problems described here appear to be common in fMRI research of many kinds—not just in studies of emotion, personality, and social cognition.”

Another critique of neuroimaging found a “double dipping” statistical error that was very common. New Scientist reported a software problem, saying “Thousands of fMRI brain studies in doubt due to software flaws.”

Flaws in brain imaging studies were highlighted by a study that found

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- Reasons for Doubting a Brain Could Do the Super-Complex Encoding Needed to Neurally Store Episodic Memories or Concepts
- The Many Cases Showing a Person's Mind Can Operate When His Brain Has Shut Down
- Your Physical Structure Did Not Arise Bottom-Up, So Why Think Your Mind Did?
- The Brain Seems to Have No Mechanism for Reading or Writing Memories
- No One Understands How a Brain Could Generate Ideas
- 30 Reasons for Rejecting the Theory of Neural Memory Storage
- Groupthink and Peer Pressure Make It Taboo for Neuroscientists to Put Two and Two Together
- Synaptic Delays Mean Brain Signals Must Move at a Snail's Pace
- Brain Dogmas Versus Case Histories That Refute Them
- In Neuroscience Papers Bluffing Is More Common Than Candor
- Young Age of Languages Contradicts Claims of Neural Storage of Linguistic Information

"correlations of consciousness" by using an fMRI brain scan on a dead salmon. See here for an image summarizing the study. The dead salmon study highlighted a problem called the multiple comparisons problem. This is the problem that the more comparisons you make between some region of the brain and an average, the more likely you will be to find a false positive, simply because of chance variations. A typical brain scan study will make many such comparisons, and in such a study there is a high chance of false positives.

Considering the question of "How Much of the Neuroimaging Literature Should We Discard?" a PhD and lab director states, "Personally I'd say I don't really believe about 95% of what gets published...I think claims of 'selective' activation are almost without exception completely baseless " This link says that a study, "published open-access in the Proceedings of the National Academy of Sciences, suggests that the methods used in fMRI research can create the illusion of brain activity where there is none—up to 70% of the time."

A new study has raised additional concerns about the use of brain imaging in neuroscience. The study was announced in a Duke University press release entitled, "Studies of Brain Activity Aren't as Useful as Scientists Thought." The study discusses a meta-analysis which looked at the question of how reliably there occurs a region of higher brain activation, in cases when a particular subject had his brain scanned at two different times.

What neuroscientists would like for there to be is a tendency to get the same result in two different scans of a person's brain taken on two different days, when the person was engaged in the same activity or exposed to the same stimulus. But that doesn't happen. We read the following in the press release, which quotes Ahmad R. Hariri:

"Hariri said the researchers recognized that 'the correlation between one scan and a second is not even fair, it's poor.'...For six out of seven measures of brain function, the correlation between tests taken about four months apart with the same person was weak....Again, they found poor correlation from one test to the next in an individual. The bottom line is that task-based fMRI in its current form can't tell you what an individual's brain activation will look like from one test to the next, Hariri said....'We can't continue with the same old '"hot spot" research,' Hariri said. "We could scan the same 1,300 undergrads again and we wouldn't see the same patterns for each of them."

The press release is talking about a scientific study by Hariri and others that can be read here. The study is entitled, "What is the test-retest reliability of common task-fMRI measures? New empirical evidence and a meta-analysis." The study says, "We present converging evidence demonstrating poor reliability of task-fMRI measures...A meta-analysis of 90 experiments (N=1,008) revealed poor overall reliability."

In a neuoscience study, the sample size is how many subjects (animal or human) were tested. Figure 1 of the Hariri study deserves careful attention. It has three graphs comparing the kind of sample sizes we would need to get reliable results in brain imaging studies (ranging from between 100 and 1000) to the median samples size of brain image studies (listed as only 25). This highlights a problem that I have many times written about: that the sample sizes used in neuroscience studies are typically way too small to produce reliable results. As it happens, the problem is even worse than depicted in Figure 1, because the median sample size of a neuroscience study is actually much less than 25. According to the paper here, "Highly cited experimental and clinical fMRI studies had similar median sample sizes (medians in single group studies: 12 and 14.5; median group sizes in multiple group studies: 11 and 12.5)."

Neuroscientists have known about this shortcoming for years. It has been pointed out many times that the sample sizes used in neuroscience studies are

- Vacillating Disarray of the Memory Trace Theorists
- Study Finds "Poor Overall Reliability" of Brain Scanning Studies
- "Brains Store Memories" Dogma Versus the Reality of Noisy Brains
- The Brain Has Nothing Like 7 Things a Computer Uses to Store and Retrieve Information
- Exhibit A Suggesting Scientists Don't Understand How a Brain Could Store a Memory
- The Dubious Dogma That Brains Make Decisions
- Long Article Tries to Show Neural Memory Storage, but Gives No Real Evidence for It
- How Evidence for ESP Undermines the "Minds Come From Brains" Dogma
- Gender Differences in Brains Help Discredit Prevailing Dogmas About Brains
- Study Finds Equal Brain Connectivity in All Mammals
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- Global Workspace Theory Sure Isn't an Explanation for Consciousness
- When Animals Cast Doubt on Dogmas About Brains
- Memories Can Form Many Times Faster Than the Speed of Synapse Strengthening
- The Guy with the Smallest Brain Had the Highest IQ
- He Had Half a Brain and Above Normal Intelligence
- The Truth About Neurons and Synapses
- A Diagram of Explanatory Dysfunction in Academia
- The Brain Shows No Sign of Working Harder During Thinking or Recall
- More Evidence of High Mental Function Despite Large Brain Damage
- The Lack of a Viable Theory of Neural Memory Encoding
- More Evidence That Neuron Loss Has Little Effect on Cognition
- Fraud and Misconduct Are Not Very Rare in Biology
- Reasons for Doubting Thought Comes from the Frontal Lobes or

typically way too small for reliable results. But our neuroscientists keep grinding out countless studies with too small a statistical power. In the prevailing culture of academia, you are rewarded for the *number* of papers published with your name on it, and not too much attention is paid to the reliability of such studies. So if you are a professor with a budget that is sufficient to fund either 100 fMRI scans on 100 subjects in a single study of relatively high reliability, or 10 little low-reliability studies with only 10 subjects each, the prevailing rewards system in academia makes it a better career move for you to do 10 unreliable studies resulting in 10 separate papers rather than a single study resulting in a single paper.

Figure 5 of the Hariri study is also interesting. It rates reliability in various tests of mental activity while subjects had their brains scanned at two different times. There's data for a single task involving memory, which failed to reach a reliability of either "excellent" or "good." This task involved a retest of only 20 different subjects. On the left of the figure, we have results for an Executive Function (EF) test tried twice on 45 subjects, and a "relational" test tried twice on 45 subjects. The relational test is discussed here. In the test you have to look at some visual figures, and mentally discern whether the type of transformation (either shape or texture) that occurred in a first row of figures was the same transformation used in the second row of figures.

So we have here the interesting case of two thinking tasks applied to 45 subjects on two different days, while their brains were scanned. This makes a better-than-average test of whether some brain region should reliably be activated more strongly during thinking.

The result was actually a flop and a fail for the hypothesis that your brain produces thinking. In the Executive Function test (corresponding to the third column of circles shown below), none of the 8 brain regions examined produced a greater activation that appeared to an extent that was either Excellent, Good, or Fair. In the relational test (corresponding to the fifth column of circles shown below), none of the 8 brain regions examined produced a greater activation that appeared to an extent that was either Excellent, Good, or Fair. The figure is shown below:

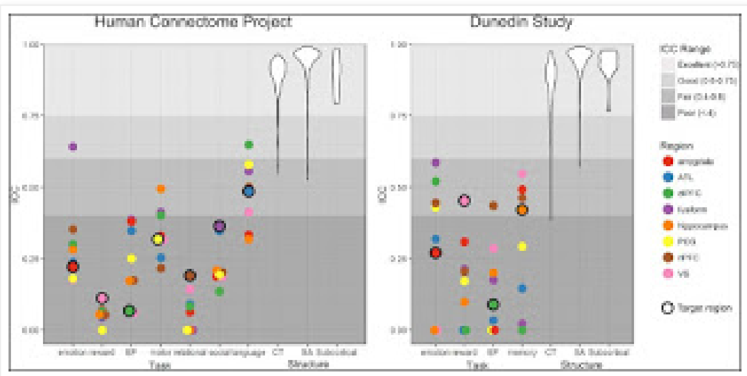

Figure 5 of the Hariri study (link)

The brain regions used in the tests graphed above were not random brain regions, but were typically the regions thought most likely to produce a correlation.

Such results are quite consistent with the claim I have long made on this blog that the brain is not the source of the human mind, and is not the source of human thinking.

at June 16, 2020 No comments:

Labels: brain imaging

Friday, June 5, 2020

Prefrontal Cortex
- Why Most Animal Memory Experiments Tell Us Nothing About Human Memory
- Other Evidence of Human Paranormal Abilities
- Why Brains Are Not Suitable for Storing Long Sequences Like Humans Remember
- Why Brain Scans Don't Show Brains Make Minds
- Why Strokes, Alzheimer's Disease and Drunkenness Don't Prove the “Brains Make Minds” Dogma
- Synaptic Density Studies Contradict the Most Popular Memory Theory
- The Rare "Total Recall" Effect That Conflicts with Brain Dogmas
- Physical Connections Do Nothing to Explain Cognition
- The Sociological Reasons Why Bad Explanations Persist in Academia
- Split-Brain Cases Conflict with "Brains Make Minds" Dogma
- Why So Much of Neuroscience News Is Unreliable
- An Analogy Clarifying Why the "Brain Stores All Your Memories" Dogma Is Untenable
- Why Darwinism Fails to Explain the Human Mind
- What Is It That a Brain Does?
- Cloud Computing and a Non-Local Model of Consciousness
- Why We Do Not Understand the Origin of Complex Biological Innovations
- Our Minds May Arrive Top-Down Not Bottom-Up
- Fancy New Technology Fails to Prove Memory Dogmas
- The Argument for Determinism Collapses Once We Discard the "Minds Come from Brains" Dogma
- Animal Experiments Conflicting with the Dogma That the Brain Stores All Memories

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Global Workspace Theory Sure Isn't an Explanation for Consciousness

Neuroscientists have no credible explanations for the most important mental phenomena such as consciousness and memory. All that scientists have in this regard are some far-fetched speculations or weak theories that don't hold up to scrutiny. Supposedly the two most popular theories of consciousness proposed by scientists are one theory called integrated information theory and another theory called global workspace theory. You can read here why integrated information theory does not work as a credible theory of consciousness. Global workspace theory isn't any better.

The wikipedia article on global workspace theory starts out by explaining it this way:

"GWT can be explained in terms of a 'theater metaphor.' In the 'theater of consciousness' a 'spotlight of selective attention' shines a bright spot on stage. The bright spot reveals the contents of consciousness, actors moving in and out, making speeches or interacting with each other. The audience is not lit up—it is in the dark (i.e., unconscious) watching the play. Behind the scenes, also in the dark, are the director (executive processes), stage hands, script writers, scene designers and the like. They shape the visible activities in the bright spot, but are themselves invisible."

As a causal explanation for why a brain might be able to produce understanding or consciousness, this is a complete failure, as it does not refer to anything in the brain, but refers to some theater. At most it is some metaphor merely describing selective attention, but selective attention (or mental focus) is merely an aspect of understanding once it exists, not an explanation of consciousness or understanding. You can't spotlight your way to consciousness. Also, there's nothing in the brain that actually corresponds physically to a spotlight. When you're thinking about something, it is not at all true that some particular region of your brain lights up like some area under a spotlight, contrary to the misleading statements and misleading visuals often given on this. Actual signal strength differences (typically far less than 1%) are no greater than we would expect from random variations.

In an interview in Scientific American, Bernard Baars attempts to explain global workspace theory, but fails rather miserably to give a coherent explanation of how global workspace theory is anything like a theory explaining consciousness. He is asked by the interviewer, "What is global workspace theory?" What we then get from Baars is an answer that kind of wanders around all over the place for 11 paragraphs without giving much of any answer that anyone will be able to grasp.

There is some mention of some swarm computing setup: "If you put a hundred crummy algorithms together and let them share hypotheses and vote on the most popular one, it turns out that very inadequate algorithms could jointly solve problems that no single one could solve." There is entirely irrelevant for any explanation of consciousness or understanding, because particular areas of the brain are not like little micro-processors running software code. There is nothing like software code that runs anywhere in the brain.

Baar's rambling and muddled answer to the question ends like this:

"Part IV of my latest book On Consciousness: Science & Subjectivity develops GW dynamics, suggesting that conscious experiences reflect a flexible 'binding and broadcasting' function in the brain, which is able to mobilize a large, distributed collection of specialized cortical networks and processes that are not conscious by themselves. Note that the 'broadcast' phase proposed by the theory should evoke widespread adaptation, for the same reason that a fire alarm

should evoke widespread responding, because the specific needs for task-relevant responders cannot be completely known ahead of time. General alarms are interpreted according to local conditions. A brain-based GW interacts with an 'audience' of highly distributed, specialized knowledge sources, which interpret the global signal in terms of local knowledge (Baars, 1988). The global signal triggers reentrant signaling, resonance is the typical activity of the cortex."

Baar's scrambled 11-paragraph answer is a complete failure as an attempt to explain how a brain could produce consciousness or understanding. Electrical signals travel around in the brain, but there is nothing like a broadcast in the brain that could explain consciousness or understanding. And it's rather silly to be trying to use fire alarms as part of an attempt to explain consciousness or understanding.

To understand how impotent the idea of broadcasting is to explain consciousness or understanding, let's consider the city I grew up in. When I was a boy there were in my city several very high broadcast towers that broadcasted TV signals and radio signals. Almost every house in the city had an old-fashioned TV that picked up these TV signals, and also an old-fashioned radio that picked up the old-fashioned radio signals. But none of this huge amount of broadcasting and broadcast reception resulted in the slightest bit of consciousness in any of the antennas, the television sets or the radios. The idea of broadcasting is worthless in explaining consciousness.

We cannot at all explain consciousness by saying that it adds up from the activity of a bunch of networks that "are not conscious by themselves." There is no reason why the activity of a bunch of unconscious networks should add up to be a conscious reality, any more than having a house made of bricks should add up to be a wooden house.

The reality in the brain is that there are billions of cells that each emits electrical signals. A rough analogy might be a packed stadium with 80,000 people who are each making noise during a football game. But still you have a unified self and a unified stream of thought from a mind. There's not the slightest reason why that would emerge from the activity of billions of individual neurons, just as there's not the slightest reason why a single paragraph of speech would ever flow from the lips of 80,000 people in a stadium.

A broadcast is a stream of tokens that can give information to an agent capable of understanding who is listening to such a broadcast. But a broadcast does nothing to ever produce such an agent of understanding. The flow of tokens during a broadcast is rather like the stream of bullets from a machine gun. Thinking that you can broadcast your way to consciousness is as silly as thinking that you can machine-gun your way to consciousness.

Narrating an achievement legend that is groundless (something very common these days in academia), Baars makes these mostly false claims:

"Our individuality is a function of the cortex, which is now proven by brain studies to be 'the organ of consciousness.' Wilder Penfield discovered that in 1934 via open-brain surgeries in fully awake patients, who were able to talk with him and gesture."

The brain is an organ, and the cortex is not an organ, but only a small fraction of an organ. So calling the cortex "the organ of consciousness" is nonsense. There are no brain studies showing that the cortex produces consciousness. To the contrary, we know that after hemispherectomy operations in which half of the cortex (and half of the brain) is removed and discarded, to stop very bad seizures, people are just as conscious and just as intelligent as they were before such an operation. And we also know from the studies of people like physician John Lorber that people have existed with very good consciousness and above-average intelligence, even though they had brains and cortexes that were almost entirely destroyed by disease. Such medical case histories debunk claims that the cortex is the source of consciousness. Of course, an operation by Penfield in which people can talk and gesture during brain surgery does absolutely nothing to establish that the brain or the cortex is the source of consciousness. So it is wrong for Baars to be citing such a thing as evidence that Penfield discovered that consciousness comes from the cortex.

Baars has tried to suggest the idea that consciousness comes from a broadcasting of something from the cortex. But the cortex of the brain is an actually an extremely bad broadcaster. Electrical signals in the cortex travel from one neuron to another with a very low reliability. It has been estimated that the chance of an action potential traveling between two adjacent neurons in the cortex is below 50%, and as low as 10%. A scientific paper says, "In the cortex, individual synapses seem to be extremely unreliable: the probability of transmitter release in response to a single action potential can be as low as 0.1 or lower." It's implausible to be saying that cortex cells that are such bad and unreliable information transmitters (such bad broadcasters) are somehow giving rise to consciousness through some kind of broadcasting effect.

Baars has some book describing his ideas on this topic. But I see no reason why anyone should buy such a book, because nothing that Baars states in his Scientific American interview should give us any confidence that he has any substantive explanation for how a brain could produce consciousness, thinking or understanding. When asked about the "hard problem of consciousness" he states there is no evidence for it, which makes no sense, and is like saying there is no evidence for the problem of the origin of language or the problem of the origin of life.

at June 05, 2020 No comments:

Labels: global workspace theory

Tuesday, May 26, 2020

Groupthink and Peer Pressure Make It Taboo for Neuroscientists to Put Two and Two Together

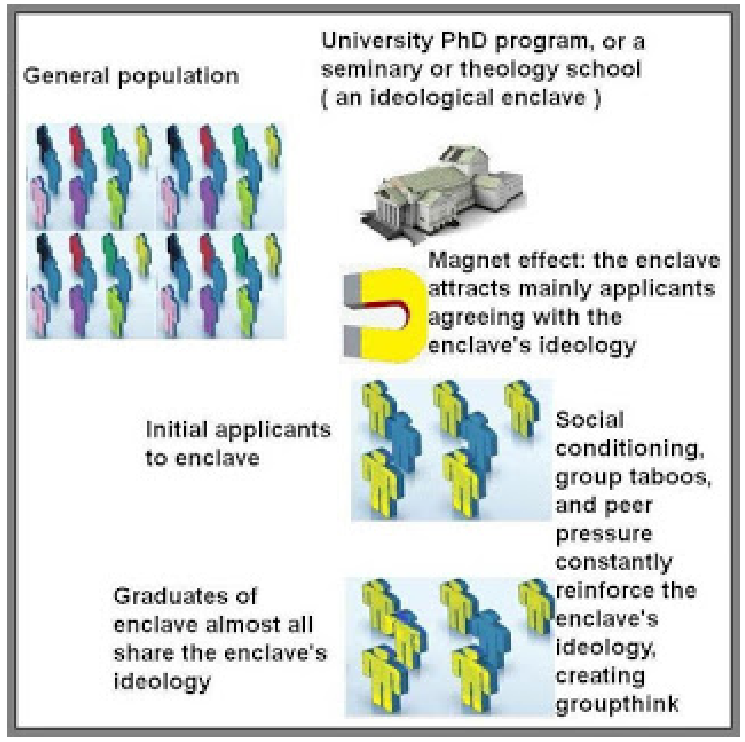
Why do so many neuroscientists go far astray in their dogmatic declarations about the brain? To understand the speech tendencies of neuroscientists, we must understand the environments that create and employ such scientists. Neuroscientists are created in university departments that are ideological enclaves. An ideological enclave is some environment where almost everyone believes in some ideology that the majority of human beings do not profess. Different departments of a university may tend to be places where different ideologies are concentrated.

A seminary is an example of an ideological enclave. A seminary is an institution where people are trained to be ministers or priests of some particular religion. A university graduate school program (one issuing masters degrees and PhD's in some academic specialty) may also be an example of an ideological enclave. Just as a seminary trains people to think in one particular way, and to hold a particular set of unproven beliefs, many a university graduate program may train people to think in a particular way, and to hold a particular set of unproven beliefs. Neuroscience graduate school programs tend to train people to believe that all mental phenomena have a cause that is purely neural, and that your mind is merely the activity of your neurons. This strange belief is not a belief professed by the majority of human beings.

It would be incredibly hard for any ideological enclave to enforce its belief ideology if the enclave got its members by some random selection process that gave it new members reflecting the thinking of the general population. Instead, things are much easier for the ideological enclave. There is what we can call a magnet effect by which the ideological enclave only gets new trainees when people choose to join the enclave. This guarantees that each new set of trainees will tend to be people favoring the ideology of the enclave. The great majority of the people signing up to be trained in the ideological enclave will be those attracted to its ideology. The great majority of the people signing up to be trained in a theological seminary will be those who favor the theology being taught in that seminary. Similarly, the great majority of the people signing up for a university graduate program in neuroscience or evolutionary biology will be people favoring the belief dogmas popular in such programs.

Once a person starts being trained in an ideological enclave, he will find relentless social pressure to conform to the ideology of that enclave. This pressure will continue for years. The pressure will be applied by authorities who usually passed through years of training and belief conditioning by the ideological enclave, or a similar ideological enclave elsewhere. In a seminary such authorities are ministers or priests, and in a university graduate school program such authorities are professors or instructors. Finally, after years of belief conditioning the person who signed up for the training will be anointed as a new authority himself. In the university graduate school program, this occurs when something like a master's degree or a PhD or a professorship is granted. In a seminary, this may occur when someone becomes a minister or priest.

Groupthink is a tendency for some conformist social unit to have overconfidence in its decisions or belief customs, or unshakable faith in such things. Groupthink is worsened by any situation in which only those with some type of credential (available only from some ideological enclave) are regarded as fit to offer a credible judgment on some topic. In groupthink situations, an illusion of consensus may be helped by self-censorship (in which those having opinions differing from the group ideology keep their contrary opinions to themselves, for fear of being ostracized within the group). In groupthink situations, belief conformity may also be helped by so-called *mindguards*, who work to prevent those in the group from becoming aware of contrarian opinions, alternate options or opposing observations. In an academic community such mindguards exist in the form of peer-reviewers and academic editors who prevent the publication of opinions and data contrary to the prevailing group ideology. We saw an example of such conformity enforcement in neuroscience not long ago when an "outrage mob" of 900 petitioners forced the retraction of a neuroscience paper which seemed to have no sin worse than contrarian thinking.



For the person who completes the program of a university graduate school program, and gets his master's degree or PhD, is that the end of the conformist social influence, the end of the pressure to believe and think in a particular way? Not at all. Instead, the "follow the herd" effect and the pressure to tow the "party line" of the belief community typically continues for additional *decades*. The newly minted PhD rarely goes off on his own to become an independent thinker marching to his own drummer, outside of the heavy influence of the belief community. Instead, such a person usually becomes a kind of captive of a belief community. The newly minted PhD will very often get a job working for the very ideological enclave that trained him, a particular academic department of a university. Or, he may end up employed by some very similar academic department of some other university, a place that is an ideological enclave just like the one in which he was trained. Such employment typically lasts for decades, during which someone may be stuck in a kind of echo chamber in which everyone parrots the same talking points. So when there is groupthink and ideological conformity in some academic specialty, peer pressure can continue to act for decades on someone like a neuroscientist or a string theorist or an evolutionary biologist.

Such peer pressure can be something that tells people they are supposed to think in one way, and may also be something that tells people they should not think in some other way. The enforcement of belief taboos and speech taboos is one of the main tendencies of ideological enclaves and belief communities. Such taboos are promoted by those interested in preserving the ideological cohesiveness of the belief community. The belief community of neuroscientists enforces thinking taboos that can prevent neuroscientists from reaching conclusions that follow rather obviously from particular observations. Such taboos can make it culturally forbidden for neuroscientists to put two and two together. "Put two and two together" is a phrase referring to reaching an obvious conclusion. Let me give some examples where belief taboos prevent neuroscientists from putting two and two together.

Example #1: Near-death Experiences and Apparitions

Human beings often have near-death experiences. In such experiences people very often report floating out of their bodies and observing their bodies from a distance. It is quite common for extremely vivid near-death experiences to occur during cardiac arrest, when brain activity has shut down because the heart has stopped. The type of accounts given by those who have near-death experiences tend to have very similar features, the type of items listed on the Greyson Scale. These include things such as passing through a tunnel, encountering deceased relatives, feelings of peace and joy, being told to go back when reaching a border or boundary between life and death, and so forth. Near-death experiences do not have the kind of random content we would expect from hallucinations. Near-death experiences also very often occur when any brain hallucination should be impossible, because the heart has stopped and electrical activity in the brain has stopped. When people report having near-death experiences when their hearts are stopped, they can often recall details of the activity of medical personnel working nearby them, details they should not have been able to observe given their deeply unconscious medical condition.

In addition, perfectly healthy humans are often surprised to see an apparition of someone they did not know was dead, only to soon find out later that the corresponding person did die, typically on the same day and hour as the apparition was seen. You can read about 165 such cases here, here, here, here, here, here and here. Moreover, a single apparition is often seen by multiple witnesses, as discussed in 50+ cases here and here and here and here.

There is a very clear conclusion that must be reached when someone puts two and two together regarding what we know about near-death experiences and apparitions. The conclusion is that human consciousness is not actually a product of the brain, and can continue even when the brain has stopped working because of cardiac arrest. But to conclude such a thing would be to violate a belief taboo enforced by groupthink and peer pressure in the neuroscientist belief community. The belief taboo is that you cannot believe in any type of human soul, but must believe that all human mental activity comes purely from neurons. So in this case the social taboo (enforced by groupthink and peer pressure) prevents neuroscientists from putting two and two together.

Example #2: The Lack of Anything in Brains Suitable for Long-Term Memory Storage or Instant Memory Retrieval

Humans are capable of accurately remembering episodic memories and learned information for more than 60 years. Humans also routinely show the ability to instantly recall information learned many years ago, given a single prompt such as a question or the mention of a name or place. But we know of nothing in the brain that can explain such abilities.

A computer hard disk may read and write information by using a spinning disk and a read-write head, but we know of no similar thing in the brain. We know of nothing in the brain that seems like a unit specialized for reading stored information, nor do we know of anything in the brain that seems like some unit specialized for writing information. No one has ever discovered any type of encoding system by which any of the vast varieties of information humans remember could ever be translated into neural states or synapse states. Nor has anyone ever discovered anything like some indexing system that might explain how humans could instantly recall things.

Although it is often claimed that memories are stored in synapses, the proteins that make up synapses are very short-lived, having lifetimes of only a few weeks or less. There is nothing in the brain that is a plausible candidate for a place where memories might be stored for either several years or six decades. Humans are able to remember very large bodies of information with 100% accuracy, as we see on the stage when we see an actor recall all of the lines of the role of Hamlet without error or all of the lines and notes of the roles of Wagner's Siegfried or Tristan without error. But such 100% recall of large bodies of learned information should be impossible if it occurred through neural activity, given the high levels of signal noise in a brain. It has been estimated that when a neural signal travels from one neuron to another in a cortex, the signal transmission occurs with far less than 50% reliability. Other than the genetic information in DNA, no one has ever found any sign of stored information in a brain, such as memory information that could be read from a dead organism after it died.

There is a very clear conclusion that must be reached when someone puts two and two together regarding what we know about the limits of the human brain. The conclusion is that the brain cannot be the storage place of human memories. But to conclude such a thing would be to violate a belief taboo enforced by groupthink and peer pressure in the neuroscientist belief community. The belief taboo is that you cannot believe that any major facet of the human mind comes from something other than the brain, but must believe that all human mental activity comes purely from neurons. So in this case the social taboo (enforced by conformist groupthink and peer pressure) prevents neuroscientists from putting two and two together.

Example #3: The Results of Hemispherectomy Operations or Even Greater Brain Tissue Loss

A hemispherectomy operation is an operation in which half of a patient's brain is removed, typically to stop very bad seizures the person is suffering from. Hemispherectomy operations provide an excellent test for dogmas regarding the brain. From the dogma that the brain is the cause of human intelligence and the storage place of memories, we should expect that suddenly removing half of someone's brain should cause at least a 50% drop in intelligence, along with a massive loss of memories and learned information.

Nothing of the sort happened when such operations were done. You can read about the exact effects of hemispherectomy operations by reading my posts here and here and here and here. In most cases hemispherectomy operation does not cause a significant reduction in intelligence as measured by IQ tests. In quite a few cases, someone did better in an IQ test after half of his brain was removed in a hemispherectomy operation. Hemispherectomy operations also do not seem to cause major loss of memories.

Brain-ravaging natural diseases sometimes provide an even better test of dogmas about the brain. Such diseases often remove much more than half of a person's brain. Astonishingly, the result is often a person of normal intelligence and sometimes even above-average intelligence. The physician John Lorber studied many cases of people who had lost the great majority of their brains, mostly because of a disease called hydrocephalus. Lorber was astonished that more than half of such patients had above-average intelligence. Then there are cases such as the case of the French person who managed to long hold a civil servant job, even though he had almost no brain.

There is a very clear conclusion that must be reached when someone puts two and two together regarding what we know about how loss of half or most of the brain has little effect on intelligence or memory. The conclusion is that the brain cannot be the storage place of human memories, and cannot be the source of human intelligence. But to conclude such a thing would be to violate a belief taboo enforced by groupthink and peer pressure in the neuroscientist belief community. The belief taboo is that you cannot believe that any major facet of the human mind comes from something other than the brain, but must believe that all human mental activity comes purely from neurons. So in this case the social taboo (enforced by an echo chamber of groupthink and peer pressure) prevents neuroscientists from putting two and two together.

In this regard we may compare neuroscience departments of universities to some bizarre pharmaceutical manufacturer that allows its researchers to note when the company's pill causes a person to collapse, turn white, and stop breathing, but makes it a taboo for researchers to put two and two together and conclude that the company's pill is dangerous.

at May 26, 2020 No comments:

Saturday, May 2, 2020

Your Physical Structure Did Not Arise Bottom-Up, So Why Think Your Mind Did?

Neuroscientists typically maintain that human mental phenomena are entirely produced by the brain. But this claim is mainly a speech custom of a social group, a belief dogma of a belief community, rather than something that is justified by facts. Looking at the human mind, we find again and again characteristics and abilities that cannot be credibly explained though any known features of the brain. Consider the following:

1. Humans are able to recall extremely esoteric or distant items of information instantly. For example, I scored more than 50% on a pair of Youtube.com challenge videos playing 40 musical themes from the 1960's and 1970's TV shows, without offering any set of choices to choose from. And upon hearing of some obscure historical or literary figure he haven't heard of in 40 years, a 60-year-old may be able to identify him. But we know of nothing in a brain that could allow such instantaneous recall. Computer information systems that retrieve information instantly can do this because of features such as b-trees, hashing and indexes that are unlike anything in the human brain.
2. For many types of performers such as Shakespearean actors and Wagnerian tenors, recall of voluminous learned information occurs with an accuracy of at least 99%. But in neurons and the supposed storage place of memories (synapses), there are multiple types of signal noise that are believed to prevent chemical/electrical signals from being transmitted at more than a 50% accuracy. Since a chemical/electrical signal would have to pass through many different neurons and synapses, we would expect a neural recall of memory to have much less than 10% accuracy.
3. Humans can remember things very well for more than 50 years, but synapses (the supposed storage place of memories) are made up of proteins that have an average lifetime of only a few weeks. Based on this fact, we should not expect synapses to be able to store memories for more than a few weeks.

4. Humans are capable of thought, reflection, insight, imagination, and creativity, but we know of no specific features in the brain that might allow any of these things. We know of no real reason why a single neuron should be thoughtful, reflective, insightful, imaginative or creative, and we know of no real reason to suppose that billions of connected neurons should be thoughtful, reflective, insightful, imaginative or creative.
5. Computers are able to store information rapidly and recall information rapidly partially because they have a specific component called a read-write head that handles such functions. But we know of no specific component in a brain that might act like a write mechanism, nor do we know of any specific component in a brain that might act like a read mechanism.
6. For a human brain to be able to store memories, it would need to have some incredibly sophisticated and elaborate encoding system whereby information that humans can recall (images, words, abstract concepts, feelings and episodic memories) could be translated into stored neural states. Nothing like any such encoding system has ever been discovered. If it were ever discovered it would be a miracle of design that would worsen a thousand-fold the problem of naturally explaining the origin of humans.
7. As discussed here, there is very good experimental evidence for paranormal abilities such as ESP, evidence that cannot be explained by brain activity.

Clearly, the human brain is an extremely poor candidate for something that can explain the human mind. But people continue to cling to the idea that the brain generates the mind (or the equally faulty idea that the brain is the mind). If you ask someone to justify such a belief, the person may say something like this: "You must believe your mind comes from your brain, because there's no other organ in the body that could be making the mind – and of course it would be ludicrous to believe that the mind comes from something other than the body." But such an idea should not seem ludicrous in the least when we consider that another huge aspect of ourselves – the human form or structure – cannot possibly have arisen bottom-up from anything in our bodies, and must somehow arrive from outside of our bodies or from something different from our bodies.

Let us consider how little we know about how humans come into the world. When a sperm unites with a female ovum, the result is a speck-like fertilized egg. But somehow over 9 months, there occurs a progression leading from this tiny speck to a full human baby. This process is sometimes called morphogenesis or embryogenesis. How does this progression happen? We have basically no idea.

For decades many have pushed an untenable misconception about morphogenesis. The idea is that DNA in a cell contains a blueprint or set of instructions for making a human, and that morphogenesis occurs when such instructions are read and carried out inside the human womb. But there are several reasons why this idea cannot possibly be true. They include the following:

1. Human DNA has been thoroughly studied, and no blueprint of a human form has ever been discovered in it, nor has anyone discovered anything in it like a program, algorithm, or set of instructions for making a human, or even any organ or cell of a human. There is not anything like a general blueprint for an overall human form in DNA, nor is there anything like a blueprint for making any large system of a human, nor is there anything like a blueprint for making any organ of a human, nor is there even anything like a blueprint for making a particular type of human cell.

Similarly, there is not anything like a set of instructions or program for making an overall human form in DNA, nor is nor is there anything like a set of instructions or program for making any large system of a human, nor is there anything like a set of instructions or program for making any organ of a human, nor is there even anything like a set of instructions for making a particular type of human cell.

2. The actual information in DNA is merely very low level chemical information, information on the chemical ingredients that make up proteins and RNA.
3. DNA is written in a minimalist bare-bones language in which the only things that can be expressed are things such as lists of amino acids. There is absolutely no high-level expressive capability in DNA that might ever allow it to be something that might be a blueprint for making humans or a set of instructions for making humans.
4. The amount of information in human DNA and the number of genes in DNA are vastly smaller than we would expect if DNA was a specification of a human. For example, a simple rice plant has twice as many genes as a human.
5. There is nothing in the human womb that could ever be capable of reading and executing the fantastically complicated instructions that would need to exist in DNA if DNA were to be a specification of a human. Blueprints don't build things; building construction occurs only when there's an intelligent blueprint reader and a construction crew. We know of nothing in the human womb that could act like an intelligent blueprint reader or a construction crew. If a human specification were to exist in DNA, it would need to be instructions so complicated it would require an Einstein to understand it; and there's no Einstein in the womb of a pregnant woman.

See this post, this post and this post for a very detailed discussion of why DNA cannot be a human specification. Those posts include quotes by quite a few biological experts supporting my statements on this topic. Below are only a few of more than a dozen similar comments that I have collected at the end of this post.

On page 26 of the recent book *The Developing Genome*, Professor David S. Moore states, "The common belief that there are things inside of us that constitute a set of instructions for building bodies and minds -- things that are analogous to 'blueprints' or 'recipes' -- is undoubtedly false." Scientists Walker and Davies state this in a scientific paper:

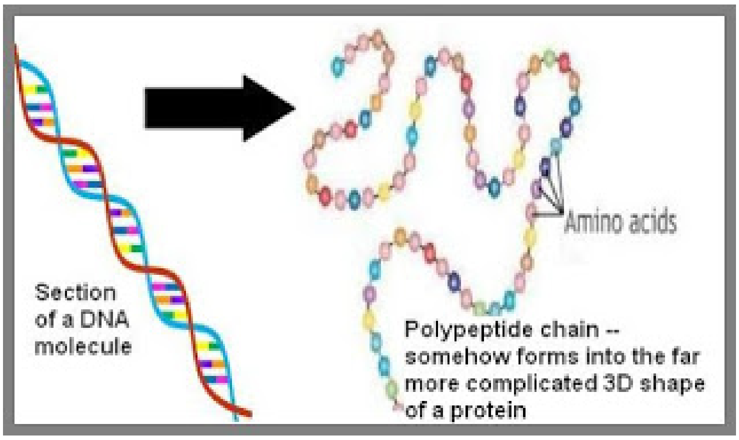
"DNA is not a blueprint for an organism; no information is actively processed by DNA alone. Rather, DNA is a passive repository for transcription of stored data into RNA, some (but by no means all) of which goes on to be translated into proteins."

Geneticist Adam Rutherford states that "DNA is not a blueprint." A press account of the thought of geneticist Sir Alec Jeffreys states, "DNA is not a blueprint, he says." B.N. Queenan (the Executive Director of Research at the NSF-Simons Center for Mathematical & Statistical Analysis of Biology at Harvard University) tells us this:

"DNA is not a blueprint. A blueprint faithfully maps out each part of an envisioned structure. Unlike a battleship or a building, our bodies and minds are not static structures constructed to specification."

"The genome is not a blueprint," says Kevin Mitchell, a geneticist and neuroscientist at Trinity College Dublin. "It doesn't encode some specific outcome." His statement was reiterated by another scientist. "DNA cannot be seen as the 'blueprint' for life," says Antony Jose, associate professor of cell biology and molecular genetics at the University of Maryland. He says, "It is at best an overlapping and potentially scrambled list of ingredients that is used differently by different cells at different times." Sergio Pistoi (a science writer with a PhD in molecular biology) tells us, "DNA is not a blueprint," and tells us, "We do not inherit specific instructions on how to build a cell or an organ."

The visual below shows you the very humble reality about DNA (so much less than the grossly inflated myths so often spread about it): that DNA merely specifies low-level chemical information such as the amino acids that make up a protein. Particular combinations of the "ladder rungs" of the DNA (the colored lines) represent particular amino acids (the "beads" in the polypeptide chain that is the starting point of a protein).



Human bodies have multiple levels of organization beyond such simple polypeptide chains, including:

- The three-dimensional structure of protein molecules
- The three-dimensional structure of the 200 types of cells in the human body, most of these cell types being fantastically complicated arrangements of matter (scientists have compared the complexity of a cell to the complexity of an airplane or city)
- The structure of tissues
- The structure of organ systems and skeletal systems
- The overall structure of the human body, what you see by looking at a naked human body

None of the structures listed above are specified by DNA or genomes or genes. How such structures arise is unknown.

In light of the facts I have discussed, we must draw a very important conclusion: the biological form of an individual (his overall body plan or structure) cannot originate bottom-up from something within the human body. The physical structure of a human must come from some mysterious source other than the human body or outside of the body. Much as we would like to believe the widely circulated myth that the form of your body comes from your DNA, the facts do not at all support such an idea. We know of nothing in the human body that can be the source of the human form or body plan, nothing that can explain the marvel of morphogenesis, the progression from a speck-sized egg to a full-sized human body. So the human form or physical structure or human body plan must somehow come from outside of the body or from some source other than the body.

The person who has carefully considered such a reality should have no objection to the idea that the human mind must come from some source outside of the body or different from the human body. Both conclusions follow from similar types of evidence considerations. Just as DNA fails in every respect to be a credible source for the human physical form, the brain fails in almost every respect to be a credible source of the human mind (for reasons discussed at great length in the posts of this site).

We must climb out of the tiny thought box of materialism and consider other possibilities. One possibility is that the human mind comes from some spiritual or energy reality that co-exists with the human body. In such a case it might be true that the mind of each person has a different source, but not a bodily source. Another possibility is that every human mind comes from the same source, some mysterious and unfathomable cosmic reality that might also be the source of the human physical form.

To gain some insight on how we have been conditioned or brainwashed to favor a bad type of explanation for our physical structure and minds, let us consider a hypothetical planet rather different from our own: a planet in which the atmosphere is much thicker, and always filled with clouds that block the sun. Let's give a name to this perpetually cloudy planet in another solar system, and call this imaginary entity planet Evercloudy. Let's imagine that the clouds are so thick on planet Evercloudy that its inhabitants have never seen their sun. The scientists on this planet might ponder two basic questions:

(1) What causes daylight on planet Evercloudy?
(2) How is it that planet Evercloudy stays warm enough for life to exist?

Having no knowledge of their sun, the correct top-down explanation for these phenomena, the scientists on planet Evercloudy would probably come up with very wrong answers. They would probably speculate that daylight and planetary warmth are bottom-up effects. They might spin all kinds of speculations such as hypothesizing that daylight comes from photon emissions of rocks and dirt, and that their planet was warm because of heat bubbling up from the hot center of their planet. By issuing such unjustified speculations, such scientists would be like the scientists on our planet who wrongly think that life and mind can be explained as bottom-up effects bubbling up from molecules.

Facts on planet Evercloudy would present very strong reasons for rejecting such attempts to explain daylight and warm temperatures on planet Evercloudy as bottom-up effects. For one thing, there would be the fact of nightfall, which could not easily be reconciled with any such explanations. Then there would be the fact that the dirt and rocks at the feet below the scientists of Evercloudy would be cold, not warm as would be true if such a bottom-up theory of daylight and planetary warmth were correct. But we can easily believe that the scientists on planet Evercloudy would just ignore such facts, just as scientists on our planet ignore a huge number of facts arguing against their claims of a bottom-up explanation for life and mind (facts such as the fact that people still think well when you remove half of their brains in hemispherectomy operations, the fact that the proteins in synapses have very short lifetimes, and the fact that the human body contains no blueprint or recipe for making a human, DNA being no such thing).

We can imagine someone trying to tell the truth to the scientists on planet Evercloudy:

Contrarian: *You have got it very wrong. The daylight on our planet and the warmth on our planet are not at all bottom-up effects bubbling up from under our feet. Daylight and warmth on our planet can only be top-down effects, coming from some mysterious unseen reality beyond the matter of our planet.*
Evercloudy scientist: *Nonsense! A good scientist never postulates things*

beyond the clouds. Such metaphysical ideas are the realm of religion, not science. We can never observe what is beyond the clouds.

Just as the phenomena of daylight and planetary warmth on planet Evercloudy could never credibly be explained as bottom-up effects, but could only be credibly explained as top-down effects coming from some mysterious reality unknown to the scientists of Evercloudy, the phenomena of life and mind on planet Earth can never be credibly explained as bottom-up effects coming from mere molecules, but may be credibly explained as top-down effects coming from some mysterious unknown reality that is the ultimate source of life and mind.

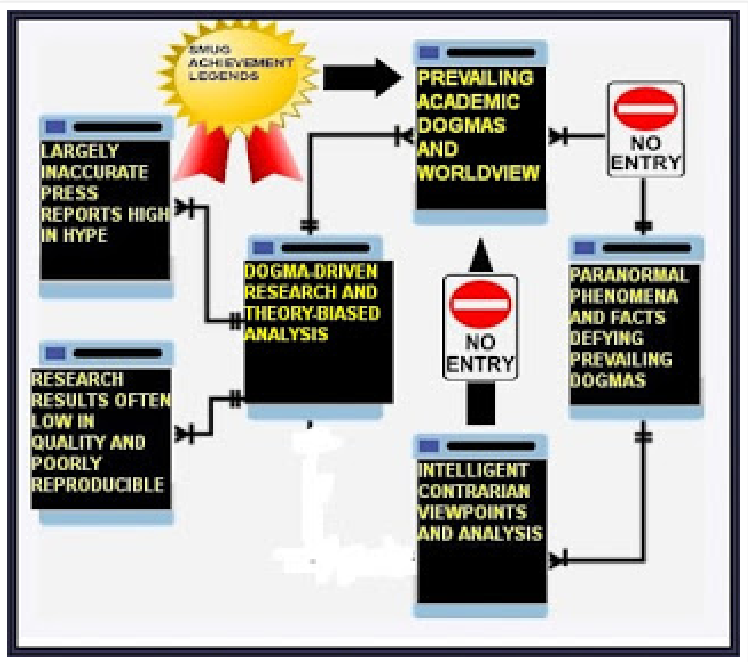
at May 02, 2020 No comments:

Labels: DNA, morphogenesis

Tuesday, April 21, 2020

A Diagram of Explanatory Dysfunction in Academia

Below is a diagram that attempts to illustrate some of the explanatory problems afflicting colleges and universities. A major factor in such problems are what we may call achievement legends.



Click to open in a separate tab

An achievement legend is a story that is repeatedly told in the classrooms of colleges and universities, a story claiming without proof that some wonderful progress was made by scientists. Such legends include the ones below and many others:

- The story that the origin of species and the origin of humanity were successfully explained by the nineteenth century biologist Charles Darwin.
- The story that neuroscientists have been able to figure out where the human mind comes from and how human memory works, by studying the human brain.
- The story that the “book of life” was discovered in the middle of the twentieth century, when scientists found some molecule that contained a blueprint or recipe for making human beings.
- The story that scientists have been been able to figure out important truths about the evolution of the universe, by coming up

with ideas such as dark matter and primordial exponential cosmic inflation (not to be confused with ordinary expansion).

All of these stories meet the definition of legend, which is "a traditional story sometimes regarded as historical but unauthenticated." None of these claims of achievement has been proven. There are very substantial reasons for rejecting each one of them. But these stories of great achievements keep being told again and again by our professors. One of the hardest things to dispel is a dubious achievement legend once it has spread. Such legends provide prestige boosts to various people in academia, and once a person has been hooked on an intoxicating conceit, it becomes incredibly hard for such a person to give it up and adopt a more realistic viewpoint about his relatively modest state of knowledge.

These achievement legends are pillars of a worldview that is predominant at colleges and universities. The worldview is based on the idea that the most important realities such as life and mind are explained by matter, and that such realities arose from blind accidental processes. Believing in the smug achievement legends, those who hold this worldview believe that scientists are making excellent progress in coming up with purely material explanations for life and mental phenomena.

But such a worldview is contradicted by a gigantic number of observational facts. Such facts and observations can be divided into two different categories: the paranormal and the not-at-all-spooky. In the paranormal category are a host of observations that mainstream professors may dismiss as "impossible," even though they are massively reported. These include things such as apparition sightings, deathbed visions, near-death experiences, anecdotal accounts of clairvoyance, extremely high scores on tests of extrasensory perception (such as we would never expect any human to get by chance), photos of dramatic recurring patterns in mysterious orbs, and so forth. But there is also a huge number of "not at all spooky" observations that stand in opposition to the prevailing academic worldview. Among these are observations such as these:

1. Low-level observations indicating that DNA does not have and cannot have a blueprint or recipe for making a human.
2. Innumerable observations of incredibly organized biological complexity vastly more fine-tuned than anything that can reasonably be explained as a result of chance.
3. Observations proving that brain tissue does not have the long-term information storage capability it would need to have if prevailing ideas about brains and minds are correct.
4. Observations proving that massive damage to brains often has only slight effects on mind and memory, contrary to what we would expect under the dogma that the mind is merely the product of the brain, and the dogma that memories are stored in brains.
5. Observations establishing that the universe has many types of physical fine-tuning such as we would not expect under prevailing academic assumptions.

These are part of a massive body of evidence that defies and discredits the worldview prevailing among the professors of academia. But such professors do a very good job of keeping their classrooms and journals and textbooks as places where such evidence is not discussed. Professors exert a kind of *de facto* censorship in which such opposing evidence is excluded from the sheltered world of academia. The "no entry" symbols in my diagram illustrate this type of *de facto* censorship.

The evidence I just discussed gives rise to contrarian viewpoints that differ from the prevailing worldview held by academic professors. But there is little or no fair discussion of such contrarian viewpoints in the regimented literature and classroom presentations of academia. If there is any discussion of such viewpoints, an academic authority will typically make sure to label the contrarian thinkers with various defamatory or deprecatory labels designed to prevent anyone from taking their opinions seriously.

Academia produces a huge flow of research and literature. But the research and literature is largely what I call dogma-driven. Dogma-driven research is research designed to reassure professors that they are on the right track, and that their grand explanatory pretensions are justified. Examples include the following:

- Innumerable papers presenting different variations of Guth's theory of primordial cosmic inflation, most of which are designed to bolster our confidence in such a theory.
- Innumerable papers speculating about dark matter and dark energy, two things that have never been observed.
- Countless papers trying to shore up the doctrine of common descent, by presenting 1001 different scenarios describing inheritance paths that life could have taken to progress through Darwinian evolution.
- Thousands of brain scanning studies, designed to provide evidence for claims that the brain is the source of mental phenomena or the storage place of memories.
- Thousands of papers presenting variations of the unverified theory of supersymmetry.

Theory-biased analysis occurs both in journals and in textbooks. The observational facts are all passed through the prism of existing theories, which are often based on smug achievement legends. There will be either no discussion of a vast number of observational facts conflicting with such theories, or the discussion will be very skimpy and jaundiced. Reasonable alternative explanations will not be discussed, or will be discussed in some skimpy deprecatory manner.

The result of such research is all too often unimpressive. A significant fraction of all research findings reported in scientific journals cannot be reproduced. The problem was highlighted in a widely cited 2005 paper by John Ioannidis entitled, “Why Most Published Research Studies Are False.”

A scientist named C. Glenn Begley and his colleagues tried to reproduce 53 published studies called “ground-breaking.” He asked the scientists who wrote the papers to help, by providing the exact materials to publish the results. Begley and his colleagues were only able to reproduce 6 of the 53 experiments. In 2011 Bayer reported similar results. They tried to reproduce 67 medical studies, and were only able to reproduce them 25 percent of the time.

But a reader of science news sites would hardly guess that such problems exist. Every week such sites seem to report a glorious march of progress, and make it sound as if wonderful breakthroughs are occurring almost every week. The problem is that weak scientific research and analysis is uncritically trumpeted.

Part of the problem is university press offices, which nowadays are shameless in exaggerating the importance of research done at their university. They know the more some locally arising scientific research is hyped, the more glory and attendees will flow to their university.

A scientific paper reached the following conclusions, indicating a huge hype and exaggeration crisis both among the authors of scientific papers and the media that reports on such papers:

"Thirty-four percent of academic studies and 48% of media articles used language that reviewers considered too strong for their strength of causal inference....Fifty-eight percent of media articles were found to have inaccurately reported the question, results, intervention, or population of the academic study."

Exacerbating this problem is an economic situation in which there is a huge monetary motivation for hyping second-rate research, to make it sound like some glorious breakthrough. Web sites that report science news have ads on their pages. The more users click on a particular page, the more money the web site makes from ad revenue. Given such a situation, there is a huge motivation for web sites to hype science research. You won't click on some headline of "Another doubtful animal study with too small a sample." But you may click on a misleading headline of, "Amazing study unveils the secret of how memory works." And once you make such a click, some web site will make money from some ad on the page you clicked on. So the science news hype and exaggeration keeps flowing full blast.

Almost every day in the science news you can find examples of hyped-up headlines that are inaccurate. The glaring example I find on today's ScienceDaily.com is a story with the extremely false headline "Strongest evidence yet that neutrinos explain how the universe exists." The long-standing matter-antimatter asymmetry mystery is that the Big Bang should have produced equal amounts of matter (protons and electrons) and antimatter (antiprotons and positrons), in incredible densities denser than a neutron star. Since matter and antimatter destroy each other upon contact, forming into only photons of energy, the Big Bang should have left nothing but photons of energy. This problem cannot at all be solved by any possible finding about neutrinos, mere "ghost particles" that are millions of times less massive than electrons, which are 1836 times less massive than protons. When you read the story you will find zero evidence justifying the headline.

In many an area of science, researchers are mostly spinning their wheels, making little progress. A hundred promising leads are not being followed up, because professors don't want to find out about what such leads suggest, which is often that the cherished tenets of such professors are dead wrong. Meanwhile there are endless poor papers inspired by dubious theories, because professors want to be reassured that they are on the right track, and that their beloved dogmas are correct. Much too little real explanatory progress is being made, but you would never know it from reading the "hype almost anything that moves" science press, which seems to trumpet almost any dubious "glorify our guys" press release coming from a university press office, while only very rarely applying critical scrutiny to such claims.

at April 21, 2020   1 comment:

Labels: academia dysfunction

Saturday, March 21, 2020

Exhibit A Suggesting Scientists Don't Understand How a Brain Could Store a Memory

Many a scientist claims that human memories are stored in brains. But when asked to explain how it is that a brain could retrieve a memory, scientists go "round and round" in circles, producing unsubstantial circumlocutions that fail to provide any confidence that scientists understand such a thing. I discussed such explanatory shortfalls in my 2019 post “Exhibit A Suggesting Scientists Don't Know How a Brain Could Retrieve a Memory,” and my 2020 post "Exhibit B Suggesting Scientists Don't Know How a Brain Could Retrieve a Memory." When they attempt to explain how a brain could store a memory, scientists give the same kind of unsubstantial and empty discussion, the kind of discussion that should fail to convince anyone that they have a real understanding of how a brain could do such a thing.

An example of such a thing is an article that appeared in the online site of the major British newspaper *The Guardian*. The article by neuroscientist Dean Burnett was entitled "What happens in your brain when you make a memory?" Burnett follows a kind of standard formula followed by writers on this topic. The rules are rather as follows:

(1) *Attempt to persuade readers that you understand memory by talking about the difference between long-term memory and short-term memory*.   Whenever such discussion occurs, it actually does nothing showing any understanding of a neural basis for memory, for such a discussion can occur based on purely phenomenal observations about how well people perform on different memory tasks.
(2) *Attempt to persuade readers that you understand memory by talking about the difference between episodic memory and conceptual memory*. This again is something that can be discussed without any reference to the brain, so any such discussion doesn't do anything to establish some understanding of a neural basis for memory.
(3) *Make frequent use of the word "encoding," without actually presenting any theory of encoding*.   Neuroscientists love to use the word "encoding" when discussing memory acquistion, as if they had some understanding of some system of encoding or translation by which episodic or conceptual memories could be translated into neural states or synapse states. They do not have any such understanding. No neuroscientist has ever presented a credible, coherent, detailed theory of memory encoding, of how conceptual knowledge or episodic experiences could ever be translated into neural states or synapse states. Any attempt to do such thing would cause you to become entangled in an ocean of difficulties.
(4) *Mention one or two parts of the brain, usually exaggerating their significance*. I'll give an example of this in a moment.
(5) *Talk dogmatically about synapses, creating the impression that memories are stored in them, without discussing their enormous instability and unsuitability as a place for storing memories that might last for decades.*

Burnett pretty much follows such a customary set of rules. He uses the word "encoding" or "encode" four times, but fails to present any substantive explanation or idea as to how any human episodic or conceptual information could ever be encoded, in the sense of being translated into neural states. Burnett claims, "The hippocampus links all of the relevant information together and encodes it into a new memory by forming new synapses." He provides no evidence to back up this claim. There are some important reasons for thinking that the claim cannot possibly be correct.

One reason is that studies have shown that people with very heavy hippocampus damage can have a normal ability to acquire conceptual and learned information. The paper here discussed three subjects who had lost about half of the matter in their hippocampi. We read the following:

"All three patients are not only competent in speech and language but have learned to read, write, and spell. ...With regard to the acquisition of factual knowledge, which is another hallmark of semantic memory, the vocabulary, information, and comprehension subtests of the VIQ scale are among the best indices available, and here, too, all three patients obtained scores within the

normal range (Table 2). A remarkable feature of Beth's and Jon's stores of semantic memories is that they were accumulated after these patients had incurred the damage to their hippocampi."

The same thing was found by the study here. A group of 18 subjects were studied, subjects with severe hippocampus damage. Some 28% to 62% of the hippocampi of these subjects were damaged or destroyed. The subjects had episodic memory problems, but "relatively preserved intelligence, language abilities, and academic attainments." We are told, "In all but one of our cases, the patients...attended mainstream schools." Could patients with such heavy hippocampus damage have normal academic achievements if it were true that "the hippocampus links all of the relevant information together and encodes it into a new memory by forming new synapses"? Not at all. In a similar vein, the study here involving 17 rhesus monkeys found that "monkeys with hippocampal lesions showed no deficits in learning and later recognizing new scenes."

A study looked at memory performance in 140 patients who had undergone an operation called an amygdalohippocampectomy, which removes both the hippocampus and the amygdala. Table 1 of the study found that such an operation had no significant effect on nonverbal memory, causing a difference of less than 3%. Table 3 shows that most patients were unchanged in their verbal memory and nonverbal memory. More patients had a loss in memory than a gain, although about 13% had a gain in nonverbal memory. These results are not at all consistent with Burnett's claim that "the hippocampus links all of the relevant information together and encodes it into a new memory by forming new synapses."

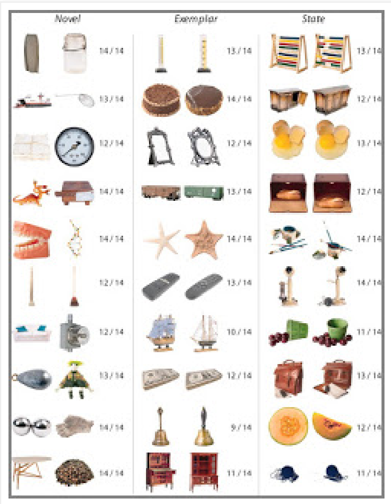
There is a reason why it cannot be true that a new memory requires a formation of new synapses. The reason is that humans can form new memories instantly, but both the formation of a new synapse and the strengthening of a synapse require minutes of time. If someone fires a bullet that passes near your head, you will instantly form a permanent new memory that you will remember the rest of your life. The same thing will happen the moment you break your leg in a biking accident. Claiming that memories require either the formation of new synapses or the strengthening of synapses is incompatible with a fact of human experience, that humans can form new memories instantly.

If it were true that memories were stored by a strengthening of synapses, this would be a slow process. The only way in which a synapse can be strengthened is if proteins are added to it. We know that the synthesis of new proteins is a rather slow effect, requiring minutes of time. In addition, there would have to be some very complicated encoding going on if a memory was to be stored in synapses. The reality of newly-learned knowledge and new experience would somehow have to be encoded or translated into some brain state that would store this information. When we add up the time needed for this protein synthesis and the time needed for this encoding, we find that the theory of memory storage in brain synapses predicts that the acquisition of new memories should be a very slow affair, which can occur at only a tiny bandwidth, a speed which is like a mere trickle. But experiments show that we can actually acquire new memories at a speed more than 1000 times greater than such a tiny trickle.

One such experiment is the experiment described in the scientific paper "Visual long-term memory has a massive storage capacity for object details." The experimenters showed some subjects 2500 images over the course of five and a half hours, and the subjects viewed each image for only three seconds. Then the subjects were tested in the following way described by the paper:

"Afterward, they were shown pairs of images and indicated which of the two they had seen. The previously viewed item could be paired with either an object from a novel category, an object of the same basic-level category, or the same object in a different state or pose. Performance in each of these conditions was remarkably high (92%, 88%, and 87%, respectively), suggesting that participants successfully maintained detailed representations of thousands of images."

In this experiment, pairs like those shown below were used. A subject might be presented for 3 seconds with one of the two images in the pair, and then hours later be shown both images in the pair, and be asked which of the two was the one he saw.



Although the authors probably did not intend for their experiment to be any such thing, their experiment is a great experiment to disprove the prevailing dogma about memory storage in the brain. Let us imagine that memories were being stored in the brain by a process of synapse strengthening. Each time a memory was stored, it would involve the synthesis of new proteins (requiring minutes), and also the additional time (presumably requiring additional minutes) for an encoding effect in which knowledge or experienced was translated into neural states. If the brain stored memories in such a way, it could not possibly keep up with remembering most of thousands of images that appeared for only three seconds each.

There is another reason why it cannot be true that we remember things because "the hippocampus links all of the relevant information together and encodes it into a new memory by forming new synapses," as Burnett claims. The reason is that synapses are too unstable to be a storage place for memories that can last for decades. The proteins in synapses have short lifetimes, lasting for an average of no more than about two weeks.

A fairly recent paper on the lifetime of synapse proteins is the June 2018 paper “Local and global influences on protein turnover in neurons and glia.” The paper starts out by noting that one earlier 2010 study found that the average half-life of brain proteins was about 9 days, and that a 2013 study found that the average half-life of brain proteins was about 5 days. The study then notes in Figure 3 that the average half-life of a synapse protein is only about 5 days, and that all of the main types of brain proteins (such as nucleus, mitochondrion, etc.) have half-lives of less than 20 days. The synapses themselves do not last for more than a few years. So synapses lack the stability that would have to exist if memories are to be stored for years. Humans can reliably remember things for more than 50 years. Such a length of time is about 1000 times longer than the lifetime of proteins in synapses.

Without providing any evidence for such a claim, Burnett teaches the widely taught idea that memories migrate from one part of the brain to another. He states the following:

"Newer memories, once consolidated, appear to reside in the hippocampus for a while. But as more memories are formed, the neurons that represent a specific memory migrate further into the cortex."

We have no understanding of how a neuron could represent a memory, no evidence that memories are written to any part of the brain, and no understanding of how any such thing as a writing of a memory could occur in neurons and synapses. We also have zero understanding of how a written memory could migrate from one place in a brain to another place, nor do we have any direct evidence that any such migration occurs. But we do have an extremely strong reason for thinking that accurate memories could not possibly migrate from a hippocampus into the cortex. The reason has to do with the very low reliability of signal transmission in the cortex.

A scientific paper states, "Several recent studies have documented the unreliability of central nervous system synapses: typically, a postsynaptic response is produced less than half of the time when a presynaptic nerve impulse arrives at a synapse." Another scientific paper says, "In the cortex, individual synapses seem to be extremely unreliable: the probability of transmitter release in response to a single action potential can be as low as 0.1 or lower."

Another paper concurs by also saying that there are two problems (unreliable synaptic transmission and a randomness in the signal strength when the transmission occurs):

"On average most synapses respond to only less than half of the presynaptic spikes, and if they respond, the amplitude of the postsynaptic current varies. This high degree of unreliability has been puzzling as it impairs information transmission."

So the transmission of information into the cortex must be extremely unreliable. To imagine how unreliable such a transmission would be, with only a 10% chance of a nerve signal transmitting, imagine that you are trying to send an email to someone, but your email provider is so unreliable that there is only a 10% chance that any character that you type will be accurately transmitted. You might send your friend an email saying, "Hi Joe, what do you say we have dinner at that new steak place that opened on 42nd Street?" But the email your friend got would be unreadable gibberish, something like "Hwdsd ondSt?" That's the type of information scrambling that would occur if memories were to migrate from the hippocampus into the cortex, given a cortex where there is only a 10% chance of any action potential (or nerve signal) transmitting.

So if memories were migrating into our cortex, we would never be able to remember things accurately. But humans have an astonishing capability for memorizing vast amounts of information with 100% accuracy. It is a fact that some Muslims accurately memorize every word of their holy book. We also know that actors can accurately memorize each of the 1569 lines of the role of Hamlet, and that Wagnerian tenors can accurately memorize both the notes and the words of the extremely long parts of Siegfried and Tristan (the role of Siegried requires someone to sing on stage for most of four hours).

Once we carefully ponder all the reasons for rejecting its main claims, and also carefully ponder the lack of any discussion of robust evidence for a brain storage of memory, we can see that an article such as the Guardian article is a kind of Exhibit A that modern neuroscientists have no real understanding of how a brain could do any such thing as store a memory. Nature never told us that brains store memories. It was merely neuroscientists who made such a claim, without good evidence.

The article by Burnett is not a detailed scientific paper, but if we look at a typical scientific paper attempting to present evidence for memory storage in a brain, you will not find any robust evidence. A recent example is the 2019 paper "Changes of Synaptic Structures Associated with Learning, Memory and Diseases." The paper fails to provide any solid evidence that synapse states have any causal relation with memory acquisition. No clear message comes from findings such as "motor learning rapidly increases the formation and elimination of spines of L5 PyrNs in the mouse primary motor cortex (M1), leading to a transient increase in spine number, which over days returns to the baseline," combined with other statements such as "another study showed that spine dynamics on L2/3 PyrNs are not affected by motor learning." Anyone looking to find a relation between one effect and some other physical factor (in a small number of tries) will have perhaps a 25% chance of finding what looks like a correlation purely by chance. For example, if I try to look for a relation between stock market declines and rainfall, I'll have perhaps a 25% chance of finding such an effect if I test on four random days. So we would expect that neuroscientists hoping to find some correlation between synapse activity and learning would find such a correlation in a certain fraction of the times they tried, purely by chance, even if synapses are not a storage place of learned information. Nowhere in this paper is there anything like an explanation of how a brain could store a memory, and when the paper authors confess that "the stability of memory and the dynamism of synapses remain to be reconciled," they basically admit that they have no answer to the objection that synapses are too unstable to be storing memories that last for decades.

Head Truth

The huge case for thinking minds do not come from brains

Sunday, September 6, 2020

In Neuroscience Papers Bluffing Is More Common Than Candor

The Cornell Physics Paper Server at arxiv.org is mainly useful for finding papers on physics, but it also includes many papers on quantitative biology and computer science. Below are some observations I made after searching for papers with "memory" or "thought" in the title.

Occasionally a neuroscience paper will have a little candor regarding the vast gulf between the claims neuroscientists make and the low-level data they observe. One paper gives us some indications that what neuroscientists observe on a low level is something totally different from the stability we see in long-term memories. We read the following, in which "turn over" refers to demise and replacement:

"The building blocks of the brain are in constant flux at the subcellular, cellular and circuit level. Synaptic and non-synaptic proteins are mobile [1] and rapidly turn over on the scale of hours to days [2]. Individual synapses continuously change their size and strength both in vitro and in vivo [3–5]. Most notably, however, the mature brain appears to continuously rewire itself, even without experimental intervention [6,7]. This is evident from the perpetual turnover of dendritic spines, small protrusions from the parent dendrites of most cortical neurons that are commonly used as proxies for excitatory synapses. Depending on the cell types and brain regions investigated, dendritic spines are gained and lost at rates ranging from approximately 1% per day in primary visual cortex [8] over approximately 5% per day in the CA1 region of hippocampus [9] to up to approximately 15% per day in primary somatosensory cortex [10] (but see [6,11,12] for potential pitfalls of these quantifications)."

Another paper refers to it as a "fundamental enigma" that memories can last for even weeks (which is not surprising, given the facts above). Using the acronym LTM for long-term memory, the paper says, "A fundamental enigma is how the physical substrate for storage of LTM can nonetheless be preserved for weeks, months, or a lifetime."

The paper here suggests that there is no understanding of how a brain could ever translate episodic experience or learned knowledge into neural states. The paper errs only in using the term "largely" when it should have used the word "totally." We read this:

"Codifying memories is one of the fundamental problems of modern Neuroscience. The functional mechanisms behind this phenomenon remain largely unknown."

The paper "Long Term Memory: Scaling of Information to Brain Size" by Donald R. Forsdyke is a paper of unusual candor. We read the following about patients whose brain regions consisted almost entirely of watery fluid rather than neurons:

"The journal Science, under the title 'Is your brain really necessary?' (Lewin

Translate

Select Language ▼

- Introduction to This Site
- Preservation of Mind and Memories After Removal of Half a Brain
- Why We Should Not Think the Human Brain Can Store Very Old Memories
- Why the Instantaneous Recall of Old Memories Should Be Impossible for a Brain
- Cases of High Mental Function Despite Large Brain Damage
- Reasons for Doubting a Brain Could Do the Super-Complex Encoding Needed to Neurally Store Episodic Memories or Concepts
- The Many Cases Showing a Person's Mind Can Operate When His Brain Has Shut Down
- Your Physical Structure Did Not Arise Bottom-Up, So Why Think Your Mind Did?
- The Brain Seems to Have No Mechanism for Reading or Writing Memories
- No One Understands How a Brain Could Generate Ideas
- 30 Reasons for Rejecting the Theory of Neural Memory Storage
- Groupthink and Peer Pressure Make It Taboo for Neuroscientists to Put Two and Two Together
- Synaptic Delays Mean Brain Signals Must Move at a Snail's Pace
- Brain Dogmas Versus Case Histories That Refute Them
- In Neuroscience Papers Bluffing Is More Common Than Candor
- Young Age of Languages Contradicts Claims of Neural Storage of Linguistic Information

1980), described a series of 600 cases with residual ventricular enlargement that had been studied in Britain by paediatrician John Lorber (1915-1996). Again, while long-term memories were not directly assessed, intelligence quotients (IQs) were. Amazingly, in 60 of Lorber's cases, ventricular fluid still occupied 95% of cranial capacity. Yet half of this group had IQs above average. Among these was a student with an IQ of 126 who had a first class honours degree in mathematics and was socially normal....The drastic reduction in brain mass in certain, clinically-normal, hydrocephalic cases, seems to demand unimaginable levels of redundancy and/or plasticity – superplasticity. How much brain must be absent before we abandon these explanations and look elsewhere?...Regarding the human brain's 'massive storage capacity' for object details, Brady et al. (2008) have also challenged 'neural models of memory storage and retrieval.' ...The unconventional alternatives are that the repository is external to the nervous system, either elsewhere within the body, or extra-corporeal. The former is unlikely since the functions of other body organs are well understood. Remarkably, the latter has been on the table since at least the time of Avicenna and hypothetical mechanisms have been advanced (Talbot 1991; Berkovich 1993; Forsdyke 2009; Doerfler 2010). Its modern metaphor is 'cloud computing.' "

But such candor and willingness to challenge fossilized dogmas is rare. What is more common is for neuroscience papers to give us bluffing, in which an author pretends to have something he doesn't have, like a poker player with a weak hand acting as if he has a royal flush. An example is the paper "Neural origins of self-generated thought: Insights from intracranial electrical stimulation and recordings in humans." The paper would have us believe that it is presenting some evidence that brains produce thinking.

But when we look at the visuals, we see no substantial evidence for such a thing. Figure 1 and Figure 2 gives us the usual deal in which some tiny difference in signal strength is shown in a very bright color such as bright red or bright blue. But in Figure 3 we get some hard numbers. We have some graphs showing brain signal differences during thinking, and we can see from the visuals that the percent signal change was never more than a tenth of one percent, never more than 1 part in 1000. Of course, such a tiny difference in signal strength is no robust evidence at all that brains are producing thought, but is merely the kind of difference we would expect from chance variations.

A recent example of a bluffing neuroscience paper is the 21-page paper "Memory Systems of the Brain," which seems to be bluffing us in the sense that it provides no compelling evidence for such systems. We have no discussion of how a brain could translate learned knowledge or experiences into neural states or synapse states. We have no discussion of how a brain could store a memory for decades, or even for a single year. We have no discussion of how a brain could retrieve a memory.

How does the paper manage to fill up 21 pages without any such things? The paper follows various space-filling strategies used by similar papers:

(1) An historical approach is taken in which pages are filled up with a discussion of the history of human thinking about memory.
(2) Lots of space is used up with a discussion of different types of memory. For example, there is a discussion about the difference between short-term memory, working memory and long-term memory.
(3) There is a discussion of a handful of cherry-picked case histories, carefully chosen to make us believe in neuroscientist dogmas about a brain storage of memories.

There are innumerable case histories that could be quoted, but neuroscientists tend to spend excessive time citing the cases of patient H.M and patient K. C. The author of the "Memory Systems of the Brain" paper repeats the incorrect claim so often made about patient H.M, a claim that he was unable to form new memories. The paper states that patient H.M. "became unable to consciously recollect new events in his life or new facts about the world." This is not entirely correct. A 14-year follow-up study of patient H.M. (whose memory problems started in 1953) actually tells us that H.M. was able to form some new memories. The study says this on page 217:

"In February 1968, when shown the head on a Kennedy half-dollar, he said, correctly, that the person portrayed on the coin was President Kennedy. When asked him whether President Kennedy was dead or alive, and he answered, without hesitation, that Kennedy had been assassinated...In a similar way, he recalled various other public events, such as the death of Pope John (soon after the event), and recognized the name of one of the astronauts, but his performance in these respects was quite variable."

Patient K.C. was a patient who had extensive brain damage in a motorcycle accident, but could still remember learned information well. However, he was unable to provide autobiographical recollections of events before his injury. But a study of a patient with a similar problem (patient Y.K.) suggests the possibility that memory of experiences was not lost, but merely the ability to recall such information in the form of a first-person narrative. In one source we read the following:

"For example, one patient (Y.K.) was reported to have some knowledge of remote incidents in his life but was unable to 'remember' them (Hirano and Noguchi, 1998, Hirano et al., 2002). Using the Remember and Know procedure (Tulving, 1985), Y.K. assigned K responses to all of his remote recollections, indicating that he had knowledge of the events as facts but could not actually place himself mentally at the scenes where the events occurred."

The "Memory Systems of the Brain" paper seems to hint that there is no understanding of how a brain could store a memory, when it states this: "It remains unclear how neuronal cooperativity in intact networks relates to memories or how network activity in the behaving animal brings about synaptic modification " Before stating that, the paper makes this claim: "Clinical evidence indicates that damage to the hippocampus produces anterograde amnesia." But while there are a few famous cases of patients with impaired recall of past experiences after hippocampus damage, there are vastly more cases of people who could recall previous memories fairly well after the total removal of the hippocampus.

The "Memory Systems of the Brain" paper conveniently fails to mention the main research paper on the hippocampus and memory: the paper "Memory Outcome after Selective Amygdalohippocampectomy: A Study in 140 Patients with Temporal Lobe Epilepsy." That paper gives memory scores for 140 patients who almost all had the hippocampus removed to stop seizures. Using the term "en bloc" which means "in its entirety" and the term "resected" which means "cut out," the paper states, "The hippocampus and the parahippocampal gyrus were usually resected en bloc." The paper refers us to another paper describing the surgeries, and that paper tells us that hippocampectomy (surgical removal of the hippocampus) was performed in almost all of the patients.

The "Memory Outcome after Selective Amygdalohippocampectomy" paper does not use the word "amnesia" to describe the results. That paper gives memory scores that merely show only a modest decline in memory performance. The paper states, "Nonverbal memory performance is slightly impaired preoperatively in both groups, with no apparent worsening attributable to surgery." In fact, Table 3 of the paper informs us that a lack of any significant change in memory performance after removal of the hippocampus was far more common than a decline in memory performance, and that a substantial number

Prefrontal Cortex
- Why Most Animal Memory Experiments Tell Us Nothing About Human Memory
- Other Evidence of Human Paranormal Abilities
- Why Brains Are Not Suitable for Storing Long Sequences Like Humans Remember
- Why Brain Scans Don't Show Brains Make Minds
- Why Strokes, Alzheimer's Disease and Drunkenness Don't Prove the “Brains Make Minds” Dogma
- Synaptic Density Studies Contradict the Most Popular Memory Theory
- The Rare "Total Recall" Effect That Conflicts with Brain Dogmas
- Physical Connections Do Nothing to Explain Cognition
- The Sociological Reasons Why Bad Explanations Persist in Academia
- Split-Brain Cases Conflict with "Brains Make Minds" Dogma
- Why So Much of Neuroscience News Is Unreliable
- An Analogy Clarifying Why the "Brain Stores All Your Memories" Dogma Is Untenable
- Why Darwinism Fails to Explain the Human Mind
- What Is It That a Brain Does?
- Cloud Computing and a Non-Local Model of Consciousness
- Why We Do Not Understand the Origin of Complex Biological Innovations
- Our Minds May Arrive Top-Down Not Bottom-Up
- Fancy New Technology Fails to Prove Memory Dogmas
- The Argument for Determinism Collapses Once We Discard the "Minds Come from Brains" Dogma
- Animal Experiments Conflicting with the Dogma That the Brain Stores All Memories

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of the patients improved their memory performance after their hippocampus was removed.

In light of these results, it is objectionable for the "Memory Systems of the Brain" paper to have made this claim: "Clinical evidence indicates that damage to the hippocampus produces anterograde amnesia." The paper should merely have stated that there are a small number of famous cases of patients who had both hippocampus damage and anterograde amnesia, but that removal of the hippocampus generally does not produce either anterograde amnesia or even a very severe decline in memory performance.

We should remember that nothing is proven by a few cases in which a small number of people had some brain damage and also a memory problem. We do not know in such cases whether there is a causal relation between the brain damage and the memory problem. If I scanned enough data in hospital records, I could surely find cases in which someone had a toothache before dying suddenly. But that would not at all prove that toothaches can produce sudden death.

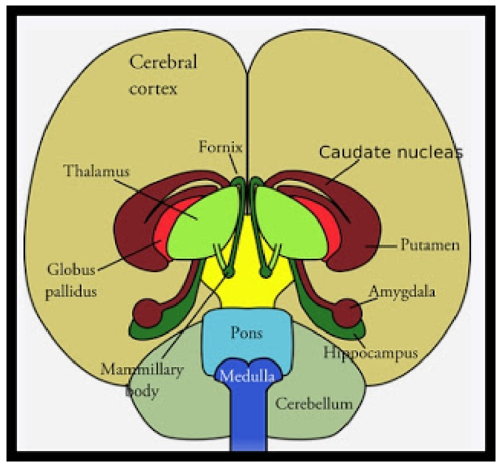
The "Memory Systems of the Brain" paper presents no good evidence that memories are stored in particular parts of the brain. But it does make this claim that it completely fails to back up with any evidence: "Memories are stored in the brain in a distributed pattern in the outer layer of the cortex, related to the area of the brain that initially processed them." At the end of this statement, the paper makes a reference to another neuroscience paper, as if such a thing had been established by that paper. The paper is the paper "Declarative and Nondeclarative Memory: Multiple Brain Systems Supporting Learning and Memory" by Larry R. Squire. That paper fails to state any such claim that memories are stored in the outer layer of the cortex, and does not at all provide any substantial evidence to back up such a claim.

The "Memory Systems of the Brain" paper does cite another paper co-authored by Squire, the paper "Structure and function of declarative and nondeclarative memory system." When I examine the paper in question, I find it does not actually make the claim that memories are stored in the outer layer of the cortex, and merely weakly says that the neocortex "is believed to be the permanent repository of memory." The paper in question does not establish any claim about a storage place of memory, and merely mentions some small-effect experiments with monkeys that had damage to various regions of their cortex. None of the monkeys had any more than a small deficit in their memory performance after such damage. For example, we are told in one case of cortical damage, performance declined from 79% correct to 67% correct, and in another such case performance declined from 79% correct to 77% correct; and it is noted that cortex-damaged monkeys "were unimpaired at learning and retaining single-object discriminations." It is not very unlikely that you might get such results purely because of chance variations, particularly if you were using a small sample size less than 15.

In this paper "Structure and function of declarative and nondeclarative memory systems" we learn that the authors are relying on absurdly underpowered cortex memory studies. For example, Figure 8 refers us to an experiment using only 5 monkeys with cortex lesions, which is way too few for a reliable experimental result. The minimum for a moderately reliable result is 15 subjects per study group.

Blog Archive

Labels



Below are some other examples of weak elements in the "Memory Systems of the Brain" paper:

(1) We are told on page 15 that neuroimaging shows that certain regions of the brain show "common activity" when memories are formed. This is irrelevant, because all regions of the brain are active during normal consciousness.
(2) We are told on page 18 that a paper showed "increased activity in the amygdala" for those who learned better. The paper in question actually only showed that those with higher levels of stress hormones in the amygdala tended to remember more. But that does nothing to show that the amygdala stores memories, but merely shows we remember better when emotionally aroused. You could do a similar test showing that people remember more what they experience when their heart rate is 130 beats per minute rather than a normal rate of only 65 beats per minute. But that would do nothing to show that memories are stored in the heart.
(3) On page 14 we are told, "Imaging studies have also illuminated the contributions of distinct prefrontal regions to encoding and retrieval." At the end of this statement there is a reference to three papers. The first of these papers used only 6 subjects per experiment, way too small a sample size to be a reliable result (15 subjects per study group has been suggested as a minimum for reliable results, and Kelly Zalocusky PhD hints that 31 subjects per study group may be needed). The second of these papers suffered from the defect of judging strength of memory based on subjective "confidence levels" rather than objective accuracy, and also the very large defect of failing to specify how many subjects were used for the experiments (we are told 14 subjects gave their permission to be tested, but not told how many subjects actually participated; and the graphs suggest that maybe only half that many participated). The third of the papers presents no original research.

Containing some very dubious assertions, some references to weak research and some troubling omissions (such as no mention of the supremely relevant research of John Lorber or the short lifetimes of synapse proteins), the paper "Memory Systems of the Brain" is an example of a bluffing neuroscience paper (in the sense that its title suggests something the paper does not deliver). The author does nothing to describe a system of the brain capable of encoding memories. He does nothing to describe a system in the brain capable of storing memory information. He does nothing to describe in the brain a system capable of preserving memory information for decades. He does nothing to describe a system in the brain capable of retrieving memories. So he does not describe any such thing as a memory system in the brain. Nature never told us that brains store memories; it was merely neuroscientists who told us that, without any good evidence for such a claim.

at September 06, 2020 2 comments:

Labels: hippocampus, memory storage

Friday, August 21, 2020

Young Age of Languages Contradicts Claims of Neural Storage of Linguistic Information

The term “memory” refers to an extremely large set of faculties of the human mind, including all of the following:

Linguistic retrieval: the ability to recall particular stretches of words that have been memorized, and the ability to very rapidly use words you have been learned. The vast human ability for linguistic recall is shown by stage actors who memorize very large roles such as the role of Hamlet. An even greater capacity for recall is shown by Muslims who memorize every word of their holy book. Humans can also use words at dizzying speeds, which may involve people speaking at a clip of more than 2 words per second.

Literary passage recognition: the ability to identify particular literary passages when they are recited. Biblical scholars often show great capacity in this regard, and can often identify the correct biblical book (and often the exact chapter and verse number) when any of thousands of scriptural quotes are recited.

Word recognition: Humans have an immense ability to recognize words very rapidly. We see this going on whenever anyone understands someone talking very rapidly. English speakers with a good vocabulary can instantly recognize and understand more than 50,000 words.

Visual retrieval: the ability to recall in great detail particular visual experiences a person had. Legal testimony shows that humans have a very high capacity in this regard, although accuracy is probably less than for memorized literary information. Court witnesses will often give very lengthy testimony mentioning dozens of visual details of things they saw.

Visual recognition: the ability to identify a place, object or face when someone sees it. Human ability in this regard is very high. The average person can probably recognize 5000 or more objects and 5000 or more faces, even when seeing objects with large amounts of variations. For example, you can not only recognize a single photo of the latest US president, but can also recognize a hundred different photos of such a person, each with its own variations. Visual recognition occurs with blazing speed, often taking less than a fraction of a second. A person may take less than a second to start running away from an animal recognized as a danger, such as a wolf, bear or snake.

Musical retrieval: Humans have extremely impressive capacities for musical retrieval. Such abilities are shown by people such as pianists who can play hundreds of songs from memory, and opera singers who can sing all the notes of very long Wagnerian musical roles such as Tristan, Siegfried or Hans Sachs.

Musical recognition: Humans have an astonishing ability to recognize pieces of music, even when they are performed with variations. We saw this ability on television in the popular TV show *Name That Tune*.

Fast musical memorization: This very rare ability is shown by some musical savants who have the ability to memorize any piece of music they hear a single time.

There is not a single one of these capabilities that can be explained as products of the human brain. We know of no neural faculties that can explain instant visual recognition. There is no convincing evidence that any part of the brain works harder during visual recognition than during visual non-recognition. A scientific paper tells us, "Specific complex mental processes cannot be inferred directly from functional brain imaging data."

The study here is an example of a brain scan study failing to provide evidence that the brain produces visual recognition. The study has the inappropriate title "Successful Decoding of Famous Faces in the Fusiform Face Area," an idea that is not at all shown by the paper. The paper describes a brain scan study in which 17 people had their brains scanned while looking at famous faces that should have provoked recognition. According to Figure 3, 11 out of 12 brain regions checked showed a 1% or less percent signal change during facial recognition, not more impressive than we would expect to have by chance. A single tiny brain region (called Right FFA) showed a 2% percent signal change, when tested with faces of 2 Israeli prime ministers. But in a replication experiment using the famous faces of Brad Pitt and Leonardo DiCaprio, this result did not hold up, with the percent signal change being no greater than 1% for any brain region. The paper does not give any test comparing recognition versus non-recognition. All in all, this is no compelling evidence that something from a brain is retrieved when people recognize a face. Another paper also gets a result of only about 1% percent signal change when testing face recognition in different brain areas, getting only about a 1% signal difference for this FFA region. Two other papers (this paper and this paper) also find less than a 1% signal difference in this FFA region when testing facial recognition. Another paper finds only a half of 1% signal change in the FFA during face recognition. Another paper using a larger sample size of 26 people reports a signal change of much less than 1% (only a small fraction of one percent) when testing this FFA region with face recognition.

Such tiny percent signal changes do nothing to establish any reading of information from brains when visual recognition occurs. For one thing, since the sample sizes are mostly small (around 15 people per study), you could easily get a 1% or 2% signal variation by chance (just as you can easily get 55% of your coin flips being "heads" if you only flip 20 or 40 times). If there is some tiny little signal change in one region of the brain when a face is recognized, that might be something that has nothing to do with reading memory information from brains. For example, it might be a little of an alert effect or an "aha" emotional boost effect caused by the mere fact of a successful recognition.

But at least someone might argue that there was lots of time for a visual recognition capability to have evolved in a brain, and that if humans have some neural capability for fast visual recognition, such a capability might have very gradually evolved over hundreds of thousands of years, or millions of years. Such a person might argue that there was a big reason why such a capability was vital for survival. It is at least true that a species will be much more likely to survive if organisms of that species can recognize their own offspring, and instantly recognize another animal as a dangerous threat.

But in the case of language and musical memory capabilities, we have a totally different situation. There is no survival-of-the-fittest reason why any organism would have either impressive language memory capabilities or impressive musical memory capabilities. Neither language nor music is needed for an organism to survive in the wild.

There is a very big reason for disbelieving in a neural storage of linguistic information. The reason is that all of the languages used by humans are relatively recent inventions. Languages such as the English language that I speak are less than a thousand years old. There would have been no time for humans to have evolved some language storage capability for a language that has existed for such a relatively short time.

In ancient times people spoke languages such as Latin and Greek. You can see that the English language is less than a thousand years old by looking at the text of the early English poem Beowolf, which dates from about 700 to 1000 AD. Below are its opening lines (you can read the full text here):

Hwæt. We Gardena in geardagum,
þeodcyninga, þrym gefrunon,
hu ða æþelingas ellen fremedon.
Oft Scyld Scefing sceaþena þreatum,
monegum mægþum, meodosetla ofteah,
egsode eorlas. Syððan ærest wearð
feasceaft funden, he þæs frofre gebad,
weox under wolcnum, weorðmyndum þah,
oðþæt him æghwylc þara ymbsittendra
ofer hronrade hyran scolde,
gomban gyldan. þæt wæs god cyning.

It is clear from this that the English language as it is now spoken has existed for less than a thousand years. How could the brain have some elaborate system that allows Hamlet actors to store all the lines of very long English language roles such as Hamlet, when the English language has not existed for more than a thousand years? This seems impossible.

Could it be that through some miracle of rapid evolution that the human brain has acquired some great neural capability that it did not have a thousand years ago, allowing it to store lots of data from a relatively recent language such as English? All claims of rapid new function evolution are mathematically unbelievable, and there is no evidence of any such rapid change in the human brain or the human genome. The article here at a major science journal is entitled "Scientists track last 2000 years of British evolution." All that is mentioned is a few minor things such as greater lactose tolerance. There is no mention of any brain evolution. It seems that 2000 years ago people had the same brains they have now. There is no evidence that the brain has undergone any change after the birth of Jesus that might allow an ability to massively store (and instantly retrieve) words in a language that is less than a thousand years old. An article in Scientific American states, "The past 10,000 years of human existence actually shrank our brains."

A similar situation exists in regard to music. Musical notation is a relatively recent invention, an invention so recent that no melodies survive from before the time of Jesus. But Wagnerian tenors are able to memorize not just songs but musical roles that involve hours of very specific singing. No one can explain how a brain could have acquired such a vast ability in storing and retrieving musical notes given that musical notation is such a relatively recent invention, and given that musical rememberance is a superfluous skill having nothing to do with human survival.

at August 21, 2020 No comments:

Labels: memory storage, visual recognition

Monday, August 3, 2020

Study Finds Equal Brain Connectivity in All Mammals

Observational realities frequently conflict with attempts to correlate brain size and intelligence. In a scientific paper a scientist states, "After correcting for body height or body surface area, men's brains are about 100 g heavier than female brains in both racial groups." After adjusting for size, male brains are 7% larger, but there is not even a 3% difference in intelligence between males and females. Elephants have brains several times larger than human brains, but elephants are not as intelligent as humans. Removing half of a human brain in a hemispherectomy operation has no major effect on intelligence, as discussed in the posts here. Crows have high intelligence despite tiny brains, and a lack of a neocortex.

Sometimes it is argued that the real measure of cognitive ability is brain connectivity (the degree to which brain cells are connected with each other). It has been suggested that maybe humans are smarter than other mammals because our neurons are better connected. But a new study indicates that the brains of humans are not better connected than the btains of other animals. The study is announced on the Science Daily web site with this headline: "MRI scans of the brains of 130 mammals, including humans, indicate equal connectivity."

We read the following:

"Researchers at Tel Aviv University, led by Prof. Yaniv Assaf of the School of Neurobiology, Biochemistry and Biophysics and the Sagol School of Neuroscience and Prof. Yossi Yovel of the School of Zoology, the Sagol School of Neuroscience, and the Steinhardt Museum of Natural History, conducted a first-of-its-kind study designed to investigate brain connectivity in 130 mammalian species. The intriguing results, contradicting widespread conjectures, revealed that brain connectivity levels are equal in all mammals, including humans."

A Professor Assaf is quoted as stating, ""Many scientists have assumed that connectivity in the human brain is significantly higher compared to other animals, as a possible explanation for the superior functioning of the 'human animal.'" But it turns out that this assumption (a natural one from the idea that your brain is the source of your mind) just isn't true.

So we have the brain connectivity of mice, the brain connectivity of cows, the brain connectivity of sheep. This is another reason for believing that the human mind (so vastly superior to the mind of such animals) is not produced by the human brain.

at August 03, 2020 No comments:

Labels: brain connectivity

Tuesday, July 21, 2020

Preservation of Mind and Memories After Removal of Half a Brain

The idea of a *crucial experiment* or *critical experiment* is an old concept in the world of science. Such an experiment is supposedly one that leaves one particular hypothesis standing, and rules out all rival explanations or rival hypotheses. The idea that there are such experiments has been criticized by some. A simpler idea is the idea of a sink-or-swim experiment. A sink-or-swim experiment is one that either leaves some hypothesis standing as a viable hypothesis (the “swim” situation) or causes the hypothesis to be discredited (the “sink” hypothesis).

Scientists have very often claimed that the human mind is produced by the brain, and that memories are stored in the brain. A very interesting question is: could you do a sink-or-swim experiment testing such hypotheses? The experiment has actually been done, not just once but many times. I will here use the term “experiment” for medical procedures that were usually done for medical reasons such as stopping very bad brain seizures in patients. Although the doctors who did such procedures may not have considered them experiments, we can consider them as experiments in the sense of testing a particular hypothesis about the brain.

The sink-or-swim experiment for the hypothesis that the brain makes the mind and the hypothesis that the brain stores memories is to surgically remove half of the brain, and see what the effect is on the mind and memory. Such an experiment has been done many times. Almost every time the result has been that there was no major effect on consciousness, no major effect or intelligence, and no major effect on memory. The memories of people who had half of their brains removed usually preserved the knowledge and life memories they had acquired.

This is a "sink" result for this sink-or-swim experiment. The results of such surgical operations decisively refute claims that the mind is the product of the brain and claims that the brain is the storage place of memories. But addicted to materialist dogma that the mind is merely the product of the brain and that memories are stored in brains, virtually no neuroscientists have paid attention to the results of these sink-or-swim experiments. In this regard, they are like fundamentalists who keep believing that the Earth is 6000 years old despite observational results indicating our planet is billions of years old.

I have in five previous posts (here, here, here, here and here) listed very much data relating to such experiments. In this post I will not restate that data showing that intelligence is well-preserved after removing half of the brain, but will mostly cite some data and cases I have not previously discussed.

I can start with the results reported in the American Journal of Psychology, Vol. 46, No. 3 (Jul., 1934), pages 500-503, regarding work of W. E. Dandy, in which he removed half of the brains of patients. You can read the results in the preview here (without doing any registration). We read the following (I have put a few of the sentences in boldface):

"*Dandy has completely removed the right cerebral hemisphere from eight patients. He has performed total extirpations of one or more lobes much oftener... There are tabulated below certain generalizations on the effects of removing the right hemisphere.... The operation was the complete extirpation of the right frontal, temporal, parietal, and occipital lobes peripheral to the corpus striatum. The weight of the tissue re moved varies, with the pathological conditions involved, from 250 to 584 grm [grams].Coherent conversation began within twenty-four hours after operation, and in one case on the afternoon of the same day.* ***Later examinations showed no observable mental changes. The patients were perfectly oriented in respect of time, place, and person; their memory was unimpaired for immediate and remote events; conversation was always coherent; ability to read, write, compute, and learn new material was unaltered.*** *Current events were followed with normal interest. There were no personality changes apparent; the patients were emotionally stable, without fears, delusions, hallucinations, expansive ideas or obsessions, and with a good sense of humor; they joked frequently. They showed a natural interest in their condition and future. They cooperated intelligently at all times throughout post-operative care and subsequent testing of function.*"

It would be rather hard to imagine a more decisive refutation of the claim that the human brain is the source of the human mind, and the claim that the human brain is the storage place of human memories. Here are eight people who had half of their brains removed. Yet the people showed "no observable mental changes," and "their memory was unimpaired for immediate and remote events." The people could read, write, compute and learn just as if nothing had happened, and "there were no personality changes."

A 1966 paper was entitled "Long-term changes in intellect and behavior after hemispherectomy." The paper refers to operations in which half of a brain is removed, often to stop very bad brain seizures. This paper gives very detailed "before and after" IQ score data on 11 people who had half of their brains removed. Eight of the 11 people had the left half of their brain removed, and the other three had the right half of their brain removed. Every single one of the 11 people was able to get an improved IQ score on at least one of the tests taken *after* half of their brain was removed, a score better than a corresponding score they had got before half of their brain was removed.

Patient 1 (a P.G.) had an IQ of 128 before half of his brain was removed. After half of his brain was removed, he scored 142 on an IQ test. The paper tells us that this man with half a brain "obtained a university diploma after operation" and "has a responsible administrative position with a local authority."

The same paper refers to previous results when removing half of a brain, and notes data suggesting that such an operation has little negative effect on intelligence. Referring to intelligence, we are told that McKissock reported "short term improvement in 13 of 17 cases," that another researcher found "significant improvement in verbal intelligence scores in a variety of tests after operation in five of 35 cases, with temporary deterioration in two, the remainder unchanged." We are also told that White "reports improvement in personality in 80% of 134 cases" in which half of the brain was removed.

In the scientific paper here, we have on page 248 and page 250 before and after test scores for various subjects who had of their brains removed in hemispherectomy operations. The IQ score differences are slight. IQ tests don't involve learned information, but almost any IQ test would be largely a test of memory, as it would be a largely a test of ability to read test questions.

On the same pages we have before and after test scores for Peabody Picture Vocabulary Tests given to various subjects who had half of their brains removed in hemispherectomy operations. In these tests, someone is shown picture cards like the one below, and asked to name the words represented by the pictures. These tests are tests of memory retention after removal of half of the brain. On these memory tests there was no decline in the score of 21 subjects mentioned on page 248, and no decline in 7 subjects mentioned on page 250.

In an article in the New Yorker magazine, we are told of a Christina Santhouse who had half of her brain surgically removed: "When I met her, she had taken her S.A.T.s and just finished high school, coming in seventy-sixth in a class of two hundred and twenty-five." If your brain makes your mind, how could you finish in the top 34% of your class with only half a brain? The same article tells us of someone who had half of the brain removed, but made the dean's list in college, a list of the top-performing students on campus.

An article in the LA Times tells us about memory preservation in a young girl who lost half her brain:

"*How is it that 8-year-old Beth Usher of Storrs, Conn., can lose her left hemisphere, yet retain her large repertoire of knock-knock jokes? Beth's memories survived not just the loss of brain tissue, but also the 32 days that she spent in a coma, the result of some brain stem swelling that occurred in response to the trauma of surgery. Shortly after Beth regained consciousness, her father began quizzing her about people and places from her past. Brian Usher didn't get very far. 'Dad,' Beth interrupted, with a trace of impatience. 'I remember everything.'* "

On page 59 of the book *The Biological Mind*, the author states the following:

"A group of surgeons at Johns Hopkins Medical School performed fifty-eight hemispherectomy operations on children over a thirty-year period. 'We were awed,' they wrote later of their experiences, 'by the apparent retention of memory after removal of half of the brain, either half, and by the retention of the child's personality and sense of humor.' "

There is a reason why we can be confident that removal of half of a brain in hemispherectomy operations does not cause any major loss of learned memories. If there was a case of any such thing happening, you can believe that it would be endlessly recited by those who wish for us to believe that memories are stored in brains. But there is no such case, so we never hear materialists telling us about some person who suffered some dramatic loss of learned knowledge after having a hemispherectomy operation in which half of his brain was removed.

Our professors very often make biology claims that are contrary to the low-level facts of biology. The table below lists various cases in which the fantasy biology of academia dogma diverges from biology reality.

FANTASY BIOLOGY VERSUS BIOLOGICAL REALITY	
Dubious Biology Claim	**Biological Reality**
Brains store memories, probably in synapses or dendritic spines.	Neither synapses nor dendritic spines last for even a tenth of the longest time that humans can remember things, and both are made up of proteins with lifetimes of only a few weeks.
DNA stores a blueprint or recipe for making the human body.	DNA does not specify the physical structure of any of these things: an organism's body, its organ systems, its organs or its cells.
Visible biological innovations arise from a combination of random mutations and natural selection, which improves the DNA of a species.	It has not been proven that any visible complex biological innovation ever appeared because of random mutations and natural selection, and we know of a reason why mere DNA mutations could never produce a complex visible biological innovation: that visible physical structures are not specified in DNA.
Life appeared because of a lucky combination of random chemicals billions of years ago.	Neither a living thing nor any of the building blocks of a living thing (proteins and nucleic acids with genetic information) has ever been produced through any experimental process that realistically simulated early Earth conditions.
The building blocks of life have been found in outer space.	No one has found in outer space either of the two actual building blocks of life: proteins or nucleic acids with genetic information.
Brain scans show your brain	Brains scans actually show signal differences

makes your mind.	of less than 1% during thinking or recall, what we would expect from random variations.
Brain signals are real fast.	Synaptic delays, synaptic fatigue and relatively slow dendritic transmission mean that signals in the cortex must be real slow.
The common descent of all life from a single ancestor is a fact.	A shortage of transitional fossils and the lack of DNA corresponding to old fossils (because of DNA's half-life of 521 years) make the doctrine of common descent very unproven.
Chemically humans are almost exactly like chimps.	80% of proteins are different between humans and chimps.
Our minds can be explained neurally.	There is no credible neural explanation for any of the main features of the human mind: memory, self-hood, consciousness, abstract thinking, and imagination.
We kind of understand how a speck-sized egg can progress to become a full-sized baby.	We have no understanding of how this occurs (given a lack of a body plan in DNA), and do not even understand what causes cells to reproduce.
Memory and intelligence depend strongly on brain status.	A person can lose half of his brain in a hemispherectomy operation, with little effect on memory or intelligence.

The image below reproduces the table above.

FANTASY BIOLOGY VERSUS BIOLOGICAL REALITY

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Brains store memories, probably in synapses or dendritic spines.	Neither synapses nor dendritic spines last for even a tenth of the longest time that humans can remember things, and both are made up of proteins with lifetimes of only a few weeks.
DNA stores a blueprint or recipe for making the human body.	DNA does not specify the physical structure of any of these things: an organism's body, its organ systems, its organs or its cells.
Visible biological innovations arise from a combination of random mutations and natural selection, which improves the DNA of a species.	It has not been proven that any visible complex biological innovation ever appeared because of random mutations and natural selection, and we know of a reason why mere DNA mutations could never produce a complex visible biological innovation: that visible physical structures cannot be specified in DNA.
Life appeared because of a lucky combination of random chemicals billions of years ago.	Neither a living thing nor any of the building blocks of a living thing (proteins and nucleic acids with genetic information) have ever been produced through any experimental process to simulate early Earth conditions.
The building blocks of life have been found in outer space.	No one has found in outer space either of the two actual building blocks of life: proteins or nucleic acids with genetic information.
Brain scans show your brain makes your mind.	Brains scans actually show signal differences of less than 1% during thinking or recall, what we would expect from random variations.
Brain signals are real fast.	Synaptic delays, synaptic fatigue and relatively slow dendritic transmission mean that signals in the cortex must be real slow.
The common descent of all life from a single ancestor is a fact.	A shortage of transitional fossils and the lack of DNA corresponding to old fossils (because of DNA's half-life of 521 years) make the doctrine of common descent very unproven.
Chemically humans are almost exactly like chimps.	80% of proteins are different between humans and apes.
Our minds can be explained neurally.	There is no credible neural explanation for any of the main features of the human mind: memory, self-hood, consciousness, abstract thinking, and imagination.
We kind of understand how a full baby can grow from an ovum.	We have no understanding of how this occurs (given a lack of a body plan in DNA), and do not even understand what causes cells to reproduce.
Memory and intelligence depend strongly on brain status.	A person can lose half of his brain in a hemispherectomy operation, with little effect on memory or intelligence.

at July 21, 2020 1 comment:

Labels: hemispherectomy, high mental function despite large brain damage

Thursday, July 9, 2020

Gender Differences in Brains Help Discredit Prevailing Dogmas About Brains

Many people are interested in differences between the brains of males and the brains of females, and differences between males and females in IQ tests and memory tests. A careful examination of this area provides some evidence against the claim that the brain is the source of human intelligence, and the claim that memories are stored in synapses of the brain.

The brains of males are significantly larger on average than females -- about 10% bigger. But we know that females tend to be shorter and weigh less than males. Some say that the relative size of female brains (female brain sizes compared to female body sizes) is no smaller than the relative size of male brains. But in a scientific paper a scientist states, "After correcting for body height or body surface area, men's brains are about 100 g heavier than female brains in both racial groups." That difference of 100 grams is about 7% of the total weight of a male brain (about 1350 grams).

So using the idea that the human mind is produced by the brain, we should expect that males do about 7% better at school and about 7% better in IQ tests. But this is not at all the case. Males and females do about the same on IQ tests, with a difference of less than 1% or 2%. In the United States females tend to get just as high academic grades as males. In this regard, the claim that the brain is produced by the mind fails the observational test.

Now let's consider human memory. The standard academic dogma (unsupported by any facts) is that memories are stored in the synapses of brains. The persistence of this dogma is mystifying, given what we know about the instability of synapses. Humans can reliably remember things for longer than 50 years, but individual synapses do not last for years. The proteins that make up synapses are very short-lived, having an average lifetime of only a few weeks.

Wikipedia.org states, "Multiple studies[22] [23] have found a higher synaptic density in males: a 2008 study reported that men had a significantly higher average synaptic density of 12.9×10^8 per cubic millimeter, whereas in women it was 8.6×10^8 per cubic millimeter, a 33% difference." The 2008 study mentioned is the study "Gender differences in human cortical synaptic density" you can read here.

Now, this 33% difference is quite a big difference, much bigger than the brain size difference previously mentioned. Under the assumption that synapses are the storage place of memory, we should expect (given this 33% greater synapse density in males) that either males tend to have stored much more memories than females, or that males are better at remembering things than females. But such things are not true.

There is no evidence that males store more memories than females. One good way of testing whether males store more memories than females is simply to look at academic scores. If males tended to store more memories, they would tend to have higher academic scores than females. But females do just as well as males in tests of learned information.

Below is a quote from an article in the New York Times indicating that boys do not do better than females (on average) in school tests:

"The study included test scores from the 2008 to 2014 school years for 10,000 of the roughly 12,000 school districts in the United States. In no district do boys, on average, do as well or better than girls in English and language arts. In the average district, girls perform about three-quarters of a grade level ahead of boys. But in math, there is nearly no gender gap, on average. Girls perform slightly better than boys in about a quarter of districts...Boys do slightly better in the rest."

Here are some quotes from the scientific paper "The Role of Sex in Memory Function: Considerations and Recommendations in the Context of Exercise":

"Females tend to outperform males in episodic memory function....Females tend to perform better than males in verbal-based episodic memory tasks, as opposed to spatial-based memory tasks [10]. Females generally access their memories faster than males [11], date them more precisely [12], and use more emotional terms when describing memories [13]. Superior verbal memory for females also appears to be independent of intelligence level [10]. Additionally, females also have greater specificity for events imagined to occur in the future [14]. In general, females outperform males on autobiographical memory (particularly with high retrieval support via verbal probing [13]), random word recall [6], story recall [15], auditory episodic memory [16], semantic memory (driven by superiority in fluency) [8], and face recognition tasks [10,17]."

So the paper is telling us that female memory performance is better than male memory performance in all these areas. But how can that be, if males have a synaptic density 33% greater? We have here additional evidence that there is no truth in the common claim that memories are stored in human synapses.

at July 09, 2020 No comments:

Labels: memory storage

Sunday, June 28, 2020

Long Article Tries to Show Neural Memory Storage, but Gives No Real Evidence for It

In Discover magazine, there was recently a long article entitled “What Happens in Your Brain When You Make Memories?” An article like this is an attempt to convince us that scientists have some good understanding of how a brain could store memories. But the article completely fails at such a task, and provides no substantial evidence for any such thing as neural memory storage.

We are told the following: “In the 1990s, scientists analyzed high-resolution brain scans and found that these fleeting memories depend on neurons firing in the prefrontal cortex, the front part of the brain responsible for higher-level thinking.” There is no actual evidence that the front part of the brain is responsible for high-level thinking. You can read here for evidence that specifically contradicts such a claim.

The quote above includes a link to a brain scanning scientific paper. That paper provides no evidence that memories depend on neurons firing anywhere. In any type of brain scanning study, the two main questions to ask are: how many subjects were used, and what was the percent signal change detected during some supposed activation of some brain region? The paper does not tell us either of these things. It mentions some brain scanning study, but does not tell any details of how many subjects it used, or what percent signal change was detected. We can only assume that the study was one of those ridiculously common studies that either: (1) used too small a sample size to get a result of good statistical power, or (2) detected only meaningless signal changes such as less than 1%, the type of differences we would expect to get by chance, or (3) had both of these problems. When scientists use impressive sample sizes or when they get impressive brain scanning results regarding percent signal changes, they almost always tell us about such a thing. When there is a failure for a paper to mention either of these numbers, we should assume it is because the numbers were not impressive, and not good evidence.

The article then states the dogma that memories form when synapses are strengthened: “When a long-term memory is formed, the connections between neurons, known as synapses, are strengthened.” There is no evidence that this is true. When stating the sentence above, the article has a link to a paper that provides no evidence that memory storage involves synapse strengthening.

In fact, there are reasons why it cannot be true that memories are formed by synapses being strengthened. The first is that synapses are too unstable to be a permanent storage place for memories. The proteins in synapses have an average lifetime of only a few weeks. But humans can accurately remember things for 60 years, which is 1000 times longer than 50 weeks. Synapses do not last for very long. The paper here says that half-life of synapses is "from days to months." The 2018 study here precisely measured the lifetimes of more than 3000 brain proteins from all over the brain, and found not a single one with a lifetime of more than 75 days (figure 2 shows the average protein lifetime was only 11 days).

The second reason is that humans are able to instantly form permanent new memories at a rapid clip. This was shown in an experiment in which humans were able to remember fairly well images they were only exposed to for a few seconds. The experiment is described in the scientific paper “Visual long-term memory has a massive storage capacity for object details.” The experimenters showed some subjects 2500 images over the course of five and a half hours, and the subjects viewed each image for only three seconds. Then the subjects were tested in the following way described by the paper:

"Afterward, they were shown pairs of images and indicated which of the two they had seen. The previously viewed item could be paired with either an object from a novel category, an object of the same basic-level category, or the same object in a different state or pose. Performance in each of these conditions was remarkably high (92%, 88%, and 87%, respectively), suggesting that participants successfully maintained detailed representations of thousands of images."

Let us imagine that memories were being stored in the brain by a process of synapse strengthening. Each time a memory was stored, it would involve the synthesis of new proteins (requiring minutes), and also the additional time (presumably requiring additional minutes) for an encoding effect in which knowledge or experienced was translated into neural states. If the brain stored memories in such a way, it could not possibly keep up with remembering most of thousands of images that appeared for only three seconds each.

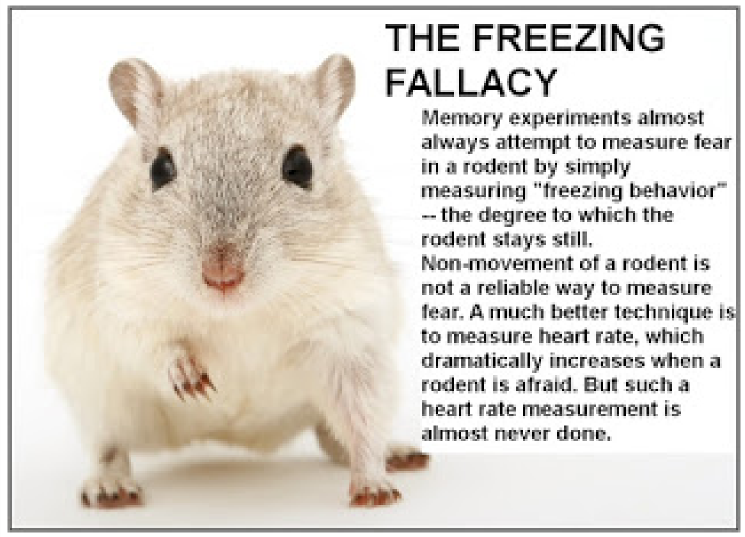
In the Discover magazine article, we are then told an inaccurate legend of scientific achievement: “ In a 2012 Nature study, Tonegawa and researchers at MIT and Stanford University used optogenetics to demonstrate that our memory traces do indeed live in specific clusters of brain cells.” No, Susumu Tonegawa and his colleagues did not do any such thing. In the post here you can read a rather lengthy discussion of various memory-related papers authored by people working at Tonegawa's MIT memory laboratory. These papers suffer from a common defect of using too-small sample sizes. Again and again when looking up the memory-related papers authored by people working at Tonegawa's MIT memory laboratory, I found papers that used sample sizes so small that were not good evidence for anything. In a neuroscience experiment, the absolute minimum for a somewhat compelling result is 15 animals per study group (and in most cases the number of animals per study group should be much higher, such as 25 or more). But again and again when looking up the memory-related papers authored by people working at Tonegawa's MIT memory laboratory, I found papers that used sample sizes of 10 or smaller. Such papers are not good evidence for anything.

In the Discover magazine article, we have a clear description of the utterly fallacious experimental technique used by Tonegawa, a technique that has given him the wrong idea that he has found a memory in brains. Here is what the article says:

"In the paper, the research team describes how they pinpointed a particular group of neurons in the hippocampus, a part of the brain involved in the formation of long-term memories, that start firing under certain conditions. In this case, the researchers did so by having mice explore an unfamiliar cage. '[Then] you give [the mouse] mild electric shocks to their footpads,' says Tonegawa. 'And the mouse will immediately form a memory that this cage is a scary place.' The next day, says Tonegawa, when the mice were placed in the cage without being zapped, this conditioning led them to fear that environment. The researchers later injected the rodents with a protein that can trigger brain cells — specifically, the neurons in the hippocampus that the scientists were targeting — by flashing them with blue light. ''These proteins have a chemical property to activate cells when light of a particular wavelength is delivered,' adds Tonegawa. Then, when the scientists flashed the mice with pulses of light in an entirely different environment, the neurons in the hippocampus they had labeled with the protein sprung into action — and the mice froze in place. The researchers think the animals were mentally flashing back to the experience of being shocked. 'That's the logic of the experiment,' says Tonegawa. 'You can tell that these neurons, which were labeled yesterday, now carry those memory engrams' "

There are two reasons why this technique is fallacious and unreliable, and does not provide any evidence at all that memories are stored in the brains of these mice. The first is that when the brains of the mice are being flashed with pulses of light, this is a stimulation effect that itself may be causing a freezing effect causing a mice to "freeze in place," even though no fearful memory is being recalled by the mice. In fact, it is known that stimulating many different regions of a rodent brain will cause a mouse to "freeze in place." A science paper says that it is possible to induce freezing in rodents by stimulating a wide variety of regions. It says, "It is possible to induce freezing by activating a variety of brain areas and projections, including the hippocampus (Liu et al., 2012), lateral, basal and central amygdala (Ciocchi et al., 2010); Johansen et al., 2010; Gore et al., 2015a), periaqueductal gray (Tovote et al., 2016), motor and primary sensory cortices (Kass et al., 2013), prefrontal projections (Rajasethupathy et al., 2015) and retrosplenial cortex (Cowansage et al., 2014)." Therefore there is no reason at all to assume that the "freeze in place" is actually being caused by a recall of a memory. The "freeze in place" effect could be caused simply by the stimulation being delivered to the brains of the mice, without any recall occurring.

The second reason why such an experiment is no evidence at all for memory storage in a brain is that "freezing behavior" in mice is very hard to reliably measure. In a typical paper, judgments of how much a mouse froze will be based on arbitrary, error-prone human judgments. The reliable way to measure fear in mice is to measure their heart rate, which goes up very suddenly and rapidly when mice are afraid. But inexplicably, neuroscientists almost never use such a technique. Since scientists like Tonegawa do not use reliable techniques for determining whether rodents are afraid, and since the experiments depend on assumptions that the animals were afraid, we should have no confidence in the results of experiments like those described above.



The Discover magazine article then proceeds to describe some work by neuroscientist Nanthia Suthana, in which epilepsy patients had their brains scanned when using video games. We are told that some evidence was found that some kind of brain wave called theta oscillations was more common during memory recall. But we are not told how large an effect size was found, and have no way of knowing whether it was merely some borderline result unlikely to be replicated. We are not given a link for any paper that has been published, and we are told that there are merely two papers "in peer review." We have no mention of how many subjects were used. And memory retrieval is something quite different from memory storage. These are all quite a few reasons why such an experiment is not anything like substantial evidence for any neural storage of memories.

The last gasp of the Discover article is to claim that "Sah and his colleagues used optogenetics in rats to identify the circuitry in the brain that controls the return of traumatic memories." The "return of traumatic memories" refers to memory retrieval, which is an entirely different thing from memory storage. We are given a link to some study behind a paywall, and the abstract mentions no actual numbers, meaning we have no basis for any confidence in it. Given the rampant sample size problem in experimental neuroscience, in which too-small study groups are being used in most studies, we should have no confidence in any study if we merely can read an abstract that does not mention how large a study group was used.

Despite its long length, the Discover article fails to give us any solid piece of evidence suggesting that memories are stored in brains. The Discover article is a kind of Exhibit A to back up my claim that scientists have no actual evidence basis for believing that memories are stored in brains. Their "best evidence" for such claims are "house of cards" studies that do not meet the requirements of compelling experimental science. We have no solid scientific basis for believing that memories are stored in brains, but we do have good scientific reasons for believing that memories cannot be stored in brains. One such reason is that people do not suffer substantial losses of learned information when half of their brain is removed in hemispherectomy operations. See the paper here for a discussion of 8 people who had "no observable mental changes" after removal of half of their brains. The paper specifically mentions "their memory was unimpared." The second reason is that the proteins that make up the synapses of the brain have average lifetimes 1000 times shorter than the maximum length of time (60 years) that humans can retain memories.

at June 28, 2020 No comments:

Labels: memory storage