

A friend of mine has had insomnia for as long as I have known him, a time spanning almost six years. I asked him what he does with all the early morning hours he inevitably collects, and he said he just lies there and thinks. His thoughts, more specifically racing thoughts, are what perpetuate the cycle and keep him awake. I find it interesting that we can be entertained in our own minds for so long, to such degree. We think without thinking about it. The mundane can be made interesting, just because we have our mind as an escape. It leads me to wonder, what actually occurs in the brain? What are our thoughts comprised of? Could we think without language to think in? How essential is formal communication to how we think, what we do, and how we feel?

THE BRAIN

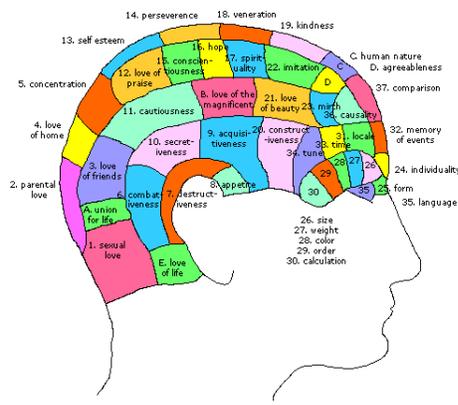
“It is... the center of higher-order thinking, learning and memory, and gives us the power to think, plan, speak, imagine, dream, reason, and experience emotions.” –Mastin

In addressing a topic as intricate as the mind and its functions, an understanding of the brain’s chemical processes puts into perspective the complexity of routine tasks and highlights how amazing our cognitive abilities are. To see an object and recognize it, the brain first has to have some knowledge of it prior. Knowledge is constantly obtained through the senses and recorded by neurons, the basic unit of the brain, that “processes and transmits information by electro-chemical signaling” (Mastin “Neurons & Synapses”). Encoding is the process that allows perceived sensations to be converted into storable events, and it is neurons that fire in order to encode the perceived sensations of an experience. The sensations are stored briefly in sensory memory (which typically decays within half a second) and continue into short-term memory. From there, neurons in the various sensory areas decode the information, and with aid of the hippocampus¹, the decoded information is distilled into what we see as the “experience.” Decoding and neural networks² pull together the information known about the object—the sight, shape, any emotions or feelings attached to it, past experiences and more—from all areas of the mind. All related neuron are tied into the idea by means of a neural network.

The hippocampus is essential to the creation of events and memories because it decides whether or not to store them long term. This is important because long-term memory is from where known,” like objects or events, is called from, due to short-term memory’s limited capacity. The decision to save information is determined through use. With more use, stronger connections between neurons are forged which leads to more defined, easier to access neural network. Once a memory is there, to recognize is the mind’s comparison of what is seen to what is stored, a simple matching of name to face. To recall is a step harder, because it calls for the brain to fully recreate the thing desired, in other words rewrite the connections that span across the mind and conjure up the image with all the details it entails.

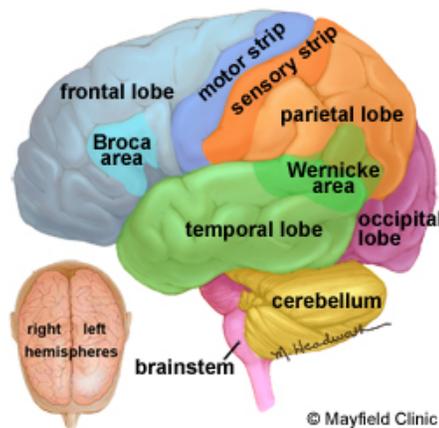
¹ Organ located in the medial temporal lobe, apart of the limbic system, that regulates emotion, memory, and the autonomic nervous system.

² Connection forged between functionally related neurons.



Phrenology, the pseudoscience based on the idea that certain areas of the brain have specific functions

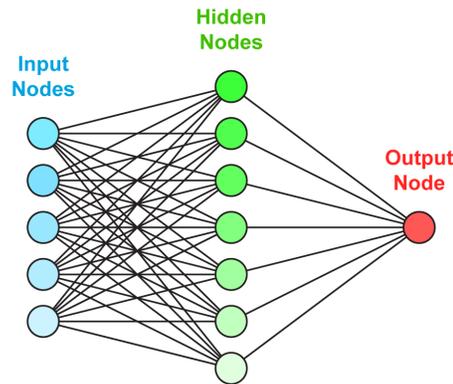
The traditional belief that the brain is fully compartmentalized (vision takes place in this region, taste in this, etc.) is a myth, for multiple areas work together in order to achieve one function or memory. As explained by cognitive scientist and professor Steven Pinker, “Strip localization is not correct... all neuroscientists today reject the idea that any particular trait... such as language, such as vision, such as memory, resides only in one little patch of the brain. There is no single brain area for x... brain function involves networks where different parts of the brain that communicate with each other in order to allow us to do pretty much everything” (Pinker “The Human Brain”). Yet, there are particular areas, and they interact through specialized neurons. For example, sensory neurons take in information to send to the nervous system, while motor neurons send commands to the muscles, and interneurons bridge the gap and communicate between the two. The communication between neurons and the areas of the brain allow us to react and adapt to the environment. Some portions of the brain have primary, not singular, functions in order to be more efficient. For instance, the mind has the brainstem and cerebellum, essential to physical aspects such as balance, movement, and automatic functions like breathing. There is a section vital to the sense of touch, and a compartment, Broca Area, specifically for the formation of words.



Brain region map

It is the paths that bridge together the pieces in which we build our lives upon. The neural networks that connect the bits of scattered information are where meaning is housed. “The actual

intelligence that your brain accomplishes... doesn't depend on lumps of tissue, it depends on the unfathomably complex computation done in the micro circuitry in the microscopic individual synapses and networks of neurons" (Pinker "The Human Brain"). The brain does not divide and store information in boxes; rather it is a large idea web with arrows connecting across and in between thousands of ideas, and it is the lack of real boundaries that allow new combinations to be formed.



Representation of a neural network

If the associations are so important, the real question is how are the links are formed, and what would happen without them? Could we have our most basic functions, of thinking, emoting, reflecting? How ingrained is the way we communicate in our functioning? Does emotion exist without a language to describe it?

SEMANTICS

The mind is enormously complex. Neurons store much information, but it has to be done in a meaningful way so that it does not get lost and can be recalled. If the brain had to sift through every piece of information it ever collected to reach a single conclusion, (like "pencil" or "red" or "chair"), nothing would ever be accomplished, connected, or understood. Because of this, more relevant or used networks are stronger and more easily accessed. The more a certain neural network is called upon, the more the neurons communicate between themselves, which leads to greater strength. Yet, the strength seems meaningless without a way to identify a particular network to further connect.

The process of recollection is can be understood in terms of a model plane. A model plane has no value unless it is assembled; the pieces separate from each other create nothing, while together they make a specific object, and each piece is vital to the next. Likewise, when recalling an event or object, every single part that makes it so (color, shape, date, importance) exists in the mind, but if such details are unattached from each other, they are not a unified whole, and therefore do not fulfill the purpose of creating the desired object. While words are usually arbitrary, the word represents a collection of neurons and neural pathways that allow the stores of information to be useful. It allows for one to say "model plane," and picture not a collection of seemingly unrelated parts—like the idea of red mixed with memories of flying, the texture of wood jumbled with the smell of glue—but a toy plane. The naming of something gives others the ability to immediately understand. Because the meaning and function are connected in

a network that can be called upon, it can be put into use, and expanded on, shared with others, and connected further.



Building blocks as apart of a structure: pieces and parts brought together into a whole

LANGUAGE

I am not holding language to its formal definition, “the method of human communication, either spoken or written, consisting of the use of words in a structured and conventional way”(Oxford Dictionaries). I believe it is more than a strictly human endeavor of either written or spoken words, for it could be any symbol, color, or sound, as long as it occurred in an organized manner. Structure is what is essential, for if words are simply names representing meaning, it is the semantics of language that give it power in our minds and allow us to communicate with the world. Semantics is the meaning behind what language fronts, and it is significant because the meaning attached to a memory is what gets remembered and stored long term, not necessarily the word, sound, color or shape itself. Language, in its many forms, structures the mind, and while it is certain that language is not thought, it cannot be denied that the way we think relies heavily on what we are surrounded by and taught. We can observe that we do not think in strings of words, yet the formal “names” give meaning to what we do think. It is the naming of, in some form or fashion, an experience or sensation that gives it meaning because it can then be shared with others. The dependence is significant because “recent cognitive neuroscience findings suggest that the neural mechanisms underlying emotion regulation may be the same as those underlying cognitive processes” (Bell and Wolfe 366). A healthy cognitive state, developed through participation with the environment by means of language, is directly related to a healthy emotional state. From this the importance of communication to the development of emotion can be inferred. Children establish a sense of self by interacting with others (Farr “Vygotsky’s Theory of Cognitive Development”). It is not unreasonable to conclude that an understanding of emotion is developed in the same way.

It can also be viewed that language exists to express emotions. Emotions, a part of the limbic system, are a physiological, vasomotor³ response of the body (“James-Lange Theory of Emotion”). They are a function entirely separate of the thinking, cognitive mind, evidenced by the limbic system’s presence in other animals (Foolen 18). Yet, language is needed to describe them, so it can be concluded that language has power over emotion. For example, when Ildefonso, a deaf twenty-seven year old who spent half a lifetime alone and in confusion because

³ Relating to the nerves and muscles that cause blood vessels to constrict or dilate.

he had no language, came to understand the significance in the gestures he was being shown, he became unable to describe his time without words in any way other than “the dark time” even though he spent the majority of his life without formal communication (Radiolab “Words”). This suggests that language and its acquisition significantly change the way our minds function. It modifies thought and its processing significantly, often in ways that lead to higher cognitive function (Radiolab “Words”).

The understanding that language both begets further understanding and guides the emotion itself leads me to question if emotion and language can exist outside of each other. If one cannot understand the idea of thinking without the word “think,” how does that fare for emotion? Can “happy” exist without the cognitive awareness and word needed to make it so? If that level can only be reached through the use of some set system of words or symbols, does the emotion actually exist outside of the language needed to express it? The dependence on the connections mediated by language, and language’s active role in conveying feeling and thought are what lead me to believe that emotion, though it may “exist,” cannot be really understood or known without words to express it.

Basic symbols							
↓	♡	∩	◩	⊖	!	∪	∧
person	feeling	mind	knowledge	time	intensity	container	work
◩	◻	h	▱	⌈	⊙	∩	∇
house, building	room	chair	table	stairs	eye	ear	hand
#	+	-	×	÷	=	÷	∞
number	and, plus, also	minus, without	multiplication	division	equal, same	part, piece	animal
∩	∖	▭	▭	∧	4	∩	∞
language	pen, pencil	paper, page	book	protection	health	medicine	world
△	—	—	⊙	~	∩	∩	~
nature	earth	sky	light	water	fire	air	cloud
↑	♀	△	⊙	⚡	⊙	☾	⊙
tree	flower	rock	wheel	electricity	sun	moon	earth

A sample of Charles Bliss's Blissymbolics

Higher-level connections acquired through language are exemplified in the instance of when nonspeaking children of the OCCC were given Blissymbolics as a way to communicate. In 1971, the Ontario Crippled Children’s Center of Toronto adapted Charles Bliss’s “graphic semantically based language” as a communication system for their disabled, nonspeaking children (McNaughten “Blissymbolics”). After its introduction, the kids came alive in ways they had not before, because they had a concrete medium in which they could link together and share their thoughts with. They were no longer trapped in their own minds, which allowed them to embark on a course of progress rather than one of intellectual silence, wordless and unchallenged. It was the bridge, the enabler for connection within themselves and with each other. “Language seems to me as a method of communication between the systems of a single mind” (Spelke “Words”). The kids may have had independent knowledge, but it seems essential for there to be a way to bridge ideas in ones own brain through means of words to reach a higher level of understanding. This indicates that without a language, the mind is unable to put to best use all that it takes in, which in comparison to those that have the structure of formalized language, can be viewed as having lower processing ability.

According to Lev Vygostky’s theories about child development, communication with others, especially in early years is essential to cognitive advancement. It is from a “more

knowledgeable other” that the most learning is done, for the connections taught through interaction are what prove to be most valuable to developmental progress. Without a common way to communicate, such paths would never be forged. One may have all of the parts, but it is through saying the pieces together outside of the mind that leads to understanding.

As evidenced by the Harvard study that compared the spatial orientation abilities of rats to adults to developing children of 18-24 months, the connecting of collected information, like color to direction, is a skill unrealized until around age six. The children tested were on the same navigation level as the rats, who understood direction and color independently but could not process the concepts together. According to Elizabeth Spelke, Head Researcher on “Cognitive Effects of Language on Human Behavior,” kids are unable to link the two until age six because they had never before “acquired relevant spatial language”(Shusterman, Lee, and Spelke 166). By saying a sentence like “left of the blue wall,” the independent thoughts are connected and understood as a whole, for the first time. Connections like this are unattainable without language as a facilitator.

CONCLUSION

The functions of the mind are vast and seemingly immeasurable. The amount of effort that goes into recognizing something is staggering, which makes the extent that language shapes our being, thoughts, emotions, and memories an incredible phenomenon. Though the lack of formal language can only really be studied in animals, young children, and those who have never learned, from them it can be glimpsed a functioning without. From them it is seen that when given the structure of a language, a light is turned on and new connections can be formed. The understanding that everything has a name allows for interaction with others, which allows for learning and further collaboration, an essential factor in creating the inner mind and self. Emotion may very well be a bodily response, but it is the meaning that language represents that gives anything, including emotion importance. The idea that emotion does not exist without language is true in that regard, for feelings without the words that both shape and convey them are intangible and indescribable, both inside ones own mine and out.

Works Cited

- Block Set. Digital image. *U.S. Made Toys*. N.p., n.d. Web. Nov. 2014.
- Brain Map. Digital image. *Mayfield Clinic: For Brain and Spine*. Mayfield Clinic, Feb. 2013. Web. Nov. 2014.
- Example of BNN Averaging. Digital image. *Observation of Single Top Quark Production*. The DØ Collaboration, Mar. 2009. Web. Nov. 2014.
- Farr, Tom. "Social Development Theory (Lev Vygotsky)." *Social Development Theory*. Udemy, May 2014. Web. 11 Nov. 2014.
- Foolen, Ad. "The Expressive Function of Language: Towards a Cognitive Semantic Approach." *The Language of Emotions*. Nijmegen: Radboud U Nijmegen, 1997. 15-27. Print.
- "James-Lange Theory of Emotion." *James-Lange Theory of Emotion*. Changing Minds, n.d. Web. 11 Nov. 2014.
- Mastin, Luke. "Memory Encoding." *Memory Encoding - Memory Processes - The Human Memory*. The Human Memory, 2010. Web. 11 Nov. 2014.
- McNaughton, Shirley. "Blissymbolics Looking Back and Ahead." *Blissymbolics*. BLISSLON: Bliss 101 Resources, Jan. 2007. Web. 11 Nov. 2014.
- Phrenology. Digital image. *Phrenology*. Northern Illinois University, n.d. Web. Nov. 2014.
- Pinker, Steven. "The Human Brain." *YouTube*. NCHumanities, 22 Jan. 2014. Web. 25 Nov. 2014.
- Shusterman, Anna, Sang Ah Lee, and Elizabeth Spelke. "Cognitive Effects of Language on Human Navigation." *Cognition* (2011): 187-200. Print.
- "Words." *Radiolab*. WNYC Radio, n.d. Web. 11 Nov. 2014.