

Mind or Matter?

**A Comparison of the Buddhist Philosophical View of Mind and the Neuroscience
View of Mind**

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“The mind enjoys a status separate from the material world. From the Buddhist perspective, the mental realm cannot be reduced to the world of matter, though it may depend upon that world to function.”
–His Holiness The Fourteenth Dalai Lama

“I am not denying that consciousness arises from the brain... It is the link itself that perplexes, however. Remarkably, subjective experience seems to emerge from a physical process. But we have no idea how or why this is.”
–David J. Chalmers, Ph.D. in Philosophy and Cognitive Science

Summary

In 2006, I participated in a study by Pace et al. studying the effects of compassion meditation on responses to psychosocial stress in university students. As a participant, I received instruction from Geshe Lobsang Tenzin on how to properly meditate. At the time, I didn't care much about the study itself – I was only looking for a way out of my Health 101 requirement. However, by the end of the study Geshe-la had piqued my interest regarding mind training. This eventually led to me participating in a study abroad semester in Dharamsala, India where I studied the Buddhist philosophy behind meditation.

As a neuroscience major, many of the topics discussed in Dharamsala directly challenged my understanding of science, especially the idea of the mind. I was initially drawn to the Buddhist philosophical view of the mind because I came to India convinced that mind did not exist. My background in science had me favoring the view that the brain alone is responsible for consciousness and cognition. And thus, I began my research surveying the two perspectives: the Buddhist philosophical view of the mind and the neuroscience intimations on the subject. In this paper I plan to conduct an in-depth review

of the mind as viewed by Tibetan Buddhist philosophy and see how it compares and potentially complements or refutes my understanding of neuroscience.

Methodology

To provide a complete yet concise review of the Buddhist philosophical view of the mind I drew mainly from class lectures, interviews and Buddhist literature. My class lectures were mainly given by Venerable Kelsang Wangmo. I conducted interviews with three teachers from the Institute for Buddhist Dialectics: Geshe Kelsang Damdul-la¹, Geshe Kunjo Wangdu-la², and Gen Gyatso-la³. All three men explained aspects of Buddhist philosophy but I was unable to get a clear answer as to how these aspects related to the mind and what the actual nature of the mind is. I interviewed Hedwig Bakker⁴, a meditation instructor at Tushita Meditation Center in Dharamkot, India. I read about the purposes and benefits of meditation as well as reviewed Buddhist literature on the subject.

To gain a perspective on the Tibetan concept of medicine I conducted an in-depth interview with Dr. Pema Dorji, the former president of the *Men-Tsee-Khang*, the exiled government's medical college⁵. Tibetan medicine relies heavily on the Buddhist view of the mind in its understanding of health. Therefore, the medical system has a very clear idea of the mind and how it is believed to relate to an organism. I also read Tibetan

¹ Geshe Kelsang Damdul-la is the assistant director of the Institute for Buddhist Dialectics. My interview with him took place on 11 March 2009 at 8AM in his office of the IBD.

² Geshe Kunjo Wangdu-la is a teacher of my professor Ani Kelsang Wangmo-la at the IBD. The interview took place 7 March 2009 at 1:30PM at his residence in the IBD.

³ Gen Gyatso-la is also a teacher of my professor. The interview took place 10 March 2009 at 9AM at his residence in the IBD.

⁴ The interview with Hedwig Bakker occurred on May 6, 2009 at ten in the morning at Tushita Meditation Center. She has been working as an instructor at Tushita for five years for about four months out of each year.

⁵ The interview with Dr. Pema Dorji took place on 21 March 2009 at 4PM. We met in his office in the Men-Tsee-Khang.

medical books as well as books written by Buddhist philosophers to get a well-rounded understanding of the mind.

I drew mainly from my knowledge of neuroscience and science texts to compare to the Buddhist view of the mind. I conducted an interview with Dr. Charles Raison, of the Department of Psychiatry and Behavioral Science at the Emory University School of Medicine, discussing the current views of the mind as debated in the science community⁶.

Introduction

In both Buddhist philosophy and neuroscience the terms “mind” and “consciousness” seem to be used interchangeably. Both disciplines agree that there is *something* that makes an individual’s experience unique and subjective, something that colors emotions and thoughts and drives personality and perception. Buddhist philosophy calls this *mind* without hesitation. In Buddhism, the mind is the single most important aspect of a conscious organism. The mind is the non-material energy that brings the physical body to life. It *is* consciousness. Neuroscience uses the term *mind* loosely. Neuroscience acknowledges that one must be conscious in order to have subjective experiences but what consciousness *is* has yet to be agreed upon. Consciousness is thus often referred to as “mind” for lack of a better word. Furthermore, science still debates if one *has* a consciousness (or mind) or is simply conscious as a result of structural functions and energies flowing in the brain.

⁶ The interview with Dr. Charles Raison took place on 26 June 2009 at 3PM. I conducted a phone interview from Oakhurst, California via the Internet. Dr. Raison was also heavily involved in the 2006 compassion meditation study I participated in at Emory University.

Neuroscience – Mind Versus Brain

Aristotle thought that the mind worked closely with the heart, not the brain, as it is now believed in the scientific community⁷. Descartes claimed that mind was the most important part of a being and was disconnected from the body. This dualistic theory posited that the mind was something intangible and separate from the brain but somehow interacted with it – which is most in line with the Buddhist philosophical view. In science, the current thinking is that mind is the *activity* of the brain⁸. The hypothesis is that consciousness is essentially built into a functioning brain. Science has identified and mapped areas of the brain responsible for aspects of consciousness, such as perception and emotion, and mapped the activity in the brain during consciousness. However, science is yet unable to explain *how* the activity of the nerve cells relates to subjective conscious experience⁹. Still, before considering the possibility of a novel entity loosely termed “the mind,” neuroscience attempts to explain consciousness as functions of brain systems.

Speaking strictly of the brain, the development of consciousness seems to be largely reliant on the nerve cells in the cortex linking to other cells. Cells in the cortex communicate with each other more than with the sensory organs and motor areas of the brain. This could mean that the cortex is the seat of consciousness as it takes the cues that it needs from the external world and decides what to do about them, essentially, how the organism *feels* about them¹⁰.

⁷ Crick, p. 11

⁸ Interview with Dr. Raison, 26 June 2009

⁹ Pauen, p. 44

¹⁰ Roth, p. 34

According to Gerhard Roth's *The Quest to Find Consciousness*, "consciousness is involved only in activities stemming from the associative regions of the cortex." The associative cortex, located in the neocortex, or the outermost layer of the brain, is involved with the conscious perception and identity of one's own body in the planning of movement, spatial perception, orientation and imagination, as well as spatial alertness.¹¹ Within the scientific community, perception is commonly thought of as the cognitive aspects of sensation. Perception and awareness do not need a subjective and separate mind to occur. They will occur simply as "a product of a functioning nervous system"¹². As Christof Koch said in his article *The Movie in Your Head*, "nothing we perceive, think, or feel falls out of the blue into our inner eye. Each mental feat is grounded in particular processes in the brain"¹³.

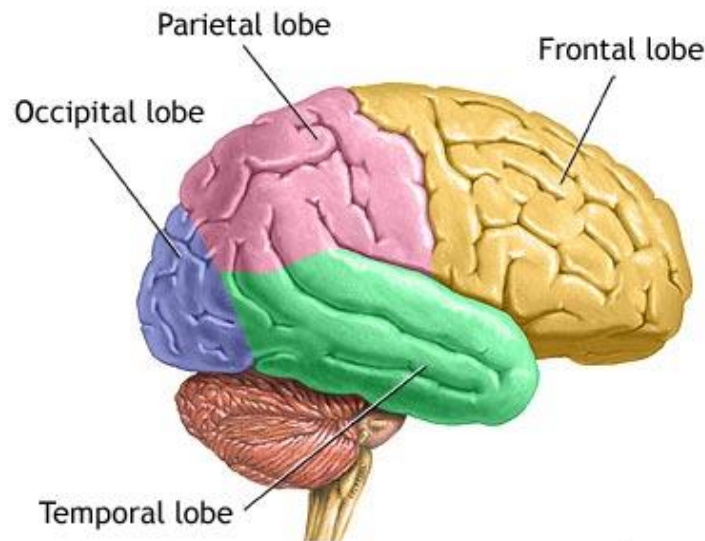
The neocortex consists of four lobes: the occipital, parietal, temporal and frontal. With regards to consciousness, the associative cortex of the occipital lobe is responsible for recognizing objects, faces and scenes as well as processing sounds and language. The temporal lobe's associative cortex is responsible for sight and hearing. The frontal lobe's associative cortex is responsible for problem solving and planning intentional actions. It is also responsible for the internal formulation of goals, motivation and emotions. Some researchers refer to this as the seat of morals and ethics and therefore, of our consciousness¹⁴.

¹¹ Roth, p. 39

¹² DeCharms, p. 75

¹³ Koch, p. 60

¹⁴ Roth, p. 39



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It becomes apparent that consciousness is “smeared across the brain”¹⁵. It has no specific location and is dependent upon the interconnections of the brain. It is not nearly as seamless and sequential as it seems because one experiences awareness from one moment to the next.

To map consciousness in the brain, we must first identify all the aspects of consciousness. Using fMRI technologies and other methods of brain observation, areas of the brain must be tested to note which areas become active. When one experiences the subjective feeling of fear, for example, the amygdala and other related brain structures become active. Unfortunately, finding ways to objectively test introspective aspects of consciousness have proven unsuccessful.

But, according to science, how does consciousness occur? Many theories surround this question within the scientific community. Dr. Raison is of the idea that consciousness

¹⁵ The Neocortex,
<http://www.nlm.nih.gov/medlineplus/ency/images/ency/fullsize/9549.jpg>

¹⁶ Interview with Dr. Raison, 26 June 2009

occurs due to the functioning of the brain. In an interview, he said, “the mind arises from the interconnections of many simple functions arranged in the brain. These brain structures process the environment – which an organism must respond to. The need to respond then requires the adaptation of consciousness, and a conscious mind thus arises from non-conscious elements.” Joseph LeDoux agrees in his article *Emotion, Memory and the Brain* when he writes, “every occurrence of thought must necessarily be accompanied or caused by chemical changes in the brain.”¹⁷ In fact, most contemporary neuroscientists are convinced that consciousness is dependent upon a physical base and that brain states give rise to mental states.

Buddhism – Mind Versus Brain

Buddhist philosophy defines the mind as “that which is clear and knowing”¹⁸. Clear, or luminous, refers to the entity that is the mind. It is to this entity that an object appears to in order to be comprehended. Knowing refers to the function of the mind. Knowing relates to the explanation of mind as a continuous, “impermanent phenomena, changing moment by moment”¹⁹. It is continuous, which is how the belief in reincarnation is explained, and arises each moment with the completion of the previous moment - it is a flow of continuous awareness. Due to this continuous change of awareness from moment to moment, Buddhist philosophy characterizes the mind as impermanent, an awareness that is never static. “Knowing” is also described as the awareness of some object that appears

¹⁷ LeDoux, p. 66

¹⁸ Lati, p. 46 and 164

¹⁹ Lati, p. 11

to a mind²⁰. A mind is, in part, defined by the object it is aware of. It is thus understood that different minds are required for different objects of awareness. For example, the “sense consciousness” perceives the environment. The “eye consciousness” perceives what the eye detects. But it goes even further - the mind that cognizes a table is a different mind from that which cognizes a chair. This is because the objects being perceived require two different awarenesses²¹.

Thus, the mind is not concentrated in the brain, as believed in neuroscience, but all throughout the body. In an interview with Dr. Pema Dorji, he explained that the body is necessary for the activities of mind, consciousness, and sense. He said, “the body is very important for the mind because if you want anything from the mind, you can only understand it through the physical activities it commands of the body.”²² When we talk about the mind in Buddhism, we are not just talking about the intellectual faculty. The mind is responsible for sensations, movement, and homeostasis throughout the body as well as thought and consciousness. It is thought of as the energies that bring the body to life²³. But “energies” is still not quite the correct term for it. Buddhists posit a non-material mind. Consciousness does not have physical properties; it is said to exist within its own continuum and is simply dependent on the physical structures of the body to assert its power. His Holiness the Fourteenth Dalai Lama says that the mind “enjoys a status

²⁰ Lati, p. 46

²¹ Wangmo, 13 March 2009

²² Interview with Dr. Pema Dorji, 21 March 2009

²³ DeCharms, p. 187

separate from the material world. From the Buddhist perspective, the mental realm cannot be reduced to the world of matter, though it may depend upon that world to function”²⁴.

In Buddhism, the mind is described as having levels of subtlety. The coarsest mind is our physical perception of the world causing us to view our environment as conventional reality. The subtlest mind, or the clear light mind, is pure, unadulterated consciousness, allowing us to see the environment in its ultimate reality, where everything is empty of inherent existence. According to Buddhist philosophy, we reach subtler and subtler levels of consciousness during times such as sleep and death. As the mind grows subtler, it draws itself inwards and concentrates itself in the heart chakra, one of the seven centers of spiritual power located in the center of our chests²⁵. As the mind retreats it takes the “sense consciousnesses” with it. The mind is responsible for senses and if the mind is not all throughout the body during the manifestation of subtler levels the awareness of the senses do not occur. “That is why,” says Dr. Pema Dorji, “when you open your eye in your sleep, you cannot see anything. While you sleep you cannot hear or smell either. All the sense consciousnesses that reside in the sense organs when alert are absorbed within the main consciousness in the chest.”

When we talk about ourselves or when someone addresses us, we do not point to our heads and say “Who, me?” We always point to our chests, to our heart chakras, the

²⁴ DeCharms, p. 153

²⁵ Wangmo, 13 March 2009

center of our being. Buddhist philosophy would attribute this action to a subconscious knowledge that this is where our mind resides²⁶.

But what of the brain? Buddhist philosophy certainly cannot simply disregard what has been proven about the contribution of the brain to cognition. Dr. Pema Dorji described the brain as just another physical organ. Its job is to receive information through sensory organs, process it and send messages to the main consciousness. The main consciousness decides how to feel about the information and then react to it. He explained that perception occurred in a very systematic fashion and all sensory systems were necessary for complete awareness. For example, if one were to close their ears and play music, there is no other sensory organ to discern the quality of the music. Only the ears can decide if the music is pleasant or not by sending the information to the brain to be processed. The brain then, in turn, sends in to the main consciousness for an opinion. And thus, only the ear consciousness can indirectly decide if the music is attractive or not. Same with seeing and smelling; only those respective sensory consciousnesses can send their sensory information through the brain to the main consciousness to decide how one feels about a stimulus. “And so,” Dr. Pema Dorji went on, “Tibetan medicine does not go into such detail as Western medicine does. We do not attribute such significance to each individual cell and molecule, as that is only a *part* of the system of perception.”

To explain the relationship between the mind and the brain as described by Tibetan medicine and philosophy, Dr. Pema Dorji used the metaphor of an electric wire. The

²⁶ Palmo, p. 44

physical wire itself produces no electrical current – it is just the conduit for the energy that is electricity to travel along. In this metaphor, the brain, as well as all physical structures of the body, is the physical wire. It does not produce energy of its own but it provides the connections and physical matter for the energy, or mind, to travel along. When asked to explain what, then, *is* the electrical current that can be found in the brain with each firing of synapses, Dr. Pema Dorji responded that the firing of synapses *is* the mind. The chemicals released and the current present in the brain is not in itself the mind, but the mind is there, traveling along with the physical and energetic aspects of the brain and body. The mind, according to Tibetan medicine and philosophy, travels along the connections made by the physical matter of the body by riding *rLung*, or wind. He described the relationship of the mind and *rLung* as a blind horse with a legless rider. The blind horse, in this situation, is the *rLung*. The horse can run, but it cannot see and thus has no direction. The rider can see, but it cannot travel. The two need each other to function – the mind gives the direction while the *rLung* carries the mind according to its wishes. In this way, the mind controls the body by firing itself through the connections in the brain and body.

If it is eventually proven that the mind concentrates itself in the chest and not the head, science must then reevaluate the significance of *brain death*. As the mind draws itself into the heart chakra as one nears death, then the mind drains itself from the brain and, if Buddhist philosophy has it right, one becomes brain dead but they still possess their consciousness. Would science then be “pulling the plug” too early? In fact, there are many known cases of highly experienced meditators entering the meditative state near the

time of death and concentrating their mind in their heart chakra. After science declares them dead, there remains a heat in the chest. The body does not decompose; it simply remains in this subtle consciousness. When the heat ceases, it is an indication that the consciousness has finally left the body and the person is completely dead. The longest known case of a practitioner remaining in this state is seventeen days²⁷. Very little is known about what is occurring in the brain and body when a practitioner is in this state, but further study on these people could lead to a better understanding of mind and consciousness.

The Problem – Observing the Mind

These two views of mind, from a spiritual and scientific point of view, differ on the fundamental definition of a mind. Buddhist philosophers are convinced that mental cognition is separate from the physical world. The neuroscience community is not so sure, believing that at some point, the mind will be described biologically. However, deciding which view, if either is plausible and acceptable by both communities, requires intense study and scrutiny. Unfortunately, the only form of study the scientific community is willing to accept is scientific and, as stated earlier, introspection is difficult to study objectively. In an interview with Geshe Kunjo Wangdu-la made a good point when he said “scientists rely on external tools like microscopes to help understand theories. Buddhists use meditation and clairvoyance as their tools. It is necessary to rely on their respective tools to understand the explanations of each view.”

²⁷Wangmo, 27 March 2009

According to Buddhism, consciousness is independent from the body and thus, one should be able to find it within themselves through meditation and introspection²⁸. It is believed that “the best instrument for investigating the mind is the mind”²⁹. Neuroscience disagrees saying that “conducting an investigation with the very instrument being investigated makes both the definition of the problem and the approach to a solution especially difficult”³⁰.

Even if science *wanted* to reconsider the mind as a separate entity from the brain there would be many obstacles in designing studies to observe introspection. For one, Western science cannot seem to agree upon how to define the key terms regarding the mind. There is no widely accepted scientific definition of what is consciousness or awareness and certainly no accepted definition of a mind³¹. Secondly, at this point, the mind is only observable to its owner³². There exists no procedure with which to discern another’s inner thoughts. However, some scientists, such as Antonio Damasio, are optimistic and believe that, despite the challenge, the mind will one day be identified as biological and described in terms of both biological and mental processes. Many Buddhist philosophers, such as the late Venerable Lobsang Gyatso, criticized the scientific community in their quest to locate the mind as being too focused on the mental capacities

²⁸ Interview with Dr. Raison, 26 June 2009

²⁹ Begley, p. 239

³⁰ Damasio, p. 4

³¹ Pauen, p. 47

³² Damasio, p. 4

of the brain and not focused enough on introspection. “You will never find it in the brain!” he said, “it is a matter of experiencing it”³³.

The Self

Of the few areas that Buddhist philosophy and neuroscience completely agree regarding consciousness the idea of the self is the most substantial. Both disciplines agree that the self is a function of consciousness that generates a sense of ownership for one’s perceptions. To a conscious organism, the self seems to be of most importance. It is one’s identity that gives us the sense of “this is me.” Both disciplines also agree that the self is not substantial, it cannot be found within the scientific brain or the spiritual mind. The sense of self is unnecessary for an organism to function. The Buddha even believed that “abandoning the sense of self would free people from attachments that lead to craving and suffering³⁴.” Buddhists have attempted through meditation and logical reasoning to demonstrate the lack of any substantial self. Neuroscience, too, has attempted to prove through mechanistic analysis and theoretical models that there is no need for a “little self behind the steering wheel” guiding the brain³⁵. Neuroscience claims there is no need for a belief in self, that there is only a process taking place which is our individual experience³⁶.

³³ DeCharms, p. 39

³⁴ Begley, p. 72

³⁵ Interview with Dr. Raison, 26 June 2009

³⁶ DeCharms, p. 229

Buddhist Philosophy

We normally think of the self as a “very solid, independent phenomena that is able to set itself up from its own side”³⁷. This is to say that our sense of self feels very real, permanent, and inherently existent within ourselves. In an interview with Gen Gyatso-la he described the self as having an “appearance of inherent existence.” However, Buddhist philosophy defines self as an absence of a permanent, part-less, independent self. It is not self-sufficient or substantially existent. In essence, we are selfless. The self is not permanent because our bodies and our minds change from moment to moment. We are in a constant state of change, especially at the atomic level (to use scientific support), where the atoms that make up all matter are in constant motion. Thus, a person and the parts of that person are in a continual process of alteration³⁸. The self is dependent on its parts because if it really were an independent object, then it would not need the mind or the body to exist³⁹. But, when one looks for an independent self within one’s consciousness, one finds nothing. Such an entity cannot be found, isolated, and be called the “self” just like a particular section of a table cannot be designated “table” on its own. Finally, the self is dependent on other beings because in order to have a separate identity, it needs another category of “others” to compare itself too. Without other “selves” around to distinguish our own self, we would cease to be separate.

³⁷ Gyatso, p. 70

³⁸ Gyatso, p. 80

³⁹ Gyatso, p. 68

However, the schools of Buddhism disagree on how, then, the self exists. Some schools say that the self does in some way reside in a part of the mental consciousness. Another discipline says that the only self that exists does so because of convention. They say that no self can be found anywhere except that it is designated, on the basis of its parts, by the conceptual mind⁴⁰.

Neuroscience

Neuroscience would agree more with this second idea – that no self can be found anywhere. Current thinking would say that the activity of the brain gives rise to mind. In the scientific community, it has been hypothesized that neurons active during any given moment of consciousness are dispersed throughout the brain rather than positioned in a localized brain structure. Thus, documenting consciousness in the brain is a complex and tricky ambition. So, to study consciousness objectively, neuroscience must identify the smallest unit of consciousness in order to trace such a unit. In neuroscience, it is thought that the sense of self is the smallest form of consciousness. Both Buddhist philosophy and neuroscience agree that there is a self that experiences and feels separate and unique from others, or “ipseity,” and a “narrative” self that makes moral judgments, feels emotion, anticipates the future and remembers the past. Of these two selves, ipseity is thought to be the simplest, because the narrative self is dependent upon it⁴¹.

Buddhist practitioners use meditation to observe the mind. One type of meditation, called Open Presence meditation, is meant to help the practitioner gain “an accurate

⁴⁰ Wangmo, 13 March 2009

⁴¹ Lutz, p. 65-66

understanding of the nature of one's identity and the nature of objects in the world", or cultivate the Buddhist ideal of "wisdom"⁴². Part of the meditation involves focusing the mind at the object at hand as well as surveying the mind itself as it watches the object. The object of meditation becomes obsolete, or objectless, as the goal of this meditation is just to observe the mind. During an interview with Hedwig Bakker, a meditation instructor at Tushita Meditation Center, she explained that in order to look into the mind during a mediation such as Open Presence, one must first calm the mind. She explained that a "loud" mind would just be distracting and the true nature of the mind would be buried.

In Open Presence meditation, one goal is to quiet the narrative self, which, in humans, is manifested by thinking in language (thus contributing to a "loud" mind), in favor of emphasizing ipseity. The point of the meditation is for the meditator to then realize that this particular self is in fact, not separate and unique from others, but is dependent upon others for its imputed existence. But, in scientific studies, an Open Presence meditator can be monitored to find "neural correlates of the most basic type of coherent states that we call consciousness"⁴³.

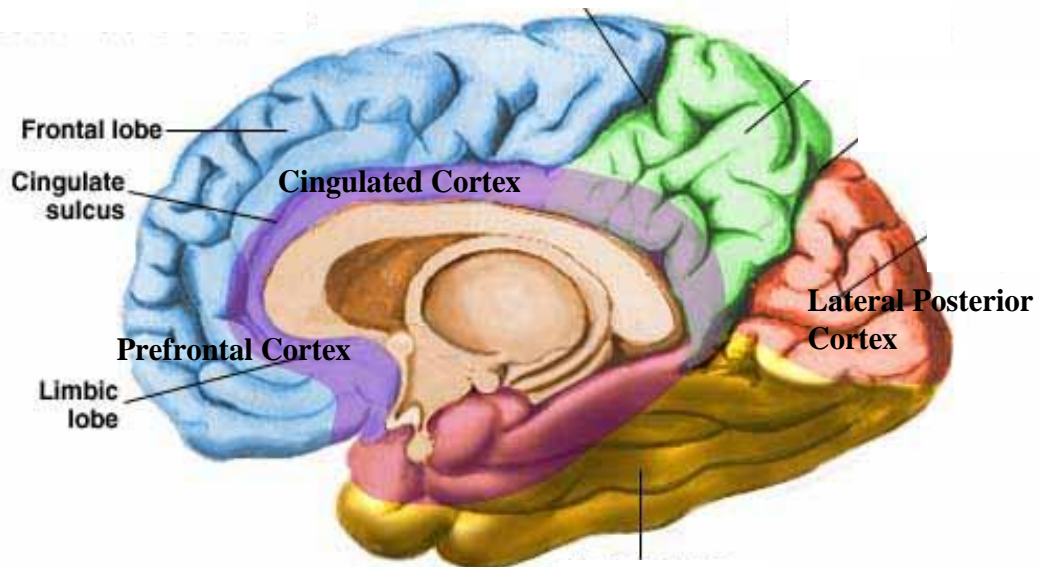
The significance of studying Open Presence meditation lies in isolating the "self" to document consciousness. In his 2004 meditation study, Antoine Lutz claims that "various studies of brain imaging have found consistent activation of particular areas of the brain during rest when one's eyes are closed, during visual fixation and the passive viewing of

⁴² Lutz, p. 34

⁴³ Lutz, p. 65-66

visual stimuli.” These findings suggest that these areas are necessary for simple consciousness⁴⁴. Images indicated that:

...the posterior part of this network (posterior cingulated cortex, precuneus and some lateral posterior cortices) are important for the continuous gathering of information about the environment around us and possibly within us, whereas the anterior part (ventro and dorsal ventral prefrontal cortices) are important for the ongoing association between sensory, emotional, and cognitive processes that participate in spontaneous self-referential or introspectively oriented mental activity”⁴⁵.



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These brain functions relate specifically to the development of the self. The self “decides” how to feel about certain stimuli gathered from the environment using these structures. However, even though this self plays a role in introspection, neuroscientists would say that it is unnecessary to perception and is not needed for normal functioning.

⁴⁴ Lutz, p. 72

⁴⁵ Lutz, p. 73

⁴⁶ http://thebrain.mcgill.ca/flash/a/a_06/a_06_cr/a_06_cr_mou/a_06_cr_mou_1a.jpg

Emotion

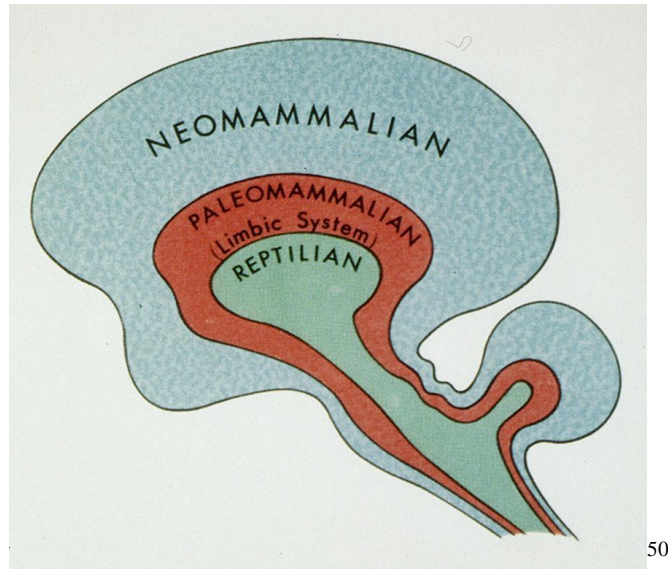
In general, when we attempt to investigate our mind through introspection, we find that it tends to be overrun with discursive thoughts or feelings. Feelings can be discussed at the physical level, as sensations with neural correlates, but when we try to understand feelings in terms of mental consciousness the issue becomes increasingly difficult. Like all forms of consciousness discussed so far, there must be some way that emotional consciousness connects with the nervous system of the body. But we must also account for deeper levels of feelings, or tones of experience⁴⁷. Neuroscience and Buddhist philosophy agree, once again, that emotion and cognition cannot be separated⁴⁸.

Dr. Raison spoke of emotions as a mammalian characteristic. He says that reptiles do not really have emotions because they have less limbic areas (the limbic system will be discussed below) and higher brain structures. The neocortex found in mammals is responsible for higher level thinking and emotions. Only in organisms that possess sufficiently advanced neural mechanisms does conscious emotion accompany bodily responses. Thus, consciousness is a prerequisite to subjective emotional states⁴⁹.

⁴⁷ DeCharms, p. 162.

⁴⁸ DeCharms, p. 232

⁴⁹ LeDoux, p. 70



However, theories on emotion and how it relates to consciousness vary widely. Some researchers agree with Dr. Raison that cognition is necessary for emotional experience. Some contemplate the opposite, questioning whether cognition is necessary for emotional processing. Others believe that emotional processing is a type of cognitive processing and is completely the work of the brain⁵¹.

Neuroscience

One of the first theories of emotions is the James-Lange theory. The theory proposes “we experience emotion *in response to* physiological changes in our body. For

⁵⁰ The Triune Brain,
http://1.bp.blogspot.com/_WitYx1Fj1Ec/SZQik5eDRxI/AAAAAAAAAPM/ZRoRwRbpEsc/s400/+A+Triune+Brain.jpg

This diagram represents the general brain area present in different species. The reptilian brain contains only enough brain area for basic functioning and survival on instincts. The paleomammalian brain can be found in lower mammals and it contains brain space responsible for instincts as well as the limbic system, needed for primitive emotional drives such as anger, fear, and desire for food and mates. The neomammalian brain can be found only in primates. It contains the neocortex needed for cognition and higher level thinking.

⁵¹ LeDoux, p. 66

example, we feel sad because we cry instead of cry because we are sad”⁵². This model suggests that our sensory systems send information about the environment to the brain and our brain, in turn, sends signals out to the body changing breathing, heart rate, etc. The sensory systems then react to the changes ordered by the brain and the sensation felt by the body puts a name to the emotion⁵³. The physiological changes *are* the emotion. While this theory seems a bit backwards, and in fact, it received a lot of criticism, a current theory supports it somewhat. In studies on fear by Arthur Craig, he posited that fear is more in one’s body than in one’s mind. He claims that once the interoceptive signals such as a racing heart and sweating palms are dampened, the fear itself is dampened⁵⁴. In fact, this is a method employed in meditation used to reduce stress.

A later theory that came after James-Lange is the Cannon-Bard theory of emotion. This theory proposed “emotional experience can occur independently of emotional expression.” The Cannon-Bard theory argued that “emotions can be experienced even if physiological changes cannot be sensed” and also that “the same physiological changes can occur for many different emotions”⁵⁵. This model suggests that sensory input is received by the cerebral cortex, which in turn activates certain changes in the body. The emotion is named when signals reach and activate a structure called the thalamus in the brain⁵⁶.

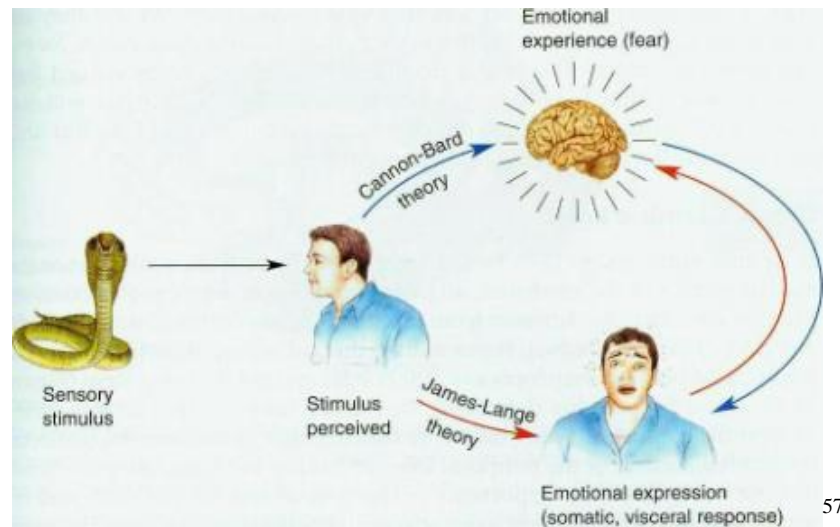
⁵² Bear, p. 564

⁵³ Bear, p. 565

⁵⁴ Blakeslee, p. 51

⁵⁵ Bear, p. 566

⁵⁶ Bear, p. 566



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An appropriate pattern of stimulation of the thalamus will thus characterize the emotion.

Both theories are still being debated.

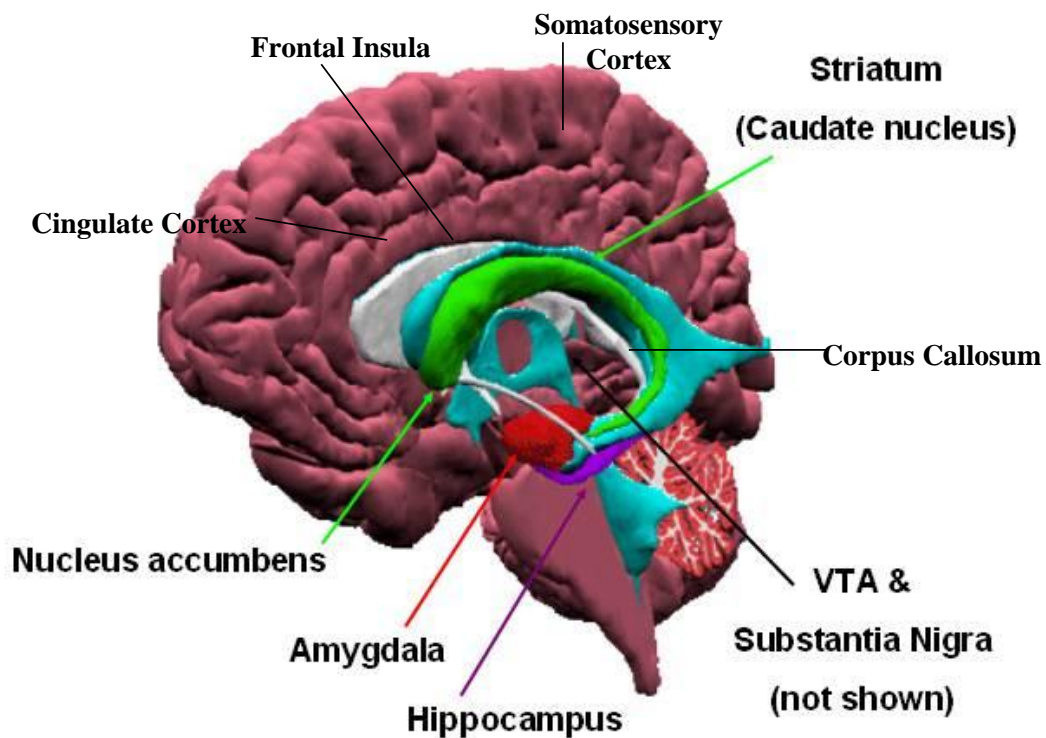
Currently, scientists say that many of our emotions to certain circumstances are shaped by our previous interactions with them, a concept called “emotional memory.” Dr. Raison says that emotions are sometimes generated by sensory information from the outside world and they are sometimes self-generated - they can happen just by thinking internally. Neuroscience currently favors the concept that emotions are colored “subcortically” by the influence of the limbic system’s centers on the cerebral cortex and by memories of one’s experiences⁵⁸. The limbic system is made up of the cortex surrounding the corpus callosum, the cingulate cortex, and the cortex on the medial surface of the temporal lobe, including the hippocampus, and the hypothalamus⁵⁹. The amygdala also plays a central role in emotion. This brain structure generates and processes

⁵⁷ The James-Lange versus Cannon-Bard Theory of Emotion diagram, <http://scienceblogs.com/mixingmemory/ACC.JPG>

⁵⁸ Roth, p. 37 and Interview with Dr. Raison

⁵⁹ Bear, p. 569

unconscious emotional states and experiences that usually stem from stimuli that are frightening. Some researches believe that the amygdala is also involved in non-fear-related emotions, such as curiosity. The mesolimbic system alerts the other brain centers when a positive or desirable circumstance occurs. It is responsible for the emotions of desire, satisfaction and contentment. The mesolimbic system consists of the nucleus accumbens and the ventral tegmental area⁶⁰.



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But most importantly, after a physical sensation or a circumstance occurs in the environment and the brain has decided what emotion should be attributed to such a circumstance, the two occurrences are paired together in the right frontal insula. This region, and also the anterior cingulated cortex, is a crucial center of emotional cognition

⁶⁰ Roth, p. 38

⁶¹ <http://www.learningdiscoveries.com.au/BrainSubdivision.gif>

and it is also necessary for acknowledging feelings that arise from the body. A study done by Hugo Critchley showed that “people who are more aware of their heartbeats are also more emotionally astute.” This makes sense, as both types of cognition occur in the same regions of the brain⁶². The right frontal insula is also active when one feels all the typical human emotions, such as love, hate, disgust, gratitude, etc. It is active when one experiences physical pain, the psychic “pain” in a situation such as rejection, or when one “feels” another person’s physical or psychic pain⁶³. This means that when one witnesses or imagines another person’s emotions or feelings, they activate the same brain regions they would if they themselves were experiencing those same emotions and feelings. It also triggers the same autonomic and somatic responses⁶⁴. “It’s like a mirror,” said Dr. Raison, “your brain acts out another’s pain. It creates a feeling of pain that you identify with because it is virtually a painful situation for yourself.” The right frontal insula is responsible for “the emotional me.” It is essentially the foundation for emotional intelligence.

Buddhism

This unique emotion that the right frontal insula creates is compassion. Geshe Kelsang Damdul-la defined compassion as “empathy for other beings.” Dr. Pema Dorji explained the feeling of compassion as uneasiness in the heart that leads a person to wish to do something good. He explained that one could only have compassion by viewing or

⁶² Blakeslee, p. 46

⁶³ Blakeslee, p. 50

⁶⁴ Lutz, p. 103-104

hearing the sufferings of others, it does not occur spontaneously. He said the information of suffering could only be received through the sensory organs, which form an opinion about the suffering via the main consciousness. Compassion, as well as other deep feelings, is dependent on a developed consciousness.

Compassion is a highly regarded emotion in Buddhism and is a required trait in a person seeking enlightenment. In Buddhism, one must acknowledge that all sentient beings are the same and no one being is more important than any other. So, one must learn to put others first so as not to think too strongly of oneself. To begin this, practitioners must cultivate compassion and try to feel others' pain as their own. The goal is to develop a wish to actively free all sentient beings from their suffering⁶⁵.

To cultivate compassion, Buddhist practitioners meditate on the emotion in many ways. One practice is called Non-Referential Compassion where one "aims to produce a specific emotional state, namely, an intense feeling of loving-kindness"⁶⁶. The meditation involves a particular mental event to cultivate the emotion of compassion, which eventually leads to objectless awareness. As objectless awareness is part of the goal, it can be considered a variation of Open Presence. But both Open Presence and a permeating feeling of compassion must occur together in order for the meditation to be successful⁶⁷. The goal of the meditation is to generate a state of unconditional feeling of loving-kindness and compassion.

⁶⁵ Wangmo, 27 March 2009

⁶⁶ Lutz, p. 45

⁶⁷ Lutz, p. 46

Researchers used this meditative practice to trace the activity of the emotional structures of the brain. During the compassion meditation study, the experimenters found activation in brain areas thought to be responsible for controlling one's feeling states, planning of movements and positive emotions. These areas include the striatum, the right frontal insula, the somatosensory cortex, and the anterior cingulate cortex. Not surprisingly, maternal and romantic love have been linked to the activation of the reward and attachment pathways, such as the substantia nigra and the striatum, which are included in this network (see image above)⁶⁸. They also found supporting data that these same areas, notably the right frontal insula and the anterior cingulate cortex (as stated above), are responsible for empathy. Dr. Raison raised the question of why people practicing compassion meditation don't fall into a state of depression after spending so much time *trying* to feel others' pain. He believes that this meditation might activate a shadow of the other person's pain and not the full extent of it. He believes that if practitioners were to feel the full extent of the pain, the meditation findings might be different. In fact, quite the opposite occurs in practitioners. With meditation practice, they report an increase in happiness (which will be discussed in detail later). Dr. Pema Dorji explained the reason for this phenomenon clearly and without speculation: happiness results from love, which results from compassion, which results from suffering. And so, through the sensory perception of suffering one can cultivate compassion, increasing their capacity for love, which naturally leads to happiness.

⁶⁸ Lutz, p. 102

Furthermore, very experienced meditators had greater brain activities in the areas responsible for positive emotions than did novices. With regards to meditation, this finding suggests that emotional and empathic processes can be trained and accompanied by traceable neural changes in the brain. In other words, positive feelings such as compassion and loving-kindness can be practiced and strengthened through mental exercise⁶⁹.

Attention and Concentration

Attention is an important feature of consciousness. “Stimuli that do not register in our attention hardly exist for us, even if they influence how we perceive, feel, or react⁷⁰.” Our brains need to utilize attention in order to pick out what is important enough to process with its limited processing power. For this reason, some scientists believe that attention and the brain mechanisms for conscious awareness are linked.

As we concentrate on one single object, the more other objects and stimuli will become increasingly insignificant to our consciousness. For example, when reading a good book on the subway, it is easy to tune out the background noise. Or when looking for a specific familiar face in a crowd, all other faces simply pass through our minds unnoticed. Our brains are constantly perceiving and processing large amounts of information that never reach our consciousness. Attention and actual consciousness occur when the brain meets objects or situations that it deems important or new. The brain uses memory systems

⁶⁹ Lutz, p. 103-104

⁷⁰ Roth, p. 34

to help decide what is important and must be attended to or known and can be disregarded⁷¹.

Neuroscience

Science explains attention through neural competition. When one looks at a certain stimulus, neurons in the brain compete so that the neurons responding to the stimulus are stronger than the neurons responding to everything else. “Attending to an object physically turns down activity in neurons other than those focusing on the object.”⁷²

But why can we not simply pay attention to everything at once? It is thought that the brain cannot process all the incoming sensory information at the same time. And so, attention is selective – it guides consciousness to concentrate on certain stimuli. It works like a spotlight, moving to highlight objects of particular interest or importance⁷³.

There is little scientific information to be found on attention and concentration in the brain. Studies are still currently trying to understand *how* attention works in the brain. Some research links attention to an increase in the firing rate of neurons in specific areas of the brain depending on what *sense* is concentrating. More current studies also include the significance of large numbers of neurons synchronizing their activity⁷⁴.

Most studies focus on the vision and how visual stimuli effects and draws attention. When something catches our attention, we reflexively refocus our eyes on the object of interest. Research shows that a stimulus induces a greater response in the parietal cortex

⁷¹ Roth, p. 35

⁷² Begley, p. 157

⁷³ Bear, p. 649

⁷⁴ Engel, p. 48

and other cortical areas commonly thought of as part of the attention network if an eye movement occurs. There seems to be a close connection between eye movements and attention. Recent research suggests that the brain areas responsible for moving the eyes to specific stimuli might also be partly responsible in guiding attention⁷⁵.

However, once science has that sufficiently worked out how attention is processed in the brain it will have to move on to more difficult questions such as *what* is directing attention?

Buddhist Philosophy

In Buddhism concentration is one of the six perfections, the six traits needed to be cultivated in order to achieve bodhicitta, which is the wish for all sentient beings to be free from suffering. Bodhicitta is required of anyone on the quest for enlightenment. Concentration is needed for the sustained meditation that leads one to realize the ultimate reality of the universe, emptiness in inherent existence⁷⁶.

Dr. Pema Dorji said, “concentration is to channel the mind.” In order to channel the mind, one must be in control of their *rLung*, the wind upon which the mind rides. If a person cannot concentrate, talks a lot, and is always fidgety a Tibetan medical doctor would diagnose him with too much *rLung*, too much wind in their body. Their mind is blown about their body too quickly and too uncontrolled. The remedy is meditation. The person must quiet their mind and stabilize it with concentration in order to return their

⁷⁵ Bear, p. 657

⁷⁶ Wangmo, 27 March 2009

body, speech, and mind to normal. When the mind controls the *rLung* one has very good concentration because one is in control of the movement of the mind.

One type of meditation used to cultivate concentration is Focused Attention meditation. The goal of this meditation is to create a mental state in which the mind is “unwaveringly and clearly focused on a single object”⁷⁷. It involves finding a balance between hypoarousal and excitation to maintain enough clarity or awareness throughout the meditative session. The advanced stage of this practice is commonly referred to as “single-pointed concentration.”⁷⁸ However, among science circles it is said that the typical human brain is incapable of sustaining intense attention for more than a few seconds before wandering into distraction⁷⁹.

In studies using this meditative practice, researchers found that during increased intensity of attention the brain showed an increase in activity in the orbitofrontal cortex, fronto-parietal cortices, and thalamus⁸⁰. Experienced meditators showed more activation in these areas, especially in the frontal-parietal network, indicating a possible neural correlate for sustained attention and the possibility that attention could be affected by mental training⁸¹.

What Came First, the Brain or the Mind?

There are many theories within science that support or question the idea that the mind is material. Those that attempt to describe mind as intangible or provide evidence

⁷⁷ Lutz, p. 32

⁷⁸ Interview with Geshe Kelsang Damdul-la, 11 March 2009

⁷⁹ Begley, p. 214

⁸⁰ Lutz, p. 99

⁸¹ Lutz. P. 101

supporting a non-material mind are highly relevant to the Buddhist philosophical stance.

Those that argue for a material mind shed light on many aspects of brain processing but fail to fully explain the occurrence of subjective consciousness.

Support for a Material Mind

One hypothesis is put forth by Francis Crick of the Salk Institute for Biological Studies and Christof Koch of the California Institute of Technology. They suggest that consciousness may arise from specific oscillations in the cerebral cortex. These oscillations become synchronized as neurons fire 40 times per second. The scientists believe the phenomenon might explain how different aspects of a perceived object (such as shape and location) that are processed in different areas of the brain are unified into a complete whole. In other words, this hypothesis could describe how information is integrated in the brain. However, this idea does not explain how synchronized oscillations give rise to a subjective experience regardless of how much integration has occurred⁸².

A similar hypothesis by philosopher Daniel C. Dennett suggested that many independent processes in the brain merge to produce a coherent response to a perceived event⁸³. This theory might explain how we can speak about our internal states but, like Crick and Koch's theory, it still does not explain subjective experiences⁸⁴.

Damasio puts forth an argument he calls "the movie-in-the-brain." He describes consciousness in the brain as if it were a movie – each sensory experience is a snapshot taken by the brain and processed. The movie-in-the-brain is "a metaphor for the integrated

⁸² Chalmers, p. 94

⁸³ Interview with Dr. Raison, 26 June 2009

⁸⁴ Chalmers, p. 94

and unified composite of diverse sensory images – visual, auditory, tactile, olfactory, and others – that constitute the multimedia show we call mind.”⁸⁵ Consciousness, he suggests, comes from the sense of self in the act of knowing emerging within the movie. He claims that “self-awareness is actually part of the movie and thus creates, within the same frame of each snapshot, the ‘seen’ and the ‘seer,’ the ‘thought’ and the ‘thinker.’” He agrees that no self is needed as there is no separate spectator for the movie-in-the-brain. He says that the “objective brain processes merge with the subjectivity of the conscious mind from sensory experience.” Because the senses come from the physical body and are imaged to one’s consciousness as feelings, the sense of self in the act of knowing presents itself as a kind of feeling – “the feeling of what happens in an organism caught in the act of interacting with an object.”⁸⁶ However, as of yet, little has been pursued and proven regarding Damasio’s theory within the scientific community.

Dissent Against a Material Mind

To solve this problem of explaining a subjective experience within our brain, some believe new discoveries must be made in neuroscience or even quantum mechanics. As David J. Chalmers, Ph.D. in philosophy and cognitive science and author of *The Puzzle* points out, “in the 19th century it turned out that electromagnetic phenomena could not be explained in terms of previously known principles. As a consequence, scientists introduced electromagnetic charge as a new fundamental entity and studied the associated fundamental

⁸⁵ Talan, p. 40

⁸⁶ Damasio, p. 9

laws.” Similar reasoning may have to be applied to consciousness. If existing theories cannot explain it, then something new may be required to solve the puzzle⁸⁷.

A hypothesis put forth by Stuart R. Hameroff of the University of Arizona and Roger Penrose of the University of Oxford suggests that consciousness arises from quantum-physical processes taking place in microtubules (protein structures inside neurons). While this novel hypothesis may eventually lead to an explanation of how the brain makes decisions it still cannot explain how these processes might give rise to consciousness⁸⁸.

Other Evidence for the Two Views of Mind

Beyond hypothesis, there are many findings and ideas that forces one to question their position on each stance. There are two famous thought experiments that bring to question if subjective conscious experience can actually occur solely in the brain.

“Consider a neurobiologist who knows everything about human color perception.

However, he has never seen color himself. Does his perfect knowledge of color perception allow him to know what it is like to see color? No; if he became able to see color for the first time, he would experience something completely new.”⁸⁹ This scenario illustrates that neurobiological knowledge alone cannot provide us with a subjective conscious experience, meaning that an explanation of consciousness as a function of the brain is unlikely.

Another thought experiment was brought forth by Thomas Nagel a philosophy professor of New York University in the 1970s. “Assume again that consciousness is nothing more

⁸⁷ Chalmers, p. 96

⁸⁸ Chalmers, p. 95

⁸⁹ Pauen, p. 44

than a process in the brain. Also assume that we know absolutely everything about the physical process in the brains of bats. Would we then have a clear sense of bat's consciousness? Would we be able to know 'what it's like' to be a bat?'⁹⁰ In both of these examples we can accept that certain neuronal processes are linked to specific mental processes. However, we cannot understand why those processes are present and also what would happen to subjective experience if those neuronal processes were to change.

Dr. Raison put forth an argument saying that studies have found that the brain knows and starts to respond to stimuli faster than thought. One experiment shows that the brain begins to respond to a gun before it's even seen. This finding provides support for the brain coming before the mind – that the activity of the brain gives rise to the mind. The brain starts responding before the consciousness knows what is going on. However, why would the brain start responding to a harmful stimulus unless it *subconsciously* knows that it is a harmful stimulus? It is situations like this that have scientists doubting their convictions regarding the mind.

Other evidence that keeps scientists guessing about the nature of the mind is plasticity in the brain. Neuroplasticity is the ability of the brain to change its neural structure and function with experience. In studies of neuroplasticity, experimenters seek to determine if mental training could affect the body in a way that would have a significant impact on brain function and physical health. There is a bi-directional communication between the brain and the periphery nervous system along the autonomic nervous system,

⁹⁰ Pauen, p. 45

the endocrine system, and the immune system. Bi-directional communications along these routes raise the possibility that changes in the brain due to meditation may very well influence aspects of physical health⁹¹. Homeostasis is the balance needed within the body to be considered healthy. When homeostasis is disturbed the immune response is activated and cellular and behavioral responses occur to restore a steady state. Science is just beginning to understand the interdependence of the brain and the immune system and how they influence each other⁹². In one study in 2003, the experimenters found that after 8 weeks of meditation training, participants exhibited a significantly greater antibody response to the influenza vaccine compared to a control group. This suggests some association between the extent to which neural and immune changes are due to meditation rehearsal⁹³.

The stress response is critical to necessary physiological and behavioral changes needed in threatening situations. For example, if a bear was chasing us our brains' stress response would be responsible for enhancing focused attention and the fight-or-flight response while inhibiting hunger and the drives for sex and sleep. However, this stress response must be regulated or disorders will arise. It is believed that stress intensifies inflammatory illnesses and that relaxation improves them⁹⁴. A compassion meditation study by T.W.W. Pace et al. at Emory University provides supporting evidence for belief. This study published in 2008 taught compassion meditation to a group of college Freshman

⁹¹ Lutz, p. 60-61

⁹² Sternberg, p. 82

⁹³ Lutz, p. 62

⁹⁴ Sternberg, p. 88

over 6 weeks and tested their stress levels compared to a control group. The experimenters found “significant correlations between the amount of meditation practice and innate immune and behavioral responses to psychosocial stress”⁹⁵. The interactions of the stress and immune systems have many hormonal responses in common. This could explain how conscious attempts to control stress could affect immune responses⁹⁶.

Similarly, one can induce other beneficial changes in the brain with mental training designed to cultivate positive qualities such as equanimity and loving-kindness, as discussed earlier. Lutz et al. observed that a two-month course in mindfulness-based stress reduction can result in changes in prefrontal brain activity that is already known to have positive mental and behavioral affects⁹⁷.

Richard Davidson believed in the 1970s that by exploiting the brain’s neuroplasticity, one could employ meditation and other forms of mental training to raise one’s happiness “set point.” A happiness set point is “an emotional magnet that, whether you win the lottery or file for bankruptcy...pulls you back to your baseline level of happiness”⁹⁸. Using compassion meditation, Davidson found that when activity in the left prefrontal cortex is higher than in the right, people feel alert, energized, and have a greater sense of well-being. He also found that in highly experienced meditators there is greater activity in the left prefrontal cortex, which implies that happiness is an emotion we can cultivate through mental training that produces measurable changes in the brain⁹⁹. Other

⁹⁵ Pace, p. 9

⁹⁶ Sternburg, p. 88

⁹⁷ Lutz, p. 58

⁹⁸ Begley, p. 221

⁹⁹ Begley, p. 229

studies showed that experienced meditators are calmer in their response to daily stress and perform better at tasks that require focused attention. Thus, meditation can alter emotions and cause lasting changes in the function of the brain¹⁰⁰.

Finally, another scenario that has scientists questioning their theories of mind is the split-brain operation. A split-brain operation is used in very extreme cases of epilepsy. In the operation, the corpus collosum, the mass of nerve tissues connecting the left and right hemispheres of the brain, is cut. The two hemispheres can then no longer communicate with one another. The result is that each side of the brain is left to its own devices and make their own decisions. For example, in the simple task of picking what to wear out of a closet, the left brain wants to wear a blue shirt and the right brain wants to wear a red shirt. The result is one hand reaching for the blue shirt and the other reaching for the red. The split-brain essentially causes a split-awareness.

Split-brain studies led to many findings about the brain. It was discovered that the two hemispheres control very different aspects of thought and action. The left brain is specialized in language and speech while the right dominates visual-motor tasks.¹⁰¹ Researchers also found that when presented with new information, people remember a lot of what they experience. However, when prompted, they also claim to remember things that were not actually part of the experience – this has to do with incorrect memory recall. “If a split-brain patient is given the same test, the left hemisphere is found to generate these

¹⁰⁰ Talan, p. 40

¹⁰¹ Gazzaniga, p. 27

false reports.” The right brain, on the other hand, gives a more accurate account.¹⁰² Both hemispheres can be viewed as conscious, however, the left brain’s consciousness seems to be *more* conscious than the right.¹⁰³

The split-brain scenario brings to question the “wire” upon which the mind travels on (as discussed above). The separate awareness highlights the functioning of each side of the brain and how it processes information. It supports the idea that the mind is the activity of the brain. However, could the cut corpus collosum prevent the mind as defined by Buddhist philosophy from completing its work?

Conclusion

I remember my drive to the airport with my mother in January 2009. I was on my way to India to learn about Buddhism and my mother and I found ourselves talking about what religions believe about death. I told her what I knew about the Buddhist view – that one’s consciousness leaves the body and enters another. But I also told her that that seemed ludicrous to me. After all, consciousness was no more than firing neurons along synaptic networks. I believed these synaptic networks were arranged in such a way to give rise to a thought when a particular pathway was stimulated. To me, human consciousness was no more than a more sophisticated form of animal instinct or reflex. I thought that one day, we would be so technologically advanced that we would be able to hook someone up to a machine and predict exactly what they would think due to electrical currents and

¹⁰² Gazzaniga, p. 29

¹⁰³ Gazzaniga, p. 31

networks in the brain. Even though this theory is still plausible in the scientific community, it is, I admit, a rather pessimistic view of consciousness.

However, over the course of my research, I have been encouraged to alter my former views. After reading countless books and articles on the scientific ideas of consciousness, even disregarding what I know about Buddhist philosophy, I have come to the conclusion that the brain alone *cannot* be responsible for consciousness. Mental processes cannot be (or cannot *yet* be) explained by the physical as there is no physical *thing* that is conscious in its own right. Non-conscious matter cannot come together to form consciousness as it has no attributes of consciousness to begin with.

I am further dissuaded from material consciousness because it seems that neuroscience cannot convince *itself* of it. I read many articles of scientists saying that science is not prepared to define “mind” and that there is something left to discover before a definition is even possible. Science attempts to explain consciousness in terms of what is already known of the brain and energy. As it has come to few verifiable conclusions, there must be something missing from the equation.

Much more research in this field must be done for science to continue theorizing. Scientists must figure out a way to study introspection objectively or simply adopt the tools of Buddhism and look within themselves to locate the mind.

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