

## Overview: A Rumor of Empathy in Neuroscience

A rumor is an unsubstantiated report. This course will pursue the rumor of empathy in neuroscience. The rumor is substantiated – empathy *LIVES* in neuroscience. But there are some conditions and qualifications. Connecting the dots between the mechanisms and triggers of neurotransmitters and the first person experience of a conversation for possibility in psychotherapy is complex.

Freud famously wrote of “somatic compliance.” The body “symbols forth” the conflict between drives inherent in the organism and the standards and morals of the community. The psychotherapist is relating to another human being, not a brain in a vat. Yet the question for both participants in the conversation is how does each relate to the embodiment of emotion and intelligence. The psychotherapist ignores the progress of empirical science, including neuroscience, at her or his peril. An “amygdala hijack” – previously known as a “panic attack” – is a response to a real or imagined boundary violation that puts the organism at risk. Obsessive compulsive behavior starts escalating as the neural network goes “into an endless loop” and does not find an exit point. Personality is probably not represented at the level of neural networks, yet patterns of reaction to events in the environment are encoded in the nervous system. Peter Kramer argued persuasively in *Listening to Prozac* (1992) that powerful psychotropic chemicals change one’s personality by changing one’s brain synapses. Let us not forget that a powerful agent for change at the neuronal level is the conversation called dynamic psychotherapy. Find out how these relate in this course.

We will spend approximately one week on each of the following topics, reading about thirty pages a week (not including pictures and diagrams). Except for the first two topics, we can take them in any order and the participants will get to select:

1. This is your mind on neuroscience – basic distinctions and facilities.
2. Philosophy of science: connecting levels of discourse between causes and intentions
3. Sperry on the split brain: the information is in the system: how to get at it
4. The neuroscience of trauma
5. MRI research: as when Galileo looked through the telescope, a whole new world opens
6. Mirror neurons: do they even exist, and if not, so what?
7. Action at a distance: the shared manifold hypothesis
8. The emotions: clues to deceit in politics, marriage, and marketing
9. Mindless neuroscience: my amygdala made me do it

10. Neurophenomenology: first person experience and what else there is

11. Disorders of empathy: on the spectrum and off it

### **Detailed Descriptions: A Rumor of Empathy in Neuroscience:**

Neuroscience provides compelling evidence that human beings are neurons “all the way down,” and without neurons working right, nothing else works right. Half a million years ago, the environment of evolutionary origin was one of groups of early hominids in communal living. Individuals with brains that had superior social skills were at an advantage and flourished, passing along this “social brain” to the offspring. The social brain had empathy and empathy-like abilities. Fast forward half a million years, and in 1991 the psychiatrist Peter Kramer, published, *Listening to Prozac*, in which both he and the patient authentically reported that the medication brought forth a new, brighter personality that had been implicitly present but inaccessible without the medication. Initially such blockbuster medications knocked the knees out from under all forms of talk therapy. However, other patients took the same medicine and felt compelled to hurt themselves or others. A few jumped from high places with tragic results, including major litigation against Big Pharma. So some argued that maybe it was premature to dispense with talk therapy after all. Nevertheless, the genie was out of the lamp.

This course will engage with the genie – and with the lamp – in the service of shedding light on the relationship between the neurons and the healing and recovery conversation which is dynamic psychotherapy. Freud famously said that “somatic compliance” was part of the process of symptom formation in hysteria – the body symbols forth the conflict between biological desires and social standards. The distinctions of “folk psychology” – distinctions such as belief, affect, want, intention, desire, volition, putting oneself in the other person’s shoes – are common sense. Children learn and use these distinctions from parents and teachers. The distinctions work. Folk psychological distinctions enable us to negotiate, cooperate, and get things done in community. How does the common sense distinction of “walking in another’s shoes” relate to the neuroscience of empathy?

There is no such thing as a brain – in isolation. Brains are embodied in human beings. Brain do not relate to people; people and people with brains related to people. Human beings function in a social context. Social contexts bring up babies and the babies’ brains to be human beings functioning in the community. Every human body without a neurological system. But what about science fiction scenarios such as brains in a vat?<sup>1</sup> Here the fMRI [functional magnetic resonance imaging] is starting to look a lot like a vat, which isolates the brain from its context except for afferent and efferent connections. Notwithstanding all the images and words of which the brain in a vat might be aware, it has no ability to refer because there is nothing intrinsically referential about such images

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<sup>1</sup> Hilary Putnam. (1981). “Brains in a vat.” In *Reason, Truth, and History*. Cambridge, UK: 1-21.

and words. The brain in the vat would have exactly the same limitations as your brain and mine and would be unaware of the discharging of its networks of neuron. The social community instructs any would-be consciousness as to the extra linguistic references between such words as “belief,” “desire,” and “empathy,” and do so outside the context of brains and neurology and vats.

No scientist believes that complex human beliefs, affects, intentions, volitions are separately represented at the level of neurons. At the level of neurons, chemical elements are transported across cellular membranes, based on the chemo-electrical potential of sodium ions, potassium, and acetylene triphosphate. Neurons that fire together are hard-wired together into neural networks that may form the neural correlates of consciousness (NCC). Acquired motor habits, memories, and adaptations to the environment are acquired and built as the nervous system generates connections at synapses. Computational models (pervasive in information technology) have been extended to neurology with impressive results. Messages and codes are translated and replicated in reproducing cognitive outputs. Results are being extended to the emotions as Paul Ekman’s facial action coding scheme is implemented in software to read the emotions. Such computational models have been productively applied to the operations of the brain and nervous systems, which forms the human biocomputer. However, the more complex functions of intentionality emerging from deterministic neural systems remains an area of intense inquiry.

1. Let’s learn some neuroscience: the language of neuroscience is significantly different than that of two persons have a conversation for possibility about the issues of family, relatedness, and community. The distance is vast between the mechanisms of neuroscience and the satisfaction of goals and purposes that make a human life satisfying. We measure the distance starting at the neural level.

Social neuroscience is about neural correlates of consciousness (NCC). For example, the NCC of fight-flight is the amygdala. In an “amygdala hijack,” one’s behavior is determined by the fight-flight response. The NCC of the frontal lobe is attention and executive function, and in attention deficit disorder, the frontal lobes hypothetically are *not* properly inhibiting the activation of attention to random irrelevant events in the environment. The NCC of other emotions is the limbic system. In terms of the subtlety of experiences encountered in psychotherapy, NCCs are like swatting a fly with a sledge hammer. Still, they can provide guidance at a high level.

The following is a list of basic distinctions in neural science with which we are going to engage: two opposing views have been advanced on the relationship between brain and behavior; the brain has distinct functional regions; cognitive functions are localized within the cerebral cortex; affective traits and aspects of personality are also anatomically localized; mental processes are represented in the brain by their elementary processing operations; the nervous systems has two classes of cells; glial cells are support cells; nerve cells are the main signaling units of the nervous system; nerve cells form

specific signaling networks that mediate specific behaviors; signaling is organized in the same way in all nerve cells; the input component produces graded local signals; the trigger component makes the decision to generate an action potential; the conductile component propagates in all-or-nothing action potential; the output component releases neurotransmitter; the transformation of the neural of the neural signal from sensory to motor is illustrated by the stretch reflex pathway; nerve cells differ most at the molecular level; nerve cells are able to convey unique information because they form specific networks; the modifiability of specific connections contributes to the adaptability of behavior.

Suggested Reading: Stephen M. Stahl. (2008). *Stahl's Essential Psychopharmacology: Neuroscientific Basis and Practical Applications*. Cambridge, UK: Cambridge University Press: 1-49.

2. What is your philosophy of science? In order to relate neural science and the level of human performance exhibited in dynamic psychotherapy, one needs to engage how the distinct levels of discourse – neurology and psychology – relate to one another. Can psychology be reduced to biology? Granted that a brain circuit is involved, can a psychological distinction such as “empathy” be reduced to a brain circuit? If such a reduction loses essential features of empathy, then how do such features emerge and take on a life of their own?

All of the above-cited neuroscience is about mechanisms – mechanical transport across cellular interfaces. The organism is optimally in a state of dynamic equilibrium with the environment with which exchanges with the environment are occurring. The purpose of the organism – to maintain such an equilibrium – is not obviously a specific part of the organism. For where does this purpose come? What is the design point that allows intentionality to emerge? Intentionality is the defining characteristic of consciousness, and, according to Freud, is also operates in the unconscious as demonstrated by slips of the tongue and other parapraxes. Darwinian evolution is based on an algorithm – variation and natural selection – but such an algorithm seems insufficient to account for a built-in design. Order and purpose emerge accidentally as a result of Darwin's dangerous idea; but once it gets going we have cooperation, joint attention, language, culture, and community.

The issue? “Paradigms of scientific replacement in the history of science are episodes such as the decline of phlogiston theory in response to the rise of Lavoisier's primitive atomic chemistry, the replacement (in principle) of Newtonian mechanics by Einstein-ian relativistic mechanics, and the rejection by educated opinion of theologically based accounts of biological origins with the ascendancy of broadly Darwinian accounts of evolution” (Dupré 1992: 150).

Suggested Reading: John Dupré. (1992). *The Disorder of Things: Metaphysical Foundations of the Disunity of Science*. Cambridge, MA: Harvard University Press: 147-167

3. Sperry's split brain neuroscience and what it has taught us. The cerebral commissure linking the left and right hemispheres of the brain is severed in extreme cases of epilepsy

to control the seizures. Now the scene changes to Sperry's psychology-physiology laboratory. "The information is available in the system." What does that mean? When the right brain was informed (via the left eye) of a word on a flash card – e.g., pencil – then the split-brain subject was able to pick it (the pencil) out by feel from a collection of things ready to hand but hidden from his view behind a partition that blocked vision. The subject was able to pick out the item by touch alone based on the word he was shown on the flash card; but he was unable to say what word he was shown on the flash card since the data had been flashed to the left eye, which, in turn, maps to the nonverbal right brain hemisphere. The inference is that the input does not reach the left hemisphere that controls verbal production from the right hemisphere which received the initial stimulus word, because the connection between the two hemispheres had been surgically severed. The subject cannot say the word – it is not introspectively available to his awareness. But he can pick out a pencil from among various objects when asked to do so. So the information was available to the system – in the right, nonverbal part of the brain. Michael. Gazzaniga. (1967). "The split brain in man" in *Readings from Scientific American: Perception: Mechanisms and Models*, intr. R. Held and Whitman Richards. San Francisco: W. H. Freeman, 1972.

4. The Neuroscience of trauma: The Intrusive Past: The Flexibility of Memory and the Engraving of Trauma. "...[D]evelopmentally, the brain is extremely plastic until myelinization, which occurs in different parts of the brain at different ages but which is complete by the end of puberty, assigns specific functions to particular parts of the CNS [central nervous system]. Binocular vision, speech and even attachment patterns depend on myelination during critical periods (van der Kolk 1987). The idea is that the trauma is sequestered – split off – in a separate neurological sector of the brain. The trauma continues to generate its disruptive sequelae as long it remains unintegrated with other aspects of the survivor's life. The treatment consists in taking steps to surface and integrate the trauma. Since directive therapy may well cause re-traumatization, the therapist wonders What should I do and how can it possibly work? This is where empathy makes a difference. This is where the experienced practitioner has the ability and skill to call forth into her or his empathic receptivity the unexpressed in the trauma, which wants to be expressed, in an unstructured process such as free association. Suggested Reading: *Trauma: Explorations in Memory*, Cathy Caruth, ed. Baltimore: John Hopkins: 151-182.

5. MRI research: The functional magnetic resonance imaging [fMRI] device is like Galileo's telescope – it reveals a whole new world that we did not imagine existed. Jean Decety's article on the functional architecture of empathy is mind opening (no pun intended). Decety and others have argued that there is something like an "empathy circuit" in the brain, but it does not require mirror neurons. The power of Decety's account of empathy is that it integrates both the receptivity and the understanding. From a folk-psychological point of view, we distinguish first- and third-person perspectives, the self-other, and controlling one's own emotions. The "shared manifold" – a hypothesis proposed by Vittorio Gallese – is *not* available at the level of folk psychology, which is why (as we shall see) it becomes the fulcrum that moves the explanatory apparatus. A

multi-component definition of empathy at the level of its functional architecture acts as a strong counter to any perspective that would assert empathy is a single module the absence of which alone is responsible for autism, psychopathology, etc.

Suggested reading: J. Decety & P.L. Jackson. (2004). "The functional architecture of human empathy" in *Behavioral and Cognitive Neuroscience Reviews*, Vol 3, No. 2, June 2004, 71-100.

6. The Debate about Mirror Neurons: do they exist or not?

"About 10 years ago [in 1995] we discovered in the macaque monkey brain a class of premotor neurons that discharge not only when the monkey executes goal-related hand actions such as grasping objects, but also when observing other individuals (monkeys or humans) executing similar actions. We called them 'mirror neurons'...Neurons [of the human brain] with similar properties were later discovered in a sector of the posterior parietal cortex connected with the area F5...<sup>2</sup> The case for mirror neurons remains unproven and alternative hypotheses are equally compelling, though lacking in the simplicity of mirroring. For example, Hebbian "neurons that fire together, wire together" combined with standard associationist psychology seem able to account for many of the same mirroring experiences, according to Hickok.

Suggested reading: Gregory Hickok. (2014). *The Myth of Mirror Neurons: The Real Neuroscience of Communication and Cognition*. New York: W. W. Norton: 184-225.

7. The big mystery – *not* whether or not mirror neurons exists – is action at a distance. How does one person resonate physiologically with another person? What activates the neurons or physiological systems across biologically separate individuals? What about The human face as an emotional Hot Spot that activates empathically relevant experiences (?) Gallese's Shared Manifold Hypothesis? Ekman's facial action coding scheme?

Suggested reading: V. Gallese. (2007). "The shared manifold hypothesis: Embodied simulation and its role in empathy and social cognition" in *Empathy and Mental Illness*, eds. T. Farrow and P. Woodruff, Cambridge, UK: Cambridge University Press, 2007: 448-472.

8. Empathy is a form of receptivity to the expression of emotion. As such, empathy is an opening to unexpressed emotions to attain completeness. The emotions constitute information processing that operates in parallel with cognition (intelligence). Translation between these two differing systems occurs frequently, but emotions are not reducible to

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<sup>2</sup>V. Gallese. (2007). "The Shared Manifold Hypothesis: embodied simulation and its role in empathy and social cognition," in *Empathy and Mental Illness*, eds. T. Farrow and P. Woodruff, Cambridge, UK: Cambridge University Press, 2007: 452. G. Rizzolatti and M. Gentilucci. (1998) "Motor and visual-motor functions of the premotor cortex" in P. Rakic and W. Singer, ed., *Neurobiology of Neocortex*. New York, Wiley. Rizzolatti, G., Di Pellegrino, G., Fadiga, L., Fogassi, L., Gallese, V. (1996). *Premotor cortex and the recognition of motor actions*, Cognitive Brain Research 3 131-141. Philip L. Jackson, Andrew N. Meltzoff, and Jean Decety. (2005). "How do we perceive the pain of others? A window into the neural processes involved in empathy." *Neuroimage* 24 (2005): 771-779. See also J. Decety & P.L. Jackson. (2004). "The functional architecture of human empathy" in *Behavioral and Cognitive Neuroscience Reviews*, Vol 3, No. 2, June 2004, 71-100.



propositional (cognitive) attitudes. There is nothing in common between basic emotions, social pretenses, and irruptive motivational reactions (“moral sentiments”). All three will be engaged as examples of emotional, affective responses. A research psychologist, Paul Ekman (1985, 2003), spent eight years mapping the movements of some 5000 different muscles in the face. Some of them such as the muscles around the eyes activated in an authentic smile expressing sincere happiness are *not* subject to voluntary control. They cannot be faked – or more precisely, the best way to fake them is really to experience an authentic smile. Thus, the skeptical scenario whereby someone always fakes the emotion is undercut empirically.

Suggested reading: Paul Ekman. (2003). *Emotions Reveal: Recognizing Faces and Feelings to Improve Communication and Emotional Life*. New York: Owl Books: 1-33.

#### 9. Mindless neuroscience: My Amygdala Made Me Do It.

The fMRI has resulted in an explosion of interest in the social brain as the neurological infrastructure and basis for empathy. “Explosion” is not an exaggeration, and an entire new field of study with new scientific, scholarly journals such as *Social Neuroscience*, *Neuroethics*, *Neurolaw*, *Neuromarketing*, apply brain imaging not only to empathy and human relations but also to advertising, the insanity defense, and moral conundrums. The backlash – or return to sanity, depending on one’s perspective – is ongoing with skepticism about neuro-mania, your brain on pseudo-science, and the debunking of “voodoo correlations” in neuroscience.<sup>3</sup> Nevertheless, few serious scholars question that genuine scientific advances are occurring thanks to diverse forms of neuro-imaging that benefit those in recovery from neurological disorders, even if popular excesses have occurred in the press and academia. For example: “As a psychopath, then, Dugan would have known that killing and raping Nicarico was against the law, but he would not have appreciated the moral gravity of these acts [...] [T]hey tend to be poor at empathizing emotionally and typically regard the pain or misery they’ve inflicted on others as being ‘their problem, not mine.’ [...] [T]he brains of psychopathic subjects manifested similar low levels of activation in response [in the paralimbic system]...” (Satal 2013: 104-105) The jury was not persuaded by neuroscience and decided on the death penalty.

Suggested reading: Satel, Sally and Scott O. Lilienfeld. (2013). *Brainwashed: The Seductive Appeal of Mindless Neuroscience*. New York: Basic Books (Perseus): 49-71, 97-123).

#### 10. Neurophenomenology – what we can learn from neuropathology?

“Can you imagine how it would be to not be able to recognize your own face as your *own* face in a mirror? A circumscribed hemorrhage in a certain area of your brain could permanently and selectively change your model of reality in this way by putting you such a highly specific, agnostic state” (Metzinger 2004: 215-264). Nervous system injuries, physical traumas, strokes, and industrial accidents to the head, provide a rich area of lesion studies where neural correlates of consciousness (NCCs) can line up cognitive and

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<sup>3</sup> Edward Vul et al. (2009). “Puzzlingly high correlations in fMRI studies of emotions, personality, and social cognition,” *Perspective on Psychological Science* 4, no. 3 (2009): 274-290 cited in *Brainwashed: The Seductive Appeal of Mindless Neuroscience*, Sally Satel & Scott O. Lilienfeld. New York: Basic Books (Perseus): 166fnt. 34.

emotional functions with brain processes to “connect the dots” between the two. Oliver Sachs pioneered such studies in amazing and moving narratives accessible to the general reader, including the account (and major motion picture) *Awakenings*.

Neurophenomenology builds on the approach of cross-referencing what we learn from pathology with the first person experience of awareness and mind.

Suggested reading: Thomas Metzinger. (2003). *Being No One: The Self-Model Theory of Subjectivity*. Cambridge, MA: MIT Press: 215-264.

11. Disorders of Empathy: Simon Baron-Cohen. It is said that there is nothing new under the sun; but “joint attention” or a “shared attention module” may very well be something new that the philosopher Descartes in his isolated introspective consciousness simply missed. In short, Simon Baron-Cohen and others have hypothesized an “empathy circuit” – including an account too lengthy to include here.<sup>4</sup> Like many phenomena, one’s ability to relate to other persons as “minded” individuals like oneself in having intentions and emotions lies along a continuum. Some individuals exude warmth and relatedness whereas others are socially awkward and do not seem to pick up on social clues. At the extremes some individuals may need to isolate themselves because they are overwhelmed by too many stimuli and too much information coming at them whereas others end up being isolated because they do not perceive and experience what is obvious to most other persons. Such disorders of empathy as Asperger’s, autism, sociopathy, and psychopathy lie on this spectrum.

Simon Baron-Cohen. (1995). *Mindblindness: An Essay on Autism and Theory of Mind*. Cambridge, MA: MIT Press.: 85-120.

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<sup>4</sup> Simon Baron-Cohen. (2011). *Zero Degrees of Empathy: A New Theory of Human Cruelty*. New York and London: Allen Lane / Penguin Books: 19-28.



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