Humanities Seminars Program
The Ever-Changing Brain
Spring 2016

Instructor:
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Course time and dates:
10:00 am - noon on Jan. 26, Feb. 2, 9, 16, and 23

Summary:
The human brain, guiding our every thought and action, is as complex as anything humans have ever attempted to explore and understand. Its almost unimaginable complexity arises from minute interconnections between tens of billions of brain cells. If we could map every connection between the nerve cells, would we understand how the brain works? Years ago, scientists might have said yes. But today it is clear that such knowledge would provide only the bare foundation for understanding, because those interconnections are changing every moment of our lives. They are recording our experiences, our emotions, our plans for the future – and they are constantly repairing disruption and injury. Evidence is mounting that intellectual challenge, social engagement, and regular physical activity can have a profound positive impact on our lives as we age. Why? Because they influence the ongoing changes, or "plasticity," in our ever-changing brains. In this course, we will examine the recent revolution in our concepts of brain function that is providing a new framework for trying to understand our brains. We will look at neuroscience research projects currently being mounted under the national BRAIN initiative and consider what might come next in brain research.

Recommended reading:

- "Rethinking the brain: How the songs of canaries upset a fundamental principle of science," by Michael Specter. The New Yorker, July 23, 2001. Available at https://www.msu.edu/course/psy/401/Readings/WK6.Supplement%20-%20New%20Yorker%20Article.pdf .

- "The challenge of connecting the dots in the B.R.A.I.N," by Devor et al. Neuron, Vol. 80, pp. 270-274, October 16, 2013. Available at http://ac.els-cdn.com/S0896627313008064/1-s2.0-

S0896627313008064- main.pdf?_tid=eba472e8-1e8c-11e5-8f00-00000aab0f02&acdnat=1435602810_e1dc4f2fce233701ea3fd1737ef76c7d .

- *(available for optional purchase)* **Phantoms in the Brain: Probing the Mysteries of the Human Mind**, by V.S. Ramachandran, M.D., Ph.D., and Sandra Blakeslee. HarperCollins Publishers, 1999.

- *(available for optional purchase)* **The Brain That Changes Itself: Stories of Personal Triumph from the Frontiers of Brain Science**, by Norman Doidge, M.D. Penguin Books, 2007.

- Update on BRAIN initiative activities, January 2015. Available at http://wpo.st/q8qn0 .

Recommended viewing:

- CNN Special Report, "Miles O'Brien: A Life Lost and Found" at https://www.youtube.com/watch?feature=player_detailpage&v=mcPjBgXty8A .

- You might also be interested in a short PBS interview of Miles O'Brien just 3 weeks after losing his arm: http://video.pbs.org/widget/partnerplayer/2365195775/?start=0&end=0&chapterbar=false&endscreen=false&topbar=true&autoplay=false .

Weekly Schedule

Week 1: How do we approach brain science?

- Opening question for discussion: Why study the brain??

- How do we approach brain science? What are the basic issues neuroscientists face as we "map" brain circuits in health and disease?

- A crash course in neurobiology: Basic physical layout of our brains and fundamental cellular concepts, from neurons and synapses to neural circuits.

Preparation for next week: Read the New Yorker article by Michael Specter and the Devor et al. article published in Neuron.

Week 2: The national BRAIN initiative and brain "plasticity"

- Define brain plasticity. What roles does it play in development? in the mature brain? What is exciting about the finding that new neurons are continually born throughout life?

- Review the basic plan of organization of the human brain, and take a glimpse into some of the exciting research being done under President Obama's expansive BRAIN initiative. What will the BRAIN (Brain Research through Advancing Innovative Neurotechnologies) initiative accomplish? How far will it take us in our quest to understand the brain?

- Introduce V.S. Ramachandran as an early adopter of the revolutionary notion that plasticity is an underlying theme for many neurological impairments.

Optional preparation for next week: Read chapters 1-5 of **Phantoms in the Brain**. (You might also enjoy chapter 12.)

Week 3: Plasticity-based treatments for brain disorders

- Discuss Ramachandran's explorations into plasticity-based treatments for such complex disorders as phantom limb pain, visual hallucinations, and syndromes in which patients are unaware of – and disown – half of their bodies.

- Test Ramachandran's mirror box yourself!

Optional preparation for next week: Read chapters 1, 3, 7, 8, and 10 of **The Brain That Changes Itself**.

Week 4: "More than the sum of its parts"

- What is meant by "critical periods" of high plasticity?

- Norman Doidge reviews recent research on how brain circuits can be redesigned not only for repair but also for enhanced cognitive abilities. What is the evidence behind his ideas? Has he gone too far?

- "More than the sum of its parts:" Doidge guides our discussion of how the brain's complexity and plasticity have unforeseen implications for cognition and cognitive disorders.

Preparation for next week: Watch the Miles O'Brien video(s) and read the update on BRAIN activities from January 2015.

Week 5: Where do we go from here?

- How is Miles O'Brien harnessing brain plasticity as he adapts to life without his left arm?
- What are the most exciting developments to emerge from the BRAIN initiative in its first years? What is the promise for the future?
- Where do we go from here?? How does your new understanding of the brain shape your feelings about brain research?
- Will your understanding of brain plasticity change your view of yourself or change your lifestyle?