AM7010 - Classics in Neuroscience - Syllabus

Objectives:

To discuss/dissect classic (mostly nobel prize winning) papers in Neuroscience of behavior, action and cognition

To discuss/dissect works contributing to a better understanding of the neurobiological basis of diseases

To discuss/dissect/analyze historical context of classic works in neuroscience

To learn to read and criticize high quality research in the area of Neuroscience.

Course contents:

1. Introduction to the course – A review of brain structures (current understanding) – one week
2. The four central dogmas of modern neuroscience
3. Role of structures on behavior (passing of iron rod throughSection the head and its effect on behavior – the case of Phineas Gage)
4. “The Neuron doctrine” - Works of the father of modern neuroscience, Santiago Ramon Y Cajal (1887)
5. “The Balancing brain” - Works of Robert Barany on the physiology/pathology of vestibular system (1914)
6. “The Synaptic formulation” - Works of the father of modern neurophysiology, Sir Charles Sherrington (1906, 1932)
7. Localization Vs Mass Action – A review of works of Fritsch & Hitzig, Hughlings Jackson and others until Wilder Penfield - An Alternate point of view (Lashley)
8. The incredible case of patient H.M., and his role in understanding the distinct memory functions of the brain. (Scoville, Milner, Corkin et al) (1957 to 2008),
9. “The emotional brain” - Neural mechanism of rage (Bard, 1929), Psychic blindness – effect of bilateral temporal lobectomy (Kluever and Bucy, 1938), Visceral theory of emotion (Papez, 1937)
10. Contributions of Hodgkin & Huxley in explaining functions of neuronal membrane using ionic (electrical) mechanisms (Hodgkin & Huxley, 1952)
11. The role of neurotransmitters in neural (and neuromuscular) function (HH Dale, 1936) & (Katz, 1968)
12. “The split brain – a tale of two halves” - Pioneering work of Sperry & Gazzaniga (1962) in understanding hemispheric functions of the brain (Cases of patients W.J., P.S., Vicki).
13. “Mirrors in the brain” - Pioneering works of Rizzolatti and colleagues (1992) to describe the functions of mirror neuron system (in area F5) of the adult monkey brain in understanding of motor events – possible role (?) of mirror neurons in imitation, empathy and social coSectionnnectedness – controversial claims.
14. “Colored numbers and pain in the non-existent limb” - The works of VS Ramachandran in understanding synesthesia and Phantom limbs
15. “Maps in the brain” - Role of grid cells in spatial navigation (Year 2014 Nobel prize winning work of Moser & Moser; 2004, 2006)
16. “The lost word” (the “last” word): The classic works of Broca (1861,1865) in describing the role of “the site of faculty of articulated speech” (“the third left frontal convolution” - pars opercularis and pars triangularis of the inferior frontal gyrus, Areas 44 and 45) in speech production.

The classic work of Wernicke in understanding/perceiving speech (1874) – the importance of the superior temporal gyrus (area 22) in understanding language.

Text Book: There is no text book for this course. All classic papers (listed above) will be supplied by the faculty, who will coordinate discussion in class. These papers will form the reading material.

Reference Books:

Leroy, F., A Century of Nobel Prize Recipients. Chemistry, Physics and Medicine, New York: Marcel Dekker, Inc., 2003

Rapport, R., Nerve Endings. The Discovery of the Synapse, New York: W.W. Norton & Co., 2005

Meyers, M.A., Happy Accidents. Serendipity in Modern Medical Breakthroughs, New York: Arcade Publishing, 2007

Principles of Neural Science, Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, Steven A. Siegelbaum, A.J. Hudspeth, McGraw-Hill Medical; 5 edition (2012)