Topics in Neurobiology Seminar: Nobel prize: the glory and the gory
Spring 2024
Class time: Tuesday 10:10-12:00
Location TBD

SHORT VERSION
Transformative Landmarks in Neuroscience Research
Modern neuroscience incorporates topics from molecular neurobiology to cognition. Cognate disciplines include psychology, biology, biochemistry, chemistry, neuropharmacology, neurology and psychiatry, physics, computational science. We review neuroscience landmarks through readings of scientific publications, news reports, and controversies surrounding apparently transformative research that had been awarded a Nobel prize at least 50 years ago, and contemplate contemporary viewpoints that have the benefit of hindsight.

LONG VERSION
Neuroscience did not exist as a discipline with that title in the 1960's. Today it is one of the largest fields of biology, with an annual scientific meeting attended by about 35,000 scientists. Modern neuroscience incorporates topics from molecular neurobiology to cognition. It includes cell biology of neurons and glia; ion channels and electrical signaling; synaptic transmission and integration; chemical systems; brain anatomy and development; sensory systems; motor systems; higher cognitive function, and the contemplation of the puzzle of self awareness and consciousness. Academic disciplines that incorporate aspects of neuroscience include psychology, ophthalmology, biology, biochemistry, neuropharmacology, pathophysiology, neurology and psychiatry, physics, computational science, biomedical engineering, neuroimmunology, etc.

We will examine how to evaluate research by studying Nobel prize awards. Each week, we will study one Nobel prize in a Neuroscience discipline that was considered transformative in its time. We will read the original paper scientific paper, commentaries and news reports on the work, discuss controversies about the research, and contemplate how the contribution of the research is evaluated today, with hindsight.

Behavioral neuroscience, like much of biological and biomedical research, is a rapidly growing field of scientific knowledge and research. The explosion of information on the web makes it less important to memorize facts and more important to understand how to evaluate information. This is a course intended to provoke thinking about how to evaluate research and its significance. This is hard: it is not foolproof. We examine how it is done at the highest levels- by examining the successes and failures of Nobel prizes in identifying superb research.

The course is suitable for Neuroscience majors in junior and senior years and for Biology and Psychology majors in their senior year because it requires knowledge of and cognate neuroscience-related disciplines to be able to understand and evaluate research and its implications. I anticipate that the students will discover how hard it is to know in

advance, what will be important. They will also learn how evidence is weighed and impact judged, and practice their own skills at this puzzle.

Prerequisites:
Students must be Neuroscience majors or seniors in Biology or Psychology. In addition, a course in Neuroscience in either the Biology or Psychology Department is required.

Student Learning Goals: Students who complete this course should be able to
1. Discuss the intellectual foundation in neuroscience.
2. Interpret and evaluate neuroscience research.
3. Explain the role of experimentation in neuroscience.
4. Effectively communicate scientific information.
5. Evaluate basic methods of experimental design and hypothesis testing.

Course Requirements and Grading:
-80% Based on class presentations.
Each week, the class presentations will cover a specific research topic that was considered transformative, and the scientist was given a Nobel prize. Material will be presented by four students in each class session. Each student will make four class presentations during the semester. Each class presentation requires a great deal of research and preparation. Presenters will read the Nobel lecture and additional sources pertaining to the following four aspects of their presentation:

1. Review the original work for which the prize was awarded by presenting the experimental paper.
2. Was the award controversial at the time it was made? Read the Nobel lecture and/or a publication for which the award was given.
3. What were important developments that made the research possible/timely? What is the historical consensus on the importance of the work, in retrospect (for those awards made at least a decade ago).
4. The person, the background, the personality, the workstyle, the life- of the Nobel prize winner.

The precise assignments depend on number of students in the class – and on their interests. After the first sessions, the specific Nobel prize winners we will study will be selected by the students, based on their preferences. The exact details of the course schedule will have to be worked out once class size is set. As you can imagine, if there are more students, there will be fewer presentations/student. Students will not do more than four presentations and a paper.

-20% Final assignment:
Final assignment will be to write a paper on current research finding (published in 2005-10) that you think will get one of the next major neuroscience award (including Lasker, Kavli, Nobel, Horowitz) and explain why you think this deserves the award and why it will top all the other fine research being done today. The paper should be about 8-10 pages long, excluding figures. The paper is due on April 7.