ENTOMOL 7910: The Nature and Practice of Science
Course Description and Syllabus

Credits: 2 credits

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Course Description:
This course addresses issues of importance to scientists but not ordinarily addressed by the graduate curriculum. The goal is to engage participants in critical examination of what science is, how science should be done, the contribution of their research to the larger picture of knowledge accumulation, and ethical obligations of scientists. The application of concepts to the participant’s own graduate research is emphasized.

The first half of the course provides in-depth structural and functional analysis of the scientific method, including contrasting philosophical views, interrelationships of functional components (discovery, empirical observation and pattern detection, theoretical explanation, prediction, and tests), role of inductive and deductive logic in hypothesis testing, and integration of logic with experimental design and statistics. The second half of the course focuses on science as a human endeavor including creativity, evaluation of scientific productivity including attribution of credit and reward, and ethical issues in research, scholarship, and application of scientific knowledge.

Experience has shown that the course is as beneficial for students beginning their MS program as it is for those nearing completion of their PhD.

Abbreviated Description: Analysis and application of logic underlying scientific reasoning, theory, hypothesis, and their integration with experimental design, discovery, ethics, and science as a human endeavor. Recommended for graduate students conducting independent research.

Evaluation
Course evaluation is based on participation in discussion of the assigned readings, and written exercises that apply readings and discussion topics to the primary literature and participant’s own research. Your contributions to discussions should (1) demonstrate that you have completed assigned readings, (2) share original thoughts about the reading, (3) advance rather than stifle open discussion.

Course objectives:
- Engage participants in critical examination of what science is, how science should be done, the contribution of their research to the larger picture of knowledge accumulation, and ethical obligations of scientists.
- Provide in-depth structural and functional analysis of the scientific method, including contrasting philosophical views, and interrelationships of functional components.
(discovery, empirical observation and pattern detection, theoretical explanation, prediction, and tests).

- Understand the role of inductive and deductive logic in hypothesis testing, and integration of logic with experimental design and statistics.
- Focus on science as a human endeavor including motivations of scientists, creativity, evaluation of scientific productivity including attribution of credit and reward.
- Examine ethical issues in research, scholarship, and application of scientific knowledge.

**Course content:**

- Address the question of what is science; philosophical views of accumulation of scientific knowledge; role of inductive and deductive logic in scientific reasoning.
- Integrating scientific logic with experimental design and statistical analysis; role of theory in accumulation of scientific knowledge.
- Motivations of scientists, creativity, discovery, and innovation; evaluating scientific productivity, including scientific metrics.
- Examine scientific ethics, including ethics in research, scholarship, and application of scientific knowledge, including role of science in larger society.

**Tentative Schedule and Reading List**

**What is science (or, does motorcycle maintenance count)?**


**Philosophical Views of Accumulation of Scientific Knowledge**


**Role of Inductive and Deductive Logic in Scientific Reasoning**


**Integrating Scientific Logic with Experimental Design and Statistical Analysis**


**Role of Theory in Accumulation of Scientific Knowledge**


**Creativity, Discovery, and Innovation**


**Evaluating Scientific Productivity**


**Scientific Ethics: Ethics in Research and Scholarship**


**Scientific Ethics: Ethics in Application of Scientific Knowledge and the Role of Scientists**

readings: To be determined: papers on topical subjects addressing interactions between science and society.