Philosophy of Science as a Means Towards Enhancing Interdisciplinary Research.
BSC 5935
Prof. Todd A. Crowl
Spring 2017

In this seminar, we will explore the ways that biological and physical scientists as well as engineers and computer scientists approach scientific understanding. The course is designed as a discussion seminar in which graduate and senior undergraduate students will be introduced to a brief history of the philosophy of science and the underlying importance of logic resulting in how we design, carry out and use mathematics and statistics to understand the world around us.

After the first couple of introductory discussion that I will lead, we will have students lead discussions of the chapters or papers for that week's discussion. Our only expectations for the course is that you share ideas and opinions freely and that we identify a review paper, book review or some other form of class authored publication. Previous classes have published papers in BioScience (Choate et al. below), Trends in Ecology and Evolution (Prather et al. below) and book reviews for various journals.

Because of my travel schedule, our class meeting times will need to be flexible and mutually agreed upon. I will make as many of our schedule Tuesday meetings as possible, but there will be times when I cannot and we will need to meet twice during the weeks I am here.

Outline of Discussion Topics:

Discussion 1: A brief history of the philosophy of science.

Discussion 2: The scientific method in natural sciences: the realization that environmental science is not physics; Is statistics the answer?

Discussion 3: Is there a philosophy of Engineering?

Discussion 4: Is there a philosophy of Computer Sciences?

Discussions 5 - 8: The nature of theory.

Discussion 9 - 12: Integration of ideas and data.

Discussion 13: The Goals, challenges and importance of interdisciplinary knowledge.

References:

Bo-cong, L. 2009. The rise of philosophy of engineering in the East and the West.

Carver, R. P. 1978. The case against statistical significance testing. *Harvard Educational Review* 48:378-399.

Choate, D., et al. 2012. Integrating theoretical Components: A graphical model for graduate students and researchers. BioScience 62:594-602.

Colburn, T.R. 2015. Philosophy and Computer Science. Routledge, 2015.

Ford, E.D. 2000. Scientific method for ecological research. Cambridge University Press. Cambridge, United Kingdom.

Levin, J. R. 1998. What if there were no more bickering about statistical signifcance tests? *Research in the Schools* 5:43-53.

Osenberg, C. W., R. J. Schmitt, S. J. Holbrook, K. E. Abu-Saba and A. R. Flegal. 1994. Detection of environmental impacts: natural variability, effect size, and power analysis. *Ecological Applications* 4(1):16-30.

Prather, C.M., D.M. Choate and M.J. Michel. 2009. Putting the "Ph" back into the "Ph.D.": framing graduate research in a theoretical context. Frontiers in Ecology and the Environment 7:389-390.

Stewart-Oaten, A., Bence,J.R., Osenberg,C.W. 1992. Assessing effects of unreplicated perturbations - no simple solutions. *Ecology*: 73(4):1396-1404.

Van de Poel, I. 2009. Philosophy and Engineering: Setting the Stage. Volume 2: Philosophy of Engineering and Technology, P. 1-11.