**Physical Sciences, Robert P. Crease, Stony Brook University**

Physics (as in Aristotle) was once just a synonym for natural science. Beginning in the 1500s, with the rise of modern physics, the field became increasingly narrow and focused on specific kinds of interactions in non-living matter. This led to the enormous triumphs of classical mechanics, the rise of modern chemistry, and then eventually nuclear physics (including now nanoscience and nanoengineering at the micro scale) and relativity and cosmology (at macro scale). But these successes have at the same time created the problem of how to relate the micro, meso, and macro levels: that is, in one instance, how to relate relativity and quantum theory, not to mention how to bridge the numerous micro disciplines and research programs in physics (as explored in Peter Galison's case studies of how different experimental traditions have difficulties communicating with each other). Then there are the expanding problems of how to bridge differences between physics and chemistry, the physical sciences and the biological sciences, the natural and the social sciences, and the sciences and the humanities and the arts -- that is, how the physical sciences are related to the society and the humanities. This chapter will explore the problems of interdisciplinarity within the physical sciences (physics and chemistry) in order to identify the problems and the mechanisms developing for responding to them, in an effort to identify tactics and strategies that might also be fruitful on a larger scale.

Section one: Historical background, the rise of disciplinarity and subdisciplinary specialization in physics and chemistry and the attendant need to reconnect the parts through interdisciplinarity. (~1500 words)

Section two: Types of interdisciplinarity in the physical sciences. Comparing the strategies of reductionism (chemistry reduced to physics) and multidisciplinarity, as well as recombinant science. The approaches of restatement and popularization as efforts to communicate among disciplines and with the public. Problems of collaboration in "big science." Attempts to develop more general theories that synthesize the fundamental forces. Etc. (~1500 words)

Section three: One or two sample case studies, such as those by Galison. (~1000 words)

Section four: Building on interdisciplinary achievements in the physical sciences. How interdisciplinarity in the physical sciences might provide guidance for how to do interdisciplinarity more generally, and how the physical sciences could benefit from a greater appreciation of interdisciplinarity. (~1000 words)