UNDERGRADUATE RESEARCH PROJECTS

Statistical Mechanics and Thermodynamics

The main focus of my scientific research is the understanding of the motions of macromolecules in solution and in bulk. This is done primarily by means of computer simulation, although analytical methods are also used where appropriate. My research group has written a number of computer codes which model the motions of long chain molecules using a Monte Carlo method. These codes can be used to study a variety of problems. Those of current interest include the motions of polymers near surfaces and the dynamics of polymer adsorption and desorption. I am also interested in the application of statistical mechanics and thermodynamics to the study of glasses. Projects in this area would be "pencil and paper" theoretical calculations and would not require extensive computer use.

Philosophy and History of Chemistry

I am interested in developing a philosophy of chemistry as a profession. This project includes both history and philosophy. Historical projects would include tracing the development of professionalism in the American Chemical Society and the history of the ACS Committee on Professional Training. Current projects involve the influence of profit and commercialization on science and the ethical implications of the development of large research groups. I am also interested in the role of tacit knowledge, as developed by Michael Polanyi, and practical reasoning in chemistry. Some of my work in ethics involves the relationship between science and law. Finally, I am interested in the rhetoric of science, understanding the role of writing in the process of science, particularly the role of metaphor in the development and communication of scientific knowledge.

Chemical Education

I am involved in a number of projects in chemical education including the use of cooperative learning in undergraduate courses, development of context-rich challenge problems and projects, inquiry-based laboratories, use of writing in chemistry education, particularly laboratory reports. Finally, I am interested in the definition of the scholarship of teaching and learning in chemistry.

History and Philosophy of Pacifism and Conscientious Objection

I am currently writing a book on the history of Civilian Public Service Camp #21 at Cascade Locks, Oregon. This camp was part of the system of alternative service for conscientious objectors during World War II and is part of a larger effort to better understand the history and philosophy of non-violence and its role in American society. I am beginning work on three new projects: an article on the life and career of World War II CO Charles Davis, who was a significant public citizen in Oregon, an article on the ethics of war-related scientific research, and a biography of Paul Comley French, the Executive Secretary of NSBRO.