Fitch Laboratory Mission Statement

The primary missions of this laboratory are to advance scientific knowledge and to train young people at the undergraduate, graduate, and postdoctoral levels for careers in science.

There are three scientific foci upon which we exert effort. The first is the isolation, structure elucidation and synthesis of bioactive natural products. Such compounds can serve as biological probes or therapeutics for the treatment of disease. The second is organic synthesis and synthetic methodology. This effort is crucial to the first focus, as the bioactive molecules from natural product isolations must be synthesized to confirm structure and new synthetic methods must be developed to prepare the targets efficiently. The third focus is on the pharmacology and structural biology of biological targets relevant to disease pathogenesis. The biological target is central to the first two foci and serves as the driving force for our work. The synergism between chemistry and biology can enable great breakthroughs to be made toward a greater understanding of human physiology and thereby can facilitate the treatment of disease through rational drug design.

The second mission of our laboratory is to train students in the pursuit of scientific careers. I use the term student broadly to include undergraduates, graduates, postdoctoral fellows and faculty, including myself. The day we cease to be a student is the day we cease to be scientists. Curiosity and the desire to learn are fundamental characteristics of a scientist. The training of students is primarily accomplished through involvement in challenging research projects which will deepen their knowledge of the chemical and/or biological science. Work in the research laboratory where the questions are open-ended is critical to this venture. In research, the answers are often not known and it is the job of the scientist to figure them out. In doing so, the student must step beyond that mentality developed in laboratory and lecture courses, which emphasize the commitment to memory of facts and demonstration of procedures, to a larger examination of the science at hand. Only through a deep understanding of the scientific problem at hand is the optimal solution found, as one must look at as many alternative approaches as possible and assess the viability of each. Problem solving is a primary ability that must be honed and an ability to look at both the big and small picture is required. It is also through this experience that the student can assess chemical or biological research as his/her career choice. This is critical to the students long-term career satisfaction and fulfillment.

Within the scientific mission, our current objectives are as follows.

Isolation, structure elucidation and synthesis of bioactive natural products. The natural world is a treasure trove of bioactive molecules, rich in chemical and biological diversity. About half of the drugs in use today are natural products, semisynthetic analogs, or natural product-inspired. Natural products are by definition bioactive, as they serve a biological purpose in the host organism. Nature rarely, if ever, produces a compound without a specific purpose. To do so is wasteful of energy that could be put into fruitful metabolism. Secondary metabolites, especially alkaloids are of current interest in our

laboratory. This is for two primary reasons. One would be hard pressed to find an alkaloid which lacks a biological activity of some kind, as alkaloids are basic, and nucleophilic. They can participate in hydrogen bonding as both donors and acceptors. Basic amines are components of most drugs and alkaloids fit this bill nicely. The second reason for our choice of alkaloids is that they are easily separated from the milieu of a natural extract by simple acid-base extraction.

Organic synthesis and synthetic methodology. As an organic chemist, I am interested in the synthesis of biologically and chemically interesting molecules that may be of utility in the investigation of biological systems. In order to accomplish this, often new synthetic methods must be developed to address limitations in current methodology in order to accomplish a desired transformation. In other cases, an entirely new transformation for which there are no existing methods must be developed. I have particular interest in these endeavors, which advance fundamental knowledge in organic chemistry.