

# Indiana State University

2006 - 2007 Academic Annual Report

Department of Chemistry

## Vision Statement

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**Below is your vision statement from previous years. Please take this opportunity to review it and if necessary update it.**

The Chemistry Department Vision Statement The faculty of the Chemistry Department seek to provide our students with: 1. A student-centered learning environment that features active participation of undergraduates in research or independent study projects. 2. An educational approach that recognizes the diverse background and range of needs of our students. Our aim is to prepare each student to reach his/her full potential. Many students come from non-supportive backgrounds and need the nurturing environment of a caring, engaged faculty. 3. A closely-knit community of learners and mentors that is modeled after the traditional "small college" atmosphere in which students derive professional and intellectual growth from the faculty through classroom, laboratory, and non-structured interactions. 4. A range of educational experiences that includes exposure to "real-world" applications of chemistry. This can be done through an increased role of recent graduates giving Departmental seminars, talks given by industrial scientists and managers, and the development of co-op or internship positions with local industry. 5. A broad-based education that allows our students to secure post-graduate positions in industry, graduate school, professional school, or as high school teachers. We aim to offer our students depth of knowledge in the five recognized sub-fields of chemistry: analytical, biochemistry, inorganic, organic, and physical chemistry.

## Year in Review

### Accomplishments

**As you have heard, increasing public awareness of Indiana State University's accomplishments is crucial to building student enrollment, influencing policy makers, and developing a place of pre-eminence in the Midwest. What do you consider to be your department's accomplishments for the 2006-2007 year that will contribute to this effort? [Please list in priority order and limit to no more than 8.]**

1. The Chemistry Department's Summer Undergraduate Research Experiences (SURE) program was a huge success in 2006. Twelve students received paid fellowships (ten full-time and two part-time) for ten weeks of effort on faculty-directed research projects. Four faculty members participated in the program. 2. The Department is prepared for SURE 2007. Seventeen students (twelve full-time and five part-time) and six faculty members will participate this summer (May 16-July 27). Financial support for the student fellowships (totaling over \$50,000) comes from a variety of internal (CIRT and CPSCE) and external (NIH, Dreyfus, RC) sources. 3. Eight undergraduates presented the results of their research at the National American Chemical Society meeting in Chicago in March 2007. These students were accompanied by Profs. Rick Fitch and Eric Glendening. 4. One of the Chemistry Department's majors, Rachael Chase, scored in the top 1% of all persons in the U.S. taking the Medical College Admission Test (MCAT) for entrance into medical school. 5. Our organic chemistry teaching laboratory renovation is nearing completion. This state-of-the-art facility has sufficient ventilation hood space to accommodate twenty students, four-person laboratory benches to facilitate collaborative learning, two ADA benches, and easy access to our new 400-MHz

nuclear magnetic resonance spectrometer in the adjoining room.

### Research and Scholarship

**What is your assessment of accomplishments in the area of research and scholarship that is focused primarily on contributions to practice and discipline-based scholarship? Are you satisfied overall? In which areas do you feel your department does particularly well? In which areas do you feel your department needs to improve?**

Scholarship, particularly research activities involving undergraduates, is increasingly becoming the centerpiece of our chemistry program. Of the eleven faculty members in the Department, nine were engaged in research this past year, and all nine involved students at least to some degree. A total of 21 students participated in research with their level of commitment ranging from two to fifteen hours per week during the academic year and from five to 40 hours per week during the summer. Seven peer-reviewed papers and book chapters were published by the chemistry faculty during the year, reflecting a very reasonable level of productivity for an undergraduate program. And four external grants, totaling \$305,000, were secured to support undergraduate research activities. These included a National Institutes of Health grant (Fitch), a Dreyfus Foundation grant (Wolf), and two Research Corporation grants (Fitch and Glendening). The Department is very pleased with its level of research activity, and our ability to offer summer research experiences to a large number of chemistry students is certainly a highlight and strength of our program. With regard to securing external funding, we have been rather successful, and the rate at which we are publishing is very reasonable. Of course, we'd like more of all of this. To improve, we need to encourage our faculty to continue to (or begin to) seek additional external funding. Three faculty members are externally funded by two-year grants that conclude this year, so we should all be pursuing funding opportunities. And only three of the six faculty working with students during Summer 2007 will be paid for their time; the other three will be working with students but will receive no financial compensation. For our summer research program to continue to grow we need to secure summer support for all participating faculty.

### Grants, Contracts & Off Campus Professional Service

**What is your assessment of accomplishments in the area of grants, contracts, and off campus professional service? Are you satisfied overall? In which areas do you feel your department does particularly well? In which areas do you feel your department needs to improve?**

The Chemistry Department is fairly well supported by four external research grants, totaling \$305,000, one from the National Institutes of Health, one from the Dreyfus Foundation, and two from Research Corporation. Funding periods for all four of these conclude this coming year, so we expect that our faculty will actively pursue additional funding for forthcoming years. Four grant applications were made during the academic year, including one to the National Science Foundation for a research collaboration involving faculty at ISU and Rose-Hulman, one to NSF for instrumentation, one to the Eli Lilly Foundation for instrumentation, and one to the Eli Lilly Foundation to support our summer research program. The latter three proposals are pending. The number of grant applications submitted by the Department was somewhat less this year than in the past, in part, because the research programs for three of our faculty were already externally funded. I believe that the level of grant activity in the Department is reasonable. The three faculty members with externally funded research programs will seek continuing support this summer, and others are considering submitting proposals. All will be able to use their activity in the summer research program to help leverage funding for the future. The Department does need to work with faculty and the College to ensure that more faculty are financially compensated for their effort during the summer. Without compensation it will likely become increasingly difficult to get faculty to participate in the summer research program.

## Teaching

**We would like to highlight innovative approaches to teaching. Has your department developed any pedagogies or practices you'd like to share with us? Please describe briefly.**

We will begin to use process-oriented, guided-inquiry learning materials in our first-semester general chemistry course in Fall 2007. Students will meet once each week for 75-minute workshops (in addition to the regular lectures) to work on team-based learning activities. Pedagogical research in chemistry education suggests that the active learning facilitated by such workshops enhances considerably students' efforts to understand and articulate conceptual aspects of chemistry that many of our students are not learning adequately.

## Course Scheduling/Enrollment Management

**How is the department making sure that students are able to get the classes they need to graduate in a timely manner?**

It is rarely an issue for students to have difficulty completing the chemistry major within four years. Those who do take longer usually do so because they either failed several courses or didn't choose to pursue the chemistry major until perhaps their junior or senior year. For the first time, the Chemistry, Physics, Life Science, and Math Departments have coordinated the teaching of science majors science and math courses to avoid conflicts as much as possible. Chemistry is offered at 9:00 (CHEM 105/106/321) and noon (CHEM 351/352), physics at 1:00 (PHYS 105/106/205/206), math at 10:00 (MATH 131/132), and biology at 11:00 (BIOL 101/102). Conflicts were increasing becoming an issue as the numbers of sections offered for these courses decreased somewhat over the past few years.

## Outreach

**What are the outreach opportunities for your discipline? (non-traditional modes of delivery and timing, etc)**

Our American Chemical Society Student Affiliates (ACS-SA chemistry club) offered a CHEM4KIDS camp this spring. Nearly 20 fourth and fifth grade students from Vigo County participated. The ACS-SA also organized a monthly program of chemistry demonstrations for the Terre Haute Children's Museum. The program was called Kids 'n' Chemistry.

## Assessment

**Please share your stated student learning outcomes.**

The Chemistry Department seeks to train its students sufficiently in methods of chemical analysis, problem-solving, and interpretation of chemical phenomena so that our graduates can contribute importantly in their chosen science or health-related fields.

## **Strategic Initiatives**

### Community Engagement I

**Please summarize your faculty's efforts in community engagement this year.**

FOR the second year, our American Chemical Society Student Affiliate (ACS-SA, chemistry club) presented chemical demonstrations at the Terre Haute Children's Museum every month. The ACS-SA will likely continue to offer these demonstrations to the Museum in the coming year too. Also, the ACS-SA presented a CHEM4KIDS, on-campus workshop for fourth and fifth grade students. This was very successful with 20 kids spending several hours on a Saturday afternoon with

our undergraduates. Prof. Larry Rosenhein is the faculty advisor for the ACS-SA.

### Experiential Learning

#### **What is your vision for experiential learning in your department?**

The principle form of experiential learning in the Department involves undergraduate participation in faculty-directed research projects. Our majors are also encouraged to work as laboratory assistants in our teaching labs and as supplemental instructors for the 100-level chemistry courses and for our organic chemistry sequence.

### Fundraising Activities

#### **What steps have you taken to support fundraising activities in your department? How can your efforts be supported?**

The Department has initiated an effort to raise funds from its graduates. We are attempting to better communicate with former students and donors via an annual newsletter. This year's newsletter (to be mailed in mid-May) includes a request for financial contributions and information about how our graduates can give to our program, particularly for scholarships and research fellowships. We also worked with the family of a deceased emeritus faculty member to establish an endowed undergraduate research fellowship in the individual's memory. This fund will eventually support one or two student researchers each summer. Dr. David Wong, a retired chemist at Eli Lilly, has approached the Department about establishing an endowed research fellowship for an undergraduate interested in synthetic organic chemistry. We anticipate that this fellowship will be fully funded within the next 5-6 years. We have two pending requests to the Eli Lilly Foundation to upgrade a suite of equipment in our instrumentation laboratories and to support four undergraduate research students for the next five years.

### **Quality**

### Quality

#### **Please provide 1-2 suggestions to increase the ability of your department or the University to meet the criteria above.**

We appreciate the support that the University and College of Arts of Sciences has provided for our research programs and for the renovation of our teaching laboratories. As our focus increasingly focuses on undergraduate research opportunities we need to consider the renovation of some of our research laboratory space. Additionally, the largest fraction of our students has research interests in organic chemistry and biochemistry, particularly in synthetic methods. Most students seek research opportunities with Prof. Rick Fitch, who generally works with 6-10 students at a time. The chemistry program could benefit considerably from the hire of an additional synthetic organic chemist to better accommodate the demand for research opportunities in that area.