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November 27, 2000

To: Lee L. Huntsman  
Provost

From: Marsha L. Landolt  
Dean and Vice Provost

A handwritten signature in black ink, appearing to read 'M. Landolt', is written over the printed name of Marsha L. Landolt.

Re: Department of Chemistry 10-year Review

*Summary and recommended action*

At its meetings of May 18 and June 1, 2000, the Graduate School Council met with the members of the Department of Chemistry review team and Departmental and College representatives, respectively.

The Graduate School Council recommended continuation of all degree programs offered by the Department. The Council further recommended an examination of teaching loads required of TAs and a consideration of a substantial increase in their number. At the same time, it recommended that the Department create a better environment for teaching and learning by creating web-based instructional aids, ensuring consistency across course sections, explicitly recognizing and rewarding the crucial role played by its outstanding faculty at the instructor rank and seeking to develop a better sense of a shared governance among all members.

The self-study, the report of the review committee, the Department's response to the review committee report are attached.

*Background*

The Department consists of 38 tenure-track faculty and 4 lecturers, a staff of 42, approximately 700 undergraduate majors, and 150 graduate students. The Department offers a BA in Chemistry, BS in Chemistry, BS in Biochemistry and MS and PhD degrees. Approximately 150 undergraduate majors, 21 MS's and 24 PhD's are graduated annually. Students complete their degrees in a timely manner. Graduates are well placed in careers or subsequent study.

The Department and its programs were last reviewed in 1987. Since that time, the Department has added a major in biochemistry, which accounts for a growth in annual graduation of departmental majors from 40-50 ten years ago to the current level of approximately 120. Approximately 90 BS in Biochemistry degrees are awarded annually; the demand for the chemistry BA and BS has not substantially changed over the last decade. The number of 200 level course credits awarded over the past ten years has doubled, while 100 level credit hours have increased by 27% and 300 and 400 level student credit hours by about 65%. Over this period, substantial space has been added to serve both teaching and research. The most urgent need to support the

expanded teaching load, in the view of the review committee, is an increase in the number of TAs on the order of 10 to 20 additional lines. One of the significant undergraduate teaching challenges faced by this department is that it introduces freshman undergraduates to laboratory sciences at the university level. Few of the freshmen it serves have a primary interest in the subject matter. Ensuring a supportive learning environment for a quantitative science under such conditions is a significant challenge.

Chemistry, although an ancient science, is continually evolving. Its core subdisciplines for decades have been physical, organic, inorganic and analytical. While the chemistry identified with these basic subdisciplines will certainly grow in the coming decades, many chemistry departments, including this one, conceive future growth along the lines of chemical biology, materials chemistry and environmental chemistry. The review committee endorsed these targets, observing that substantial strength already exists in chemical biology, materials chemistry and theory. The Department appears not to have a clear focus as to how it defines environmental chemistry. Competing definitions are chemistry of the environment itself, or environmentally-friendly chemistry. Growth of the field of chemistry in the areas identified above is certain to be explosive. The committee recommended that the faculty develop a strategic plan for the evolution of the Department along these lines. This process should include a dialogue with the University regarding the future of environmental geochemistry.

Tensions identified during the review include the following issues:

1. Due to increased demands for chemistry instruction, faculty at all levels sense responsibilities beyond the historical norm. Faculty believe that this is not a transient condition, but rather that it has become the new norm. The review committee was not convinced that the addition of tenure track faculty is necessarily the solution to this problem. Rather, they recommended investment in the infrastructure of teaching. Such investment might include development of courses in the teaching of chemistry for TAs, support for web-based instructional materials and the addition of TA lines.
2. Faculty salaries are low, but not unusually so for the University. Nevertheless, the review committee points out that preemptive raises are preferable to risking the loss of key faculty to other venues.
3. Graduate students comment on the Department's lack of community. This is particularly disadvantageous for a Department seeking to grow in areas that are inherently multidisciplinary. At present, the Departmental culture is overly reliant on the single lab and investigator model. This culture is detrimental both to the future of graduates and to the Department itself. Moreover, a greater sense of shared destiny is perhaps the best means of diminishing tension among faculty. Although the Departmental reply states that steps are being taken to overcome this problem, it is not clear that the administration fully understands the dimensions of the problem and the stresses to which it leads.

Several ways in which teaching at the undergraduate level could be enhanced were suggested, among them:

1. Improve coordination among sections at the undergraduate level and improve the uneven linkage of content in linked lecture-lab courses. The review team suggested adoption of a team teaching approach that includes faculty and TAs. The Department responded by saying that undergraduate sections are better coordinated than was perceived by the review committee. They have begun to focus on the linkage of content between lecture and lab courses, a change that has been accomplished relatively recently.
2. Do not ask a TA to teach multiple courses in a single quarter.

Other issues raised by the review team include the following:

1. A slight increase in faculty numbers appears to be warranted but is not the greatest need for investment. The team suggested that the Department and the University enter jointly into a strategic plan for recruitment in chemistry and related departments.
2. TA lines should be increased in proportion to undergraduate demand, not in response to a desire to grow the chemistry graduate program. Students recruited to fill the new lines could come from several departments. Graduate program growth per se should come from increased RA funding, as it does in other sciences. The Graduate School is not averse to a growth in the graduate program assuming that quality is maintained.
3. The outstanding educational outreach effort of the Department, supported by competitive grants awarded to instructors, is jeopardized by the assignment of added instructional duties to these individuals. The value of outreach efforts in the sciences is clear and highly visible in the community. Enhancing the investment in teaching infrastructure and outreach efforts is likely to pay dividends.

The Council identified two additional areas in which practice should be improved. First, the Council was surprised at the lack of inclusion of graduate students in either an advisory board to the Department or on key Departmental committees. Inclusion of students could go a long way to improving relations, and enhancing the internal Departmental climate. The Department actually seems atavistic in this regard. Second, the Department appears to overlook the very important contributions made by its instructors, uniformly identified as outstanding by the review committee. The Department will suffer substantially at all levels if it disaffects its outstanding instructors.

This Department has considerable strength and its scholarly caliber is well respected. It has shown itself to be responsive to University initiatives through the development of its new major and in other ways. It clearly needs some help to sustain its programs and to develop as it has the capacity to. At the same time, if the brightest of futures is to be realized the Department must carefully reconsider counter productive practices and values that seem to be deeply ingrained.

#### Enclosures

- c: Richard L. McCormick, President  
Paul B. Hopkins, Professor and Chair, Department of Chemistry  
Debra Friedman, Associate Provost for Academic Planning  
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David C. Hodge, Dean, College of Arts and Sciences  
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J. Fleming Crim (University of Wisconsin), Royce Murray (University of North Carolina),  
Stephen Sligar (University of Illinois)  
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