

July 9, 1984

FINDINGS AND RECOMMENDATIONS OF THE PROGRAM REVIEW PANEL FOR THE DEPARTMENT OF CHEMISTRY

I. INTRODUCTION

The following findings and recommendations are based on reports to the Program Review Panel (PRP) from the Chemistry Self Study Committee (SS), an Internal Review Team (IRT) chaired by Professor Peter Kuempel, and an External Review Team (ERT) chaired by Professor P. von Hippel of the University of Oregon and including Professors M. Fixman, Colorado State University, J. Michl, University of Utah, and J. R. Norton, Colorado State University. The reports were generally accurate, well prepared, and constructive.

II. FINDINGS

A. General

Overall, the Chemistry Department is a strong, successful department of 37 faculty (including adjunct members). The ERT rates it as "exceptionally good" and the 1981 National Research Council review of 145 doctoral programs in chemistry for the period 1976-1980 places it 32nd based on the scholarly quality of the faculty. The ERT points out that the department is continuing to grow in research strength and has used recent new positions very wisely. Both the IRT and ERT note that, for the most part, the department functions smoothly and collegiality is evident among the faculty. The department is divided into 5 Divisions: Analytical (4 faculty members), Biochemistry (9), Inorganic (5), Organic (8) and Physical (11).

B. Faculty

The faculty of the Chemistry Department remained nearly constant at 29-29.5 FTE from 1979-1983. A number of adjunct faculty participate actively in the department. During the last decade, the research strength of the department has grown substantially due to excellent new appointments.

The age distribution of the faculty is skewed toward younger ages, with the majority in the 35-48 age range. Four to five retirements are expected over the next 10 years, which will allow for some continued revitalization.

Average faculty salaries are lower at all three academic ranks than those of AAU public institutions. The largest deviation occurs at the rank of associate professor (12% lower). The ERT pointed out that better salaries for some of the younger faculty are needed in order to avoid the much more expensive alternative of matching specific offers as they come in. There was no evidence in any of the reports of discontent with current salary allocation procedures within the department.

Despite the fact that the department has functioned reasonably

well and has made significant advances under the current system of governance, all 3 reports note that there are some problems that should be addressed. In doing so, the department may wish to consider alternatives to the current form of governance. One problem appears to be a lack of efficiency. An organizational approach that retains the benefits of consensus and broad-based participation, but that involves more effective delegation of authority is needed. The current form of governance also tends to inhibit seriously the research productivity of the chairman. In addition, the ERT felt that the department should consider weakening the divisional organization. This change might contribute in a significant way to the intellectual and administrative well-being of the department as a whole. Furthermore, the advantages of strengthening the chairmanship should be considered. These advantages might include less time spent in meetings discussing routine operations and a larger role for the chairman in directing change and forging cooperation.

The affirmative action record appears to be above average for Chemistry departments. Eight percent of the faculty are women and 3 of the last 13 appointments (23%) have been women. These percentages compare favorably to the percentage of women in the applicant pool. There are currently no minority faculty members in the Chemistry Department. Nevertheless, the department feels that it has been conscientious in carrying out its policy of non-discrimination on the basis of gender and ethnic background. It is committed to inviting for interviews any protected class applicants whose qualifications are at least close to the top group.

C. Undergraduate Teaching

The Chemistry Department currently generates over 20,000 student credit hours per year, with student evaluations consistently slightly below the University average. The number of undergraduate majors has stayed constant at about 275 for the past several years. One professor received a Boulder Faculty Assembly Teaching Excellence Award in 1983.

The General Chemistry courses, which are primarily service courses for non-majors, currently suffer from a lack of long-range planning. Such planning is urgently needed to maintain the quality and organization of the courses and to ensure acquisition of much needed resources, especially the replacement of outdated instructional equipment. The IRT and ERT both felt that these needs could best be addressed by assigning the leadership and organizational responsibility for General Chemistry courses to one faculty member, who should be adequately compensated for this responsibility. Divisional considerations should not be allowed to override this departmental need.

The upper division courses appear to be in better shape, primarily because each Division takes responsibility for its teaching program. The Divisions should be encouraged to continue to work toward creative solutions to the problems of laboratory instruction in upper division courses that were identified in the SS. The department should be commended on the extent to which undergraduate majors participate in independent research.

D. Graduate Program

The number of graduate students has stayed constant at approximately 150 for the past several years. While the number of applicants dropped steadily from 1980-82, it increased dramatically in 1983 and 1984. As noted in the SS and reinforced in the ERT report, the department must continue to work on recruiting and retaining the best students in order to maintain and improve the quality of the graduate program. Nevertheless, it is clear that recent recruiting efforts have been quite successful. Furthermore, many of the graduate students are outstanding, as evidenced by their ability to compete for major national awards and for excellent positions in academia and in industry.

The new graduate advising procedures appear to address previously existing problems in this area. The graduate program will benefit from continued efforts to upgrade research instrumentation and to provide more access to computers.

Funding for graduate students appears to be adequate for a major research department in that most students serve as Teaching Assistants for only their first year. In subsequent years they are typically supported on research assistantships or University or national fellowships. However, additional fellowships and/or larger stipends would enable the department to compete more readily for the best graduate applicants. The IRT noted that some graduate students complained that tuition waivers for out of state students were often for only six or seven hours, when they felt that at least nine were needed. It should be noted that preventing a student with a tuition waiver from taking more than 7 hours is not in keeping with the rules of the Graduate School.

One problem identified in the SS was that female graduate students show a higher rate of leaving the program with no degree or with a terminal master's than do their male counterparts. As noted in the SS, faculty members need to pay more attention to providing encouragement when it is warranted, and to make it clear that discriminatory behavior on the part of male graduate students will not be tolerated. Maternity leaves and adjustment of the scheduling of exams and other requirements for parents of small children who do not have a spouse at home full-time should be made available.

E. Research

The overall level of research activity in the Chemistry Department is quite high. There are only a few individuals whose research productivity is low. However, these faculty members have contributed disproportionately to the teaching and administrative needs of the department.

All 5 research divisions of the department include faculty with strong, active research programs. From 1980-1983, the faculty published 402 articles, an average of 4 articles per faculty member per year. All but 5 faculty members have externally funded research programs. The current annual level of funding attributed directly to the Chemistry Department is approximately \$3.35 million. If the funding to chemists in JILA and CIRES is added, the figure is \$5.57

million.

Numerous national honors and awards for research excellence have been received by Chemistry Department faculty. Three have been elected to the National Academy of Sciences. Numerous faculty have been awarded Guggenheim Fellowships and Faculty Research Lectureships. It is especially notable that almost all of the junior faculty have received national awards designed for outstanding young faculty members (e.g., Sloan Foundation Fellowships, NIH Career Development Awards, Dreyfus Teacher-Scholar awards). This is indicative of the fine job that the department has done in recruiting new faculty.

Another indication of a strong research program is seen in the excellent departmental and divisional seminar programs and the summer lecture series. These are also important contributions to the graduate program.

The size and quality of the postdoctoral population is also indicative of a high quality research department. Currently there are 58 postdocs, who have been attracted from the top Ph.D. programs nationally. Former postdocs in the Chemistry Department have gone on to very good positions in academic departments and in industry.

F. Service

The Chemistry faculty has been active in service at University and national levels. Within the University, members of the Chemistry faculty have served on a wide range of committees, including the Program Review Panel, the Council on Research and Creative Work, the Vice Chancellor's Advisory Committee and the Faculty Assembly.

Chemistry faculty members serve on numerous committees for the American Chemical Society and the American Physical Society. Currently, 7 faculty serve on editorial advisory boards for 20 major research journals. Chemistry faculty also serve on NIH study sections, NSF panels and NRC committees.

G. Association with Research Institutes

The Chemistry Department has ties with both the Cooperative Institute for Research in Environmental Sciences (CIRES) and the Joint Institute for Laboratory Astrophysics (JILA). The department benefits in many ways from its association with these institutes. While there are some problems created by competition for space, divided loyalties and the offering of start-up money for Institute-sponsored candidates, both the IRT and the ERT felt that these were relatively minor compared to the benefits. Better communication and discussion of the issues would help to resolve some of the problems. This process would benefit from a strengthening of the position of chairman in the Chemistry Department.

H. Space, Facilities and Staff Support

The Chemistry Department urgently needs additional and modernized space. Full implementation of the Program Plan for Environmental Health and Safety and the Chem 40 Renovation Proposal (Appendix 16 of the SS) should go a long way toward solving these problems. These

plans include releasing use of the space currently occupied by the School of Pharmacy and renovation of major areas of the Chemistry building and of Ekeley. For health and safety reasons as well as to facilitate the Chemistry research and teaching programs, it is essential that this remodeling program proceed as planned.

Current uses of existing financial support for secretarial and technical support should be re-evaluated in order to determine whether existing support could be used more efficiently and to identify specific additional needs, if any. For example, the IRT and ERT both question the current *modus operandi* of the Chemistry Department machine shop. As presently operated, the machine shop neither meets the needs of a modern research-oriented Chemistry Department, nor is it cost-effective. One option, mentioned by the ERT, is to create a central set of University shops. The fees for these should be, at least in part, subsidized by the University from indirect cost returns and other sources. This, as well as other alternatives, should be considered carefully by the Chemistry Department and the Dean.

As noted by both the IRT and ERT, the departmental operating budget is too low. Additional funds are needed for undergraduate teaching laboratories and for departmental administration. Increases in these areas should not be made at the expense of providing adequate start-up packages for newly hired faculty or matching funds for major instrument proposals.

I. Biochemistry

The ERT felt that the most immediate and pressing problem facing the Chemistry Department and the University administration is to deal with the administrative and structural organization of the Biochemistry Division. This issue has been addressed by the IRT and ERT as well as by an *Ad Hoc* Biochemistry Study Committee, made up of 3 members of the Biochemistry division and 3 members of the MCDB department. All 3 reports support the necessity for reorganization. Independent of the form of the reorganization, the issues that must be addressed include the intellectual shift of the field of biochemistry toward biology, the lack of national visibility of the biochemists due to their being housed in a Chemistry Department, the reduction of teaching loads and the possible addition of FTEs to the Biochemistry Division.

Although the *Ad Hoc* committee recommends the establishment of a separate Biochemistry Department, both the IRT and the ERT favor changes that fall short of removing the Biochemistry Division from the Chemistry Department. According to the ERT, the disadvantages of forming a separate department include the imposition of administrative duties on the biochemists, despite the fact that there are few members who have the time for, or interest in, such duties. Furthermore, the ERT felt that there might be an intellectual loss if the biochemists distanced themselves from the important conceptual connections to chemistry on which basic biochemistry is built.

Alternative solutions proposed by the ERT include renaming the department as the Department of Chemistry and Biochemistry, as has been done at UCLA, setting up a separate Graduate Department of

Biochemistry, as has been done at Brandeis, or establishing an interdisciplinary Ph.D. program in Biochemistry including members of the Biochemistry Division as well as interested members of MCDB. A proposal that received little support was that of moving the biochemists to the MCDB Department.

No matter which of these options is chosen it must involve the transfer of real administrative power and control over their activities to the biochemists. In addition, the biochemistry group should be treated as, at least, a semi-autonomous group by the University administration.

To meet the research and teaching needs in biochemistry, both the IRT and ERT recommend expanding the Biochemistry group from its present size of 9. In addition to replacing 2 upcoming retirements, the ERT feels that 3-4 new positions are needed to provide more balance to the group, to maintain intellectual continuity with MCDB and to cover teaching needs. The ERT suggests that one of these positions be a senior appointment, who could serve as chairperson of the group.

III. RECOMMENDATIONS

1. The research strength of the Chemistry Department has grown substantially over the last 10 years, due in large part to the excellent new faculty who have been hired. For this reason, the department deserves continued University support in providing adequate start-up funds and research space and in finding matching funds for large, shared equipment proposals. The department should certainly be allowed to replace faculty vacancies as they arise.
2. Although the Chemistry Department has made excellent progress under the current form of governance, it should carefully evaluate whether there are even better alternatives. The department could potentially benefit enormously from a strengthening of the position of chairperson and from an increase in the efficiency with which routine matters are handled.
3. The department is encouraged to complete the long-range plan for development that is mentioned in the Self Study Report (part D.4). This should include a comprehensive programmatic plan, including its implications for future faculty hiring, space needs and curriculum development. It is important that Departmental goals for improvement be given precedence over more narrowly defined Divisional concerns.
4. The question of how the Biochemistry Division should be reorganized must be addressed in such a way as to provide the biochemists with increased national visibility and more control over their program (including teaching loads, resource acquisition and distribution and graduate education). Nevertheless, the value of maintaining strong ties to the Chemistry Department should not be underestimated. Included in the plan for Biochemistry reorganization must be a realistic assessment of the space needs of this group and identification of appropriate space.
5. The Dean of the College and the Chairman of Chemistry should work

together to make sure that the salaries of the best younger faculty stay competitive to avoid the danger of losing them or of continually having to match other offers.

6. A director for the General Chemistry courses must be appointed. Ideally this person should be one who would welcome the challenge and would be willing to make a fairly long-term commitment. Adequate incentive, such as a salary increase should be associated with this position and sufficient resources must be committed to General Chemistry to make the job worthwhile. The director should be charged with considering ways to restructure the courses so as to use the teaching time of other faculty members most efficiently, optimize support staff organization, determine needs for new laboratory equipment and provide continuing pressure for General Chemistry course support.

7. We urge that the Program Plan for Health and Safety and the Chem 40 Renovation Proposal be fully implemented in order to provide adequate space for the teaching and research needs of the Chemistry Department.

8. The department should look for more efficient ways to use existing staff support. For example, both General Chemistry staff support and the machine shop might be reorganized in ways which would free up resources for use in other areas.

9. The Chemistry Department is to be congratulated on its continued efforts to improve the quality of its graduate program. Additional work is needed in retention of female graduate students and the acquisition of resources with which to attract the best applicants.

10. The Chemistry Department should report annually to the Dean of Arts and Sciences on its progress toward carrying out these recommendations.