Academic Program Review
Issues Report

November 2000

Department of Chemistry

Colorado State University

- **Faculty Workload**

A questionnaire (see Appendix A) was designed and sent to 21 peer chemistry departments. The selection was primarily made based on each department's ranking in the most recent National Research Council survey of graduate programs. The programs solicited were ranked both above and below CSU, which ranked 37th in that report. The range of rankings was from 6th to 49th. A secondary consideration was the similarity of the institution to CSU; for example, the list contains a large number of Land Grant universities. Of the 21 departments contacted 15 returned the questionnaire. The questionnaire contained several questions related to workload as well as to other academic issues. Tabular summaries of the results are included in Appendix B and C attached to this report.

Comparisons were sometimes difficult to quantitate because of institutional differences such as term types (i.e., semesters vs. quarters). That fact not withstanding, it is clear from the results of the survey that ***no chemistry department*** responding to the questionnaire has a teaching load for research-active faculty which is higher than that at CSU—most are comparable and a few, it could be argued, are lower. Therefore, the present Chemistry Department teaching load of one lecture class per semester for research active faculty is well justified based on this peer comparison.

The major differences in the comparisons are in the area of faculty characterized as "research-inactive." Some of the surveyed departments make no distinction between "research-active" and "research-inactive" faculty and/or their claim to have no research-inactive faculty. Nevertheless, relative to the group of peer institutions participating in the survey, research-inactive faculty at CSU have, on average, a moderately higher teaching load. Despite these results, it is a long standing part of the culture of the CSU

Chemistry Department that individuals not significantly contributing in the arena of scholarly research should rightly be expected to contribute more effort in other areas—most frequently, this means in the teaching area. We feel it would be a mistake to attempt to modify this local policy by administrative edict.

- **Faculty Turn-Over: Start-Up and Retention Funds**

If the past ten years are indicative of the rate at which this department will face retention battles, we can expect, on average, about 2 retention or replacement hires per year for roughly the next 15 years. An average start-up package at competitive institutions is presently running $400K (retention packages tend to be larger). Ignoring inflation, this amounts to a total of $12-million by 2015. Within the funding algorithm in place prior to last fiscal year, the Chemistry Department and CNS would be responsible for $4-million each. Neither entity will be able to come close to affording that. Last year the former VPRIT, Jud Harper, was able to convince the EBC to commit one-time funds to assist with start-up costs. This allowed the algorithm to be modified to increase the VPRIT's contribution funds from 33% to 50%. Unfortunately, because of some administrative problems, a large part of the extra money ultimately may not be available to offset last year's start-up costs. Also, if past history is any guide, there should not be any real expectation that the availability of the extra money from central sources will continue in the long-term. But even assuming the best case scenario under the present modified algorithm, the financial burden of the anticipated hires placed on both the Department and the College is probably beyond the ability of either entity to fund.

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The Department and College can only look to the University for help in this matter. Retention and start-up packages are issues that very directly affect overhead generation and the overall health of the Department, College and University. It is essential that the EBC continue to be responsive to these needs and continue to provide central resources. The offices of the Provost and VPRIT should work together to keep this issue at the forefront of University priorities.

- **Faculty Salary Issues**

A major factor in the faculty retention problem is the fact that salaries in Chemistry at CSU lag significantly behind those in comparable departments. Also, based on history, faculty assume that the only way to obtain a meaningful salary adjustment is by obtaining a credible outside offer. We estimate that ca. 85% of the present faculty are fully capable of getting offers from comparable or better institutions. Last year we experienced the first real attempt by the University to deal with the issues of faculty salaries. While the intentions may be good, it remains to be seen what the results will be. For example, this year, between the Provost's tax on open positions and the reallocation process, the Chemistry Department lost almost twice what it regained in the form of special salary adjustments. Moreover, this was not unique to Chemistry within the College of Natural Sciences. Except for the Department of Computer Sciences, virtually every department in CNS either lost ground or barely held their own in the reallocation/special faculty salary exercise. This raises real doubts about whether the Equity and Retention faculty-salary exercise will ultimately be of any substantive help to us. If this fear is realized, and salaries are not adjusted to bring them more in line with peer departments the problems with retention will only worsen.

Finally, while retention/hiring problems in the area of information science and technology and in the College of Business are real problems, they are not unique. A misguided effort to be egalitarian in the redistribution of limited resources will have long-term disastrous consequences for productive programs such as the Department of Chemistry. Ultimately the disaster will be for CSU as a whole—these are problems that require hard choices beyond the departmental level.

- **Faculty Size**

The planned and agreed upon increase in the Chemistry Department faculty to 33 FTEs has, for many reasons, fallen behind schedule. Based on comparisons of credit hour production with peer departments, this number of FTE faculty in Chemistry is fully justified. Unfortunately, with retirements and unanticipated faculty replacements, hiring rates have fallen behind what has been put forward in recent hiring plans. The Department must now catch up with the plan in order to keep research, teaching, funding, and overhead generation at traditional levels. The present hiring plan is as follows:

Year	Search #	Objective	Level Preference
2000-01	1	Martin Replacement	None
2000-01	2	Solie Replacement	Asst. Professor
2000-01	3	New Position (formerly Polymer)	Asst. Professor
2000-01	4	Stille Chair (New Position)	Professor
2001-02	5	Fixman Replacement	Asst. Professor

Does the dept. have a plan?

- **Aging Infrastructure of Lecture and Lab Space**

The A, B and C wings of the Chemistry Building are 30 years old. The condition of the research laboratories, in particular, are a matter of major concern from many standpoints not the least of which are health and life-safety. These out-of-date facilities and their poor condition have a negative impact on graduate student recruiting and faculty recruiting and retention. Thirty years of wear and tear with little maintenance notwithstanding, much has changed in what is considered to be the standard for a safe chemical laboratory (20-30 years is considered the normal life span of a research lab). Moreover, health and life-safety standards and expectations have significantly increased over the last 30 years. In their present condition, the C-wing laboratories fall far short of this standard. Many institutions with whom we compete for graduate students and faculty have much more modern facilities as a result of recent renovations or new buildings, and this fact does not go unnoticed by visiting potential graduate students and colleagues.

The present Physical Development Plan includes plans for renovation of the chemistry research laboratories. Serious efforts should be made to move this plan to the top of the University's physical development priorities.

- **Graduate Student Recruiting**

  Nationally the pool of qualified domestic students who are pursuing graduate degrees in chemistry is shrinking. The Department needs to address the graduate student recruiting issue aggressively. To maintain our present quality and numbers of graduate students, we must increase the number of applicants, increase the acceptance rate, and/or look to other pools of applicants (China? Eastern Europe?). Some factors which affect these numbers (for example, number of fellowships, TA salaries, out of state tuition, and decaying infrastructure), require institutional assistance.

- **Departmental Divisional Structure**

The divisional structure of the Department is an issue that has been discussed ad nauseam for over two decades. With the turnover in faculty anticipated in the next decade, now seems to be as good a time to revisit this issue with the intention of serious overhaul. We must try to balance new trends and funding politics with the main trust of a classical education in chemistry that will prepare our students to adapt to the future of chemistry.

This year the Department is seeking to hire up to three faculty. The approach taken in the search was intentionally designed to play-down the traditional emphasis on divisional affiliation. The ultimate success of this year's hiring efforts will likely influence the Department's long-term attitude in this regard. If this approach facilitates our hiring the highest quality individuals possible, there is a good possibility that the notion of a looser divisional structure will be embraced and a permanent change in departmental culture will result. Alternatively, if the opposite result is obtained, it is likely that the Department will be less receptive to a looser divisional structure—at least, with respect to faculty hiring.

Finally, unlike many disciplines there is a definite "hiring season" for chemistry faculty at the assistant professor level. Irrespective of how well intentioned the motives may be, we have found that delays in the process and a lack of flexibility in procedures resulting from OEO regulations has actually hindered efforts to recruit and hire under-represented class faculty. By the time we have been in a position to interview and/or make offers to these highly sought-after individuals, they were often no longer available.

Ties with Chemical Engineering?

- **Indirect Cost Recovery**

Within the last two years, two of our most productive faculty have left the Department. Professor A. I. Meyers retired at the end of last Spring term after a two-year period of winding down of his research program. Professor C. R. Martin left CSU to take a position at the University of Florida. These two individuals generated a large amount of ICR and their absence has had its consequences. Within the last two years, the Department has hired five new Assistant Professors. We are presently searching to hire up to three more faculty.

If one considers the chemistry faculty that were hired in the ten-year period between 1990 and 2000, those individuals have averaged bringing into the CSU ca. $190K per person, per year in research funds. The vast majority of these individuals were hired as Assistant Professors and obviously they did not initially generate the $190K /year that they subsequently averaged. Given the loss of the two highly productive senior faculty, and the hiring of a large number of brand new Assistant Professors we have hired in the last two years, it is our considered judgment that it is highly premature to have serious concerns about any long-term declines in the research productivity of the Chemistry Department.

- **Library Issues: Priority Problems with Missing Monographs**

  While some ground has been gained in replacing the journal collection lost in the flood, virtually none of the monographs and few of the non-journal series collections have been replaced. The state of the chemistry collection continues to be a serious hindrance to the research efforts in the Chemistry Department and other research departments at CSU. Serious attention needs to be directed at this problem in the near term.

  The delays in getting research material through ILL have been a significant impediment to research. The library should try to rebuild its journal collection and/or access through electronic means. It remains to be seen if the new efforts from the Library to provide web access to ILL materials will improve the problem. It is unlikely, however, that this approach will significantly improve problems associated with non-journal type research materials.

- **Service Courses and Departmental Public Relations.**

Chemistry is a rigorous discipline which is an essential part of the necessary background material for many other areas of study. Complaints about the "quality of instructions" in chemistry courses are sometimes simply a reaction to the fact that chemistry presents a formidable intellectual challenge to some students who are required to take it. Moreover, resources require that most lower-level chemistry lecture courses be large consequently, some students feel that they are not given the personal attention they would like.

In the past, the Chemistry Department has had a public relations problem. We have been less concerned with perception than was probably prudent given the evolution of consumerist education. Recently, however, we have been making conscientious efforts to improve student relations and our general image across campus. We, for example, have revised the protocol for dealing with student complaints. We have made an effort to assign more of our best teachers to the large lower division courses. We have instituted a formal procedure for obtaining student feedback and suggestions through the establishment of the Student Chemistry Advisory Council. We feel that we are making real progress towards making chemistry more "user friendly."

While there is always room for improvement (even given limited resources), the quality of instruction in freshman and organic chemistry is excellent over all. Admittedly, our standards are high. The ultimate measure of the success of any instructional endeavor is, or at least should be, what the students learn—not how enjoyable the experience is at the time. But we do take any and all student concerns seriously. We would invite and welcome any faculty who have concerns about the quality of instruction in any chemistry course to attend lecture and evaluate it first-hand. Any feedback we would get from concerned faculty who are sufficiently committed to evaluate a class first-hand would be most valuable.

- **Issues of Undergraduate Education**

The number of undergraduate majors, particularly of high quality, is small given the international profile of the Chemistry Department at CSU. A major issue is one of retention. Increasing the number of scholarships available to meritorious undergraduate chemistry majors is a high priority goal. Also, gaining more control, at the departmental level, of the scholarship money in order to recruit and retain talented undergraduates would be a significant move in the appropriate direction to enhance the success of our recruiting efforts.

The department anticipates that the freshman seminar will become a valuable tool in recruiting and retaining majors. It is our belief that one of the major contributors to the attrition in the ranks of our majors during the freshman and sophomore years is the fact that our resource base forces the introductory courses for majors to be large and, thus, somewhat impersonal. The small size of the freshman seminar will allow majors and potential majors to develop a personal connection with the department that has previously been difficult or impossible to achieve.

Employment opportunities for chemists remains excellent; however, participation in independent research is becoming a more and more important factor in the marketability of BS chemistry majors - especially for the best jobs. Moreover, it is a prime factor considered by graduate admissions committees in chemistry departments around the country. While the Chemistry Department has offered independent research as an elective option, the burden of providing the resources for this course has fallen on the backs of researchers through externally funded research. The importance of the independent research experience has never been higher than at present. Increasing the numbers of chemistry majors who participate in research is a goal of the department—finding resources to fund the additional participants is the issue. Expanding undergraduate research should help with retention and recruiting of majors.

A constant matter of concern in the general chemistry program is the degree to which material being covered in lecture temporally correlates with related laboratory experiments. This problem is exacerbated by the fact that chemistry is in the rather unique position within the University of having lectures and laboratories which are separate courses. While this situation has the perceived political advantage for the University of reducing average class sizes, it has some distinct pedagogical drawbacks.

The issue of how to correlate the materials in lecture and laboratory better is of prime importance to our service mission.

A corollary to the above issue is the larger question of determining to what extent faculty resources should be directed at coordinating all aspects of general chemistry, down to and including insuring uniformity of course content between different sections of the same course. In one extreme, the Department might consider committing a full-time faculty or admin-pro position to this duty. From the results of the survey of peer departments (see Appendix B), all but one indicate some arrangement for overseeing or coordinating general chemistry, ranging from a dedicated faculty member to committee oversight. Our task is to determine how best to accomplish the degree of coordination desired while recognizing the limitations on resources.

Another resource-limited issue is that of expanding recitation sections to more of the large lower division courses. The Department strongly believes that recitation sections should be added to the second semester of the science-major general chemistry sequence and to the two semester organic sequence. Again the results from the survey in appendix B indicate that a majority of our peer institutions offer more recitation than we - in some instances significantly more. Eight institutions offer recitation in both semesters of general chemistry and four offer recitation in at least one semester of organic. While few in this department would argue against the pedagogical merits of taking these actions, there are practical questions of resource reallocation that must be addressed. More daunting, perhaps, are the political issues associated with introducing a total of 3 additional credit hours that would be required to complete course work through the sophomore organic series. We believe that smaller classes and more TA/student interaction will help with the general perception of some of our classes. Unfortunately, the reduction in the size of the auditorium in the new Chemistry/Biological Sciences teaching facility from the original planned 500 seats to roughly 250 seats has rendered moot our plan to offer the additional recitations using existing resources.

Finally, institutions across the country have come under pressure to improve the quality of instruction in courses taught by GTAs. Problems have increased as larger numbers of non-native English-speaking graduate students have joined the TA ranks; however, problems of poor instructional performance by GTAs is not restricted to non-domestic students. The overall performance of our GTAs has been very good, but we have plans to introduce a new course to help make it even better. This class will supplant

the present "Supervised College Teaching" course. We are not in the business of language education, however, and help from other corners of the University will be necessary if we are to make real progress in improving the GTA instruction from non-native English speakers.

Summary of Chemistry Department Issues

Virtually every issue raised in this report will require additional resources. It might be hoped that some of the resources freed by the present reallocation processes could be directed at these issues; however, given the result from last year, we are not optimistic. In fact, between the Open Position Tax and Reallocation, the Chemistry Department lost ground in its base.

Real reallocation requires that hard decisions be made at every level. It is our fear that egalitarian choices will be made in the course of this reallocation simply because they are easiest. As a result, PRSEs and other successful programs of distinction will suffer disproportionately simply because they appear to be easiest to tax. In all candor, this committee doubts that much will come of this report unless a critical ordering of priorities for reallocation is made at the highest levels of the University that preserves excellence already achieved and builds on that excellence.