

January 20, 2015

PROFESSOR SETH COHEN, Chair
Department of Chemistry and Biochemistry

PROFESSOR JUDY KIM, Vice Chair for Education
Department of Chemistry and Biochemistry

SUBJECT: Undergraduate Program Review for the Department of Chemistry and Biochemistry

Dear Professors Cohen and Kim,

The Undergraduate Council discovered that the Department of Chemistry and Biochemistry had not received a Senate response for the 2009 undergraduate program review. To rectify this omission, the Council has reviewed the review subcommittee's report and the Department's response. It was evident to the Council that many of the issues found in the review were budgetary and potentially difficult due to the economic climate at the time of the review. The Council will inquire about the status of each of these issues during the next undergraduate program review which is scheduled for 2015-16. The Council will also check in on the Department's concerns about offering service courses while maintaining a quality program for your own undergraduates, which we understand may be an ongoing issue.

The Council extends its thanks to the Department for its engagement in this process and we look forward to the next program review.

Sincerely,



Leslie Carver, Chair
Undergraduate Council

cc: G. Boss R. Continetti G. Cook R. Rodriguez B. Sawrey M. Sidney

**Committee on Educational Policy
Undergraduate Program Review**

**Department of Chemistry and Biochemistry
University of California, San Diego
April 9-10, 2009**

I Introduction

The Committee on Educational Policy (CEP) review committee for the Department of Chemistry and Biochemistry met on April 9 and 10, 2009. The committee had previously received material from the Chair of CEP and the Associate Vice Chancellor for Undergraduate Education (AVCUE). This material included (1) a letter dated June 6, 2008 from CEP chair Kim Griest to Professor Robert Continetti, Chair of the Department of Chemistry and Biochemistry, (2) the Department's Self-assessment report dated December 23, 2008, (3) supporting material, including course scheduling and enrollment data, courses taught, grade distribution by courses, funding and support summary, instructor ratings from CAPE, faculty workload policies, teaching statistics for chemistry and biochemistry, physical sciences and the general campus, ladder-rank faculty demographics, degree requirements, degrees awarded, distribution of majors by college, retention and time to degree, UCUES results, post-baccalaureate survey, UCSD Career services survey, and (4) the report of the last review of the department in July 1999 and subsequent letters from Barbara Sawrey, Vice-Chair of Chemistry and Biochemistry, Interim Dean of Natural Sciences Mark Thiemens and CEP Chair Gabriele Wienhausen. The committee also received an organizational chart of the department and the department's resource profile provided by UCSD Academic Affairs.

The committee met on March 6th with the chair and vice-chair of the department, with faculty members, lecturers with security of employment (LSOES), lecturers, teaching assistants, undergraduates, MSO and advising staff. On March 7th, the committee met with representatives from the colleges' Deans of Advising, once again with the chair and vice-chair, and finally during an exit interview with the AVCUE, the Associate Dean of Physical Sciences and representatives from the office of the Academic Senate and the Senior Vice Chancellor for Academic Affairs.

II Description of the current operation of the department

The Department of Chemistry and Biochemistry (C&B hereafter as in the self-study report) is ranked 20th in the 2009 US News and World Report ranking of Chemistry Graduate programs. The department currently has 46.10 Regular Filled FTEs 6.00 FTES in Recruitment and 7.50 Temporary FTEs allocated. The FTES include 2 LPSOEs (one of whom is currently Associate Vice-Chancellor for Academic Affairs) and 3 LSOEs. The Department Chair is Robert Continetti. There are two Vice-Chairs, one for Undergraduate Affairs (Doug Magde) and one for Graduate Affairs (Dan Donoghue).

The former is responsible for recruiting and supervising lecturers. The MSO (Marjorie Hardy) is responsible for a staff of 36. On the undergraduate education side, this includes a Student Affairs Office, managed by Irene Jacobo and with 7 staff (one vacant) and Undergraduate Laboratories run by Suzanne Anderson with a staff of 7. Both of these offices also report to the Vice-Chair for Undergraduate Affairs (VCUA). A faculty Committee on Undergraduate Affairs provides faculty input into the department's undergraduate teaching.

C&B is a large department, with approximately 1200 majors. This makes it one of the largest such departments in the country by number of graduating majors. It also teaches a large number of service courses: in fall 2008, total enrollment was 7863 students (not including research or joint courses). One third of enrolled students approximately are chemistry and biochemistry majors. Majors can pick one of 10 specializations. Three are large: biochemistry, chemistry, and pharmacology. Pharmacology has grown substantially since its creation to 438 majors (Fall 2008 numbers). Biochemistry has 496, chemistry has 191, and the other specializations have 42 combined. This growth has significant impacts on the overall operation of the department. It is worth bearing in mind that, from an undergraduate teaching perspective at least, only about 20% of majors are chemistry majors. On the whole, the specializations do not differ drastically between each other in terms of requirements, although pharmacology has a number of outside classes as requirements and consequently requires fewer units from chemistry and biochemistry. Nevertheless, 80% of students are only doing 2 quarters of Physical Chemistry rather than 3.

The standard faculty course load is essentially 2 per year, one large and one small class. The departmental Bylaws contain a remarkable formula to determine each faculty member's teaching load, but in practice class allocation is carried out in concert between the Chair, the VCUA and the Divisions within the department (these essentially reflect research areas: Biochemistry, Inorganic Chemistry, Organic Chemistry and Physical Chemistry). The service courses (11-12-13, the 6A/B/C sequence and 140A-B-C) and most of the laboratory courses are covered predominantly by lecturers.

There has been a lot of turnover on the staff side in the past, from student advisors up to the MSO level. Some level of continuity now appears to have been established, but the department is still addressing issues of staffing stemming from this time.

III Analysis of the strengths and weaknesses of the department's program

The committee was impressed by the department's ability to deliver a high-quality education to a large number of students, both large service courses and upper-division courses for its own majors. This is achieved by having dedicated faculty, lecturers and laboratory staff running a very tight ship in lectures and laboratory classes. With some exceptions, students like classes and students like chemistry and biochemistry. At the upper-division level, they are able to get a high-quality education in a small-college atmosphere.

The overall picture is one of impressive achievement with increasing strain present in the system. The 9% budget cut due on July 1 will add to this strain. The major problem, namely growing waitlists, does not appear to be one of willingness or manpower, but one of resources: laboratory courses cost the department more than it brings in. This is not TA or Temporary FTE money, but permanent budget money, precisely what is being cut.

In this and the following section, we break down the department's activities under four headings. Aspects such as TAs that are common to both major and service classes (categories A and B) are discussed in B.

A) Undergraduate Majors

The combination of a large service teaching load combined with cuts in monetary support, along with a doubling of majors, has seriously impacted the chemistry majors' experience.

The numbers of majors has doubled in the last 10 years. Part of that growth is due to the general growth in numbers on campus. Part of it seems to be due to the introduction of the new pharmacology majors. The committee applauds the department's ability to attract majors and graduate students in chemistry and biochemistry. Campus funding models reward departments for the number of majors they have, so high numbers should work to the advantage of the department. However the sheer weight of numbers is now taking its toll on the educational mission of the department. The committee heard about waitlists in bottleneck classes such as 6BL leading to students' being delayed in taking these sequences by up to a year.

The department clearly values undergraduate research, and undergraduates appreciate it and participate in it. Research experience is required for Honors students. Actual numbers seem hard to pin down because a large part of it is carried out not as part of 199 classes or in other departments. There was concern that students were not finding out about such possibilities until late, possibly too late, in their career. This appeared to be the case not just for weak students but also for strong students.

The self-study report makes very little mention of transfer students. One can hope that no news is good news. However, mixed opinions were heard: better on average, worse on average, more mature, etc... The reality appears to be that transfer students have higher variance, and that a great deal depends on where they come from. The diversity in the department has increased, although no statistics are presented in the self-study report even though the 1999 report had specifically asked about this.

Advising was mentioned repeatedly. Faculty would like to see more faculty advising, students would like to see more faculty advising. Students appeared to obtain information at least on some occasions from their peers rather than from the student affairs office, which was a worrying prospect. Misapprehensions seemed common even in the small sample of motivated students the committee met. It is true that the current

advising staff have not been in their present jobs very long, and in addition a lot of their time is spent dealing with non-majors. However the colleges' Deans of Advising were positive about their efforts.

There was some concern about the availability of state-of-the-art equipment of laboratories. Faculty have in the past written grants for teaching equipment and the department has had success obtaining gifts from industry (from Pfizer for example). There was concern however that C&B majors do not have hands-on access to an NMR instrument as part of their advanced laboratory classes. Accounts of UCSD C&B majors being at a disadvantage in the job market as a result of such lacks, and not because of the perceived quality of their chemistry degrees as a whole, disturbed the committee.

One of the consequences of UCSD's college system is a wide range in general education requirements. Computerization of enrollment has revealed hidden prerequisites that had not been noticed for years. The VCUE is currently reviewing the curriculum in this regard.

B) Service teaching and links to the rest of campus

Classes like 6A/B/C and 6BL need to satisfy the needs both of the department's own majors and of the students outside the major. They appear to carry out this role and to give students the "big picture" and foundation needed in the subject. While there does not seem to be any formal feedback mechanism to liaise with other departments, informal feedback occurs and seems to work.

One problem linked to increasing class sizes is the lack of large lecture rooms on campus. This can force classes to be lectured twice. It is also an issue when giving exams.

Coordination between multiple sections is informal, but viewed as effective when it happens. There was concern about inconsistent coverage of material in parts A and B or multiple class sequences ascribed, at least in part, to GPA manipulation for professional schools and to inadequate advising.

As for every service department, C&B has no ability to control numbers. There is concern that the Division of Biology's obtaining impacted status may lead to further increases in the number of majors in C&B, particularly in the pharmacology specialization.

TA training was viewed as good: it comprises safety training, videotaping of lectures, feedback, and so forth. The TAs the committee saw were enthusiastic and knowledgeable.

C) Faculty issues

The Penner parameter is extremely high (1.88 in Fall 2008). This has been the case for years and presumably the administration is aware of this. The department appears to

have found a way to provide its teaching effectively without impossible strains being placed on it. The committee did not hear serious arguments to expand faculty dramatically to lower the ratio. Maybe the current budget crisis makes such wishes appear too impractical.

Teaching is clearly taken seriously in the department. Junior faculty are aware of its importance as part of the promotion process. The chair, VCUA and senior members of the department commented on the department's efforts to encourage good teaching and the fact that UCSD CAP is aware of these efforts.

Junior faculty are expected to teach one large class a year and this number is a reasonable number. The perception of some junior faculty is that their teaching evaluation is based solely on CAPE scores. The committee has heard examples of junior faculty changing the course material in response to this. It is entirely possible that the resulting course covered all the required material and was more effective at engaging the students, rather than being dumbed-down. The issue may partly be one of calibration. However, the motivation for these occurrences is very clear.

Large research universities like UCSD often justify their spending on startup and hiring of outstanding researchers by the argument that students benefit from contact with these leading researchers. The majority of majors are now either in the biochemistry or pharmacology Specializations. However, there is only one faculty member working in pharmacology, and problems arise when he takes sabbatical.

D) Succession

A critical question is that of the long-term successor to the current VCUA. The position is clearly all-consuming and burdensome. The present incumbent stepped in when Barbara Sawrey moved to become AVCUE. What happens when he in turn decides to move on? He is clearly aware of the issue and working to train other, more junior, colleagues in aspects of the job. However, either one person will have to take on the whole load, with or without training, or the job will have to be split up. In parallel, the role of the department's Undergraduate Affairs Committee seemed rather nebulous. Is its main remit curriculum? Petitions and administration seem to be the charge of the VCUA.

IV Recommendations

A) Undergraduate Major

1. Faculty Advising. There appears to be an urgent need for more faculty interaction with and advising of majors. The ratio of 1200 majors to 45-50 faculty is reasonable for an advising system where each undergraduate student, perhaps starting in the sophomore year, receives is assigned a faculty advisor. In practice many students do not consult an assigned advisor: the Department can either accept this tendency or counter it by

requiring the student to obtain a faculty signature periodically, e.g., each year/quarter. In any case, more faculty advising seems to be needed.

2. Transfer Students. The department should keep track of transfer student data (see the 1999 report recommendations).

3. Student Progress. Students should be encouraged more strongly to take classes on track. Implementation of policies to cut down on more egregious cases is worth considering; making critical classes prerequisites is one clear solution. However, it is noted that a number of students are off-track because of not being able to get onto laboratory class waitlists that contain non-majors with higher standing.

4. Student Awareness of Majors within Chemistry. A number of students would benefit from broader knowledge of the different undergraduate majors and specializations.

5. Lab Instruction Equipment. Concerned lecturers and faculty are clearly working on ways to address the issue of instructional instrumentation improvement, including getting access to old research instruments. A formal mechanism for identifying instrumentation needs and writing instrumentation proposals, and making sure that faculty, L(P)SOEs and lecturers are rewarded and encouraged to do so even if the outcome is ultimately negative, should be considered. The current economic and funding climate may provide opportunities from federal funding and struggling companies.

6. Undergraduate Research. More publicity and information about undergraduate research would be helpful to students. This may be addressed through student advising, by faculty, staff, and other students (via their organization). In addition, some means of tracking both how many B&C majors are carrying out undergraduate research as well as how many undergraduates are working in B&C laboratories (not the same population) would be useful information for the department to keep track of, especially in these times of increased attention to assessment and value-added to students.

B) Service teaching and links to the rest of campus

1. Student Access to Courses. Anecdotal evidence indicates that a large number of both C&B and non-C&B students are unable to take C&B classes when they would like to because of enrollment limits. The latter is a core issue for service to the rest of campus. Apparently, the demand for courses and the provided supply of class slots are out of balance. Analysis of service teaching needs, fulfillment, and waitlist should also be done on an annual basis. There are apparently estimates of incoming students which at least define needs for freshmen classes, but these were not formalized.

2. Relationships with Client Departments. There do not appear to be mechanisms for interaction with client departments. Some mechanisms in between informal conversation and formal requests to CEP would probably be helpful. To quote a review committee report from last year: "The committee realizes that obtaining feedback from client departments can be difficult. The current review structure does not explicitly contain a

mechanism for doing so. However, it would be useful to have some mechanism in place for subsequent CEP reviews of departments with large service teaching loads to aid in understanding how successful the service teaching is, or at least appears to be. This is really a recommendation to CEP as well as to the department.”

3. Standardization of Class Content. Some mechanism for class coordination would help consistency across multiple offerings of a course during a quarter or academic year, and also offerings between years. A clear framework or policy could make coordination relatively straightforward.

4. The Need for Large Classrooms. The committee has no recommendation to offer here. This is a concern evoked by many, if not most, departments. The administration must be aware of it by now, but we repeat it here.

C) Teaching load and faculty

1. Additional Communication to Faculty About Teaching Assignment Policies. As mentioned above, the committee was amazed by the formula for teaching workload. It is clearly of enormous historical value, but junior faculty were quite unaware of it and concerned with other issues. The present Division-based system seems to work well on the whole, but some additional explanation to junior faculty and new faculty of the process and underlying reasons (both historical and CAP-related with respect to giving junior faculty a taste of everything) for teaching assignments may be helpful.

2. Faculty Expertise in Undergraduate Courses. UCSD does not hire faculty to over aspects of the undergraduate curriculum. However it is definitely a secondary consideration in hiring. For B&C, it could be a primary consideration in two cases. First if it were decided to replace the VCUA by faculty in the field of Chemical Education. (The situation for hiring an LPSOE is a little different, but not completely.) Second in the area of pharmacology. Pharmacology is a very large major but does not match the department’s research focus areas. While the education in this area is provided by one or a few faculty, additional faculty and more formal interactions or identification of such with the School of Pharmacy may bolster the educational program by integrating further the strengths of a research-intensive university. If education in pharmacological chemistry is to achieve further distinction, recruiting faculty with both research and education interests in this area would be beneficial.

D) Succession

1. The succession to the Current VCUA and Long-term Plans for Undergraduate Educational Planning. These issues need to be addressed and are critical to helping the department plan future undergraduate educational efforts. Possibilities include: (a) Convincing a single person to do it. The rewards would have to serious to make this an attractive offer to junior faculty. One option might be to hire someone in Chemical Education to do the job. (b) Splitting the job up and rotating amongst faculty. (c) Splitting the job up and having the pedagogical side devolve to the UAC and the

management side to an administrative person. Management of the lecturers doesn't quite fit in with this approach. The faculty and lecturers would ideally work together to synergize their areas of expertise as related to education.

2. A More Active Undergraduate Affairs Committee. Such a committee could well be chaired by the VCUA and might take some of the burden off the VCUA in the area of curriculum. Committees are not always enthusiastic about undertaking tasks like curriculum revision and prerequisite hunting, but appropriate incentives might make an active role more palatable.

V Financial Issues

1. Funding for Advising of Non-C&B Majors. The current campus and department funding model does not appear to provide for the advising provided by C&B and other service departments for majors outside their own department. For departments with large service instruction, such as C&B, this can be a major resource issue. While the current advisors are well-liked, they are few in number and staff transitions result in serious perturbations to advising.

2. Funding for Laboratory Classes. The current departmental funding model for laboratory classes, based on the faculty's own judgment of what is needed to provide a sound pedagogical environment, appears untenable with the current press of numbers. The result now is growing waitlists and ultimately will be delayed time to graduation. The situation will deteriorate with the current budget crisis. Increasing bench fees seems necessary but also appears insufficient to solve the problem. PRC has already allocated \$200,000 to the permanent operating budget. There is a plan to solve the formula, but it will require one-time investment (\$1M, probably necessary in any case) as well as an increased budget (\$200K/year + 1 person). With no action, the alternative to waitlists is poor education.

3. Lecturer Funding. The department uses a large number of lecturers to cover some of the service teaching load. If this part of the budget were cut, the result would be serious problems for the department.

Stefan Llewellyn Smith, Department of Mechanical and Aerospace Engineering, UCSD
(chair)

Robert Sah, Department of Bioengineering, UCSD

Robert Corn, Department of Chemistry, UCI

August 31, 2011

PROFESSOR DOUGLAS MAGDE, Vice Chair
Undergraduate Education, Department of Chemistry and Biochemistry

SUBJECT: Undergraduate Program Review: Department of Chemistry and Biochemistry

Dear Professor Magde,

On April 11, 2011, the Committee on Educational Policy and Courses (CEP) considered the review for the Department of Chemistry and Biochemistry, which included the report of the Review Subcommittee that conducted a site visit with the Department and the Department's response. The Committee would like to thank the Department's for its thoughtful response, which addressed issues of Department and campus concerns. Indeed, the Committee intends to consider many of the issues raised in the response in the coming months – it's clear that these issues cut across campus, and are not specific to the Department of Chemistry and Biochemistry. Your well-articulated response provides a good basis for these discussions.

However, for the purposes of the Department's undergraduate review, the Committee asks that the Department submit a response that focuses exclusively on the recommendations of the Review Subcommittee. Particularly, the Committee wishes to understand where the Department agrees or disagrees with the recommendations, what its plans for implementing the recommendations will include and where there are barriers & hardships to implementing the recommendations. Such a response will allow the Committee to finalize its review and assist the Department in addressing the Review Subcommittee's recommendations. Please forward your response to the Undergraduate Council, c/o Senate staff Miky Ramirez (mikyramirez@ucsd.edu), by November 23, 2012.

Sincerely,



Mark Appelbaum, Chair
Committee on Educational Policy and Courses

cc: S. Cohen
D. Hamann
G. Masters
B. Sawrey
M. Todd