

SIMON FRASER UNIVERSITY
Senate Committee on University Priorities
Memorandum

TO: Senate

FROM: Jon Driver
Chair, SCUP and
Vice President, Academic

RE: Department of Chemistry

DATE: October 22, 2008

The Senate Committee on University Priorities (SCUP) has reviewed the External Review Report on the Department of Chemistry, together with responses from the Chair and Dean of the Faculty of Science, and input from the Associate Vice President, Academic.

Motion :

That Senate approve the recommendations from the Senate Committee on University Priorities concerning advice to the Department of Chemistry and the Dean of Science on priority items resulting from the External Review.

The report of the External Review Team* for the Department of Chemistry was submitted in July 2008 following the review team's site visit. The response from the Department of Chemistry and the response from the Dean were received in August 2008.

The Review Team viewed the Department as a strong department which has made very good hiring decisions. A number of recommendations were made by the Team which may further strengthen the Department.

SCUP recommends to Senate that the Department of Chemistry and the Dean of Science be advised to pursue the following as priority items.

1. Undergraduate Programmes

- As a priority and with the assistance of the Dean, establish a plan for the upgrading of equipment in the physical and analytical chemistry laboratories.
- Review the level of dependence on the use of sessional instructors for teaching undergraduate courses.
- Review the teaching loads of the continuing faculty.

2. Graduate Programmes

- Review the requirements for the B Sc and the MSc degrees with a view to avoiding 'double numbering' of courses.
- Review the procedures for the admission to the PhD to ensure consistent application of admission requirements..
- Introduce a graduate course for PhD candidates that includes the preparation and defense of an original research proposal.
- Review the graduate stipends offered to ensure they are competitive with other departments of Chemistry across Canada.
- Consider the compilation of a departmental Graduate Student handbook.

3. Faculty

- Consider with the assistance of the dean, the possibility of increasing the number of faculty.

4. Administration

- As a priority and with the assistance of the Dean, address the critical safety issues associated with the Shrum Science Building.
- Continue to seek possible solutions to address the shortage of adequate space.

*** Review Team**

Dr. Steven Loeb (Chair) - University of Windsor

Dr. Douglas Stephan - University of Toronto

Dr. Monica Palcic – Carlsberg Research Centre, Copenhagen

CC Mike Plischke, Dean, Faculty Science
 Andrew Bennet, Chair, Dept of Chemistry



TO: Bill Krane , Associate VP
Academic

FROM: Dr. Michael Plischke, Dean
Faculty of Science

RE: External Review of Chemistry DATE: August 26, 2008

I am writing with respect to the 2008 external review of the Department of Chemistry and the Department's response, dated August 25, 2008. The Department has either accepted the recommendations of the review team or has referred them to the appropriate committee for further discussion and I therefore have little to add. The report contains a formal "Recommendation" section but the body of the report also contains some suggestions that are not reiterated in this summary or addressed in the Department's response. I will highlight a few of these.

The review is highly complimentary of the quality of the Department's research and teaching faculty and I completely agree with this opinion. The Chair, Andrew Bennet, and his predecessor, Mario Pinto, are to be congratulated for positioning the Department in such a way that it is competitive with any in Canada in its areas of strength.

The external review report identified four primary areas of concern: (i) quality of the research space in the Shrum section of the Science area, (ii) poor quality of equipment in some of the undergraduate teaching laboratories, (iii) excessive use of sessionals in the teaching program and (iv) graduate program organization and resources. I will comment briefly on each of these.

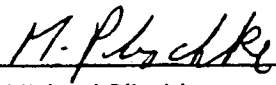
(i) Quality of Research Space in the Shrum building: There is no doubt that this space is inadequate and potentially unsafe. The University has recognized this and made a new building for Chemistry one of its highest priorities. However, relief is probably several years in the future.

(ii) Undergraduate laboratory equipment: This is a situation that must be fixed. I will work with the Department to formulate a financial plan to refurbish the relevant labs over a two- to three-year period. The expected cost to bring these labs to an acceptable standard is around \$1,200,000, a sum not easy to find in these difficult times. However, the review committee identifies this as the most urgent priority and we will have to address it.

(iii) Excessive use of sessionals: There is no doubt in my mind that Chemistry uses an undesirably high number of sessional instructors. A glance at the position roster of the Department reveals that there are two vacant positions and three other tenure-track faculty with 100% teaching relief. As well, because of secondments (Holdcroft , Eikerling), CRCs (Branda, Gates, Vocadlo), UFAs (Andreoiu), LEEF Chairs (Young). MSFHR awards (O'Neill), split and administrative appointments (Agnes, Bennet and Percival) a further eleven tenure

track faculty have reduced teaching loads. Therefore, it is easy to see how we have arrived at the present state of affairs. While it is not stated in the recommendation section, there is a clear hint in the text that the Department should have a discussion of whether or not the current "normal" teaching load is consistent with the imperative to deliver quality undergraduate and graduate programs.

(iv) Graduate program issues: The Department has addressed most of the points raised by the review committee. Two that have not been addressed are the double-numbering of fourth year undergraduate courses as graduate courses and the introduction of a comprehensive examination for Ph.D. candidates. Double-numbering of courses is highly undesirable in my opinion but is, unfortunately, becoming more common across the Faculty. I have no firm opinion on the benefits of a comprehensive examination but do recommend that the Graduate Program Committee consider it.


Michael Plischke

c: Andy Bennet

Response of the Chemistry Department to the Comments and Recommendations of the External Review Team Prepared by A.J. Bennet, Chair with Input from Chair's Advisory Committee
August 25, 2008

1. Introduction

The Chemistry Department thanks the External Review Team for the time and effort they put into their analysis and the clear statement of the challenges facing SFU Chemistry. We agree with most of the recommendations and are working on those that are within our power. Before responding to specific comments and recommendations we correct a few misunderstandings that were incorporated in the report from the external review committee.

2. Clarification:

Teaching loads (page 9, also mentioned on pages 4-5): *"The normal teaching load is 2 courses for research faculty, 4 courses for lecturers therefore 32 courses can be covered by the research faculty and 28 by the lecturers."* We try to set a normal teaching load for faculty who do not have teaching release or major administrative duties to 2½ courses per year. The additional half course results from team teaching of the graduate seminar course CHEM 801 and occasionally other graduate courses. With regard to the lecturers, the normal teaching load is two courses per semester for eight out of nine semesters (the ninth semester being for professional development). Thus, the average teaching load for a lecturer is 5½ courses per year.

Page 9: *"Replacements for Hill and Pomeroy should be sought, but additional research faculty should not be hired unless NEW laboratory space is available."* It is our understanding that faculty members who are on an extended medical leave of absence (Pomeroy in this case) cannot be replaced. Also, when the replacement position for Professor Hill is allowed to be advertised (currently this position is, as are all others in the department, frozen) the successful candidate will be housed in the state of the art facilities that are currently assigned to Professor Hill in the TASC-II building.

Page 10: *"5) Some support staff had the view that there had been a gradual erosion of support for teaching and a resulting increase in their overall workload. In particular, the use of diminished space for undergraduate laboratories and ..."* It is true that when Professors Branda and Vocadlo were hired (both as Tier II CRCs) reductions occurred in the teaching spaces allocated to the analytical/physical and organic teaching laboratories, respectively. However, when the new TASC-II building was opened the allotted teaching spaces for these vital undergraduate student laboratories was restored to approximately their historical sizes.

3. Responses to the Specific Comments and Recommendations:

i) Recommendations related to Departmental infrastructure

Laboratories

The Department agrees with the review committee that *"The oldest laboratories used for research and teaching are embarrassing and unsafe. Wooden fumehoods are a fire hazard and generally provide poor ventilation. Several of these laboratories are cramped due to outdated design and lack proper egress for evacuation in the event of an emergency."* Thus, almost all of the laboratories that contain fume hoods in the Shrum Science Centre are unsafe. The notable exceptions are C8024, C8031, and C9013. C8024 is a research laboratory that was renovated after the occurrence of a fire. C8031 is an undergraduate teaching laboratory which was renovated at a cost of \$1M -- note the comment on page 3 of the report, which states: *"The renovations to undergraduate laboratories for general chemistry were very nicely done. The*

consequence is an inviting, efficient and safe learning environment". C9013 was renovated at a cost of \$800K for the synthetic chemist Dr. Robert Britton: this renovation became necessary when SFU hired Dr. Robert Young as the LEEF chair in Pharmaceutical Genomics and Drug Discovery as Dr. Young was given the use the synthetic laboratory SSB8148 that was to house Dr. Britton when Dr. Mario Pinto's research group relocated into the TASC-II building.

Accordingly, the Department agrees with the review committee that "... *there is a critical need for a new building.*".

With regard to faculty currently housed in the Shrum Science Centre wing, which the review committee labeled as "*third world standards*", the department is cognizant of the problems with these laboratories and that the worst laboratories are those used for synthetic chemistry applications, i.e., those where the wooden fume hoods are being routinely used for chemical reactions. The list of faculty for which this situation holds is: Leznoff, Plettner, Pomeroy (when he is not on medical leave), Storr (starts September 1, 2008), Walsby, Wilson, and Wolfe (emeritus). In addition, Drs. Agnes, Li, O'Neill and Percival require occasional access to fume hood facilities. Unfortunately, the cost of removing old fume hoods and replacing them with modern facilities is extremely expensive (see examples listed above).

It is clear that the committee's recommendation: "... *it is absolutely essential that a plan for renovating the worst of both the teaching and research laboratories be implemented immediately.*" will require a sizable investment from the University. The department is committed to doing everything within its power to ensure that all faculty and students are provided with a safe working environment in addition to the modern infrastructure necessary to ensure their (and by extension the university's) success. The problem is clear, but the remedy requires a very significant investment.

Office Space

The review committee noted (on page 10) that: "*There is a critical lack of departmental space for general meetings, thesis defences, group meetings, etc. The current booking system and method of room allocation are seen as impediments to the efficient operation of an academic department.*" The department views this shortage as critical. Unlike other departments (Biological Sciences and Physics have 4 and 2 various sized meeting rooms, respectively) we have no space for even small meetings. In addition, we lack the space needed for teaching assistants to give office hour assistance to undergraduate students. For obvious safety reasons we actively discourage graduate students from allowing undergraduates to visit them in their research laboratories. The department would like to correct this deficiency because chemistry is the central science and many undergraduate programs require their students to have a basic understanding of general and organic chemistry. It is crucial, as part of the University's current retention drive, to ensure that students enrolled in the department's "gatekeeper" courses CHEM120/121 (General Chemistry I) and CHEM281 (Organic Chemistry I) are given every possible resource to help them succeed. As can be seen from the statistics given in the review document for the year (2007-4 to 2008-1) 1,158 and 685 students enrolled in CHEM120/121 and CHEM 281, respectively. The department opened, with financial support from the Dean for one semester (2007-3), a "resource centre", an idea borrowed from the undergraduate program at the University of Windsor. In essence, two of the larger offices in chemistry were set up with computers and numerous chemistry textbooks for use by first-year undergraduates who were identified as having problems in CHEM120/121. These rooms were staffed by two of our best teaching assistants for 12 hours per week each. However these two offices have now been assigned to new faculty members and this program, which produced encouraging results (the

fraction of D and F grades decreased by ~14%), had to be terminated due to lack of both space and TA funding. Details of current office space are given in Appendix 1.

ii) Recommendations Related to Undergraduate Teaching and Curriculum

The Departmental Undergraduate Studies Committee (DUGS) was pleased to see the very positive evaluation of the Chemistry undergraduate program in general and it agreed with the reviewers' recommendations that: "*The department, faculty and university need to make the upgrading of the undergraduate laboratory equipment a high priority.*" The Department is well aware that the purchase of modern equipment necessary to give students a practical correlation between the experiments that they perform in the teaching laboratories and what they will encounter in "the real-world" will require a significant investment of at least \$1.2M (see Tables 10 and 11 on pages 6 & 8 of "The Chemistry Department: A Self Study The Future" document given to the reviewers).^{*} We are confident that a phased renewal plan over four to five years would allow the department to integrate the new instrumentation into courses throughout the curriculum. Of note, the figure mentioned above does not include the suggested "... *low field (200-300 MHz) NMR spectrometer*". However, given the recent calamity associated with the burst steam pipe and the associated damage to three departmental NMR spectrometers we feel that it is premature to request money for a dedicated undergraduate instrument when the replacement research NMR spectrometers may be able to handle samples from undergraduate laboratories.

We also agree with the statement in the report that: "*There is a definite need for more faculty*" in order to improve our undergraduate course offerings and to have our program accredited. The report also recommended that we reduce our reliance on sessional instructors: "*The use of sessional instructors is typically meant to be a stop-gap procedure for unique demands arising from sabbaticals, faculty awards (teaching reductions) and as a result of administrative postings*". This perceived dependence on sessionals results, in part, from the recent faculty renewal that has taken place within Chemistry (see self study section). For instance, during the 2007-3 to 2008-2 academic year there were no fewer than eight individuals who were at some point on a study leave. The situation is exacerbated when it involves a teaching faculty member taking a year-long study leave, as the department must use sessionals to cover between 5 and 6 full courses.

The department was happy to note that the review committee noted the benefits of LON-CAPA (Learning Online Network with Computer-Assisted Personalized Assignments): "... *dedicate a staff member, Ray Bachelor, to the development, implementation and exploitation of the LON-CAPA on-line learning tools. This is particularly well utilized in Year 1 courses for assignments and on-line practice questions. A brief demonstration convinced the committee of the versatility and usefulness of this strategy.*"

Based on the concerns of undergraduate students highlighted in the report the department will offer CHEM260 more frequently (4 out of 6 semesters rather than the current 3 out of 6). This change has already been implemented.

iii) Recommendations Related to the Graduate Program

The Department Graduate Studies Committee (DGSC) has reviewed the comments made by the

^{*} We have not chosen state-of-the-art equipment but rather "workhorse" instrumentation. The 2001 external review of the department noted that up to \$3M would be needed to furnish the analytical chemistry laboratory with research grade infrastructure if the department was to offer professional development courses for industrial users.

external review team and appreciated the constructive input.

Students

We have started a survey of graduate student stipends in chemistry across the country and the DGSC will bring this matter to a Department meeting for discussion and, ultimately, a vote to raise graduate student stipends to a much more competitive value. With regard to the concerns voiced in the panel's report that: *"The department is encouraged to be selective in the admission process and maintain competitive standards as a reputation for lower admission standards can be extremely detrimental in recruiting efforts"*, the DGSC recognizes the situation and is taking steps to make entry into the program more demanding while still enabling students coming from diverse backgrounds to gain entry and engage in interdisciplinary studies.

Graduate Courses and Requirements

The DGSC has already prepared a draft proposal to incorporate a comprehensive exam into the requirements for a Ph.D. degree.

Also, the review team states: *"We recommend that a Graduate Student Handbook be compiled that would outline all the expected program requirements for a graduate student, provide a timeline and highlight important dates."* The DGSC is now aware that some students are uncertain with regards to the requirements for transfer to the Ph.D. program. The committee will continue their efforts to make the process transparent to students and faculty members.

The shortage of graduate courses was noted by the panel. The DGSC is aware of this problem and possible solutions will be brought forward for discussion at a future departmental meeting. Also, the external review team recommended that: *"the department seriously consider a team taught "core" graduate course for year one graduate students. This could be comprised of several short modules each focusing on a particular advanced area or a sub-discipline"*. The DGSC plans to discuss this option further and will bring its recommendations to a departmental meeting for discussion.

Other Graduate Student Items

The review committee noted: *"There were some questions about workman's compensation coverage for graduate students on scholarships working in the laboratory. Are they students or are they employees? It was not clear what the details of the occurrences were, but the department (and university) is encouraged to take this very seriously. It would be completely unfair to expect students to cover their own costs given their meagre salaries."* There is indeed inequity with regard to benefits for graduate students. Some benefits which are standard for SFU employees, including those students appointed as teaching assistants, are considered by the University to be optional for graduate students. This means that faculty are forbidden from paying for such benefits from NSERC/CIHR grants, for example. Apart from the issue of inequity, there is considerable paperwork involved in switching back and forth between different rules for TSSU members and research assistants. As a Department we urge the administration to make extended health insurance and basic life insurance mandatory benefits. This issue has taken on renewed significance for the Department because of the recent death of one of our graduate students. The student body is currently fund-raising in order to purchase airline tickets for the parents of the dead student to come from China.

Appendix 1: List of offices in SSB and SSC currently assigned to the chemistry department.

Room	Area (m ²)	Occupant	Room	Area (m ²)	Occupant
C7002	7.3	C. Zhang and F. Haftbaradaran (Tech)	C8062	12.7	D. Leznoff (F)
C8041	12.7	R. Young (F)	C8064	11.6	A. Lewis (NMR)
C8043	11.6	R. Batchelor (TF)	C8066	11.6	S. Lavieri (TF)
C8045	11.6	R. Pomeroy (F)	C8068	13.1	L. Hanlan (TF)
C8047	13.2	Y. Broderick (MAAS)	C8070	13.2	S. Wolfe (EF)
C8049	13.2	K. MacFarlane (MLS)	C8072	13.1	M. O'Neill (F)
C8051	13.1	Budget Assistant and "Scantron Scanner", which is used for marking multiple choice exams	C8074	13.1	E. Plettner (F)
			C8076	13.0	S. Purdon (Assistant to Chair)
			C8078	25.3	A. Bennet (Chair)
C8053	13.1	BISC	C8080	13.3	D. Vocadlo (F)
C9016	10.7	J. Wilkie (F)	C8082		Storage room for confidential documents
C9016a	10.8	K. Starosta (F) start date Sept 1, 2009	C9036	9.3	Radiation Safety
C9016b	15.9	C. Andreoiu's students (data analysis)	C9037	9.3	G. Mund (TF)
C9016c	16.0	C. Andreoiu	C9038	9.3	SI
C9030	9.2	Adjunct Faculty	C9039	8.2	SI & NMR processing
C9031	9.2	μ SR data analysis	C9040	11.2	TRIUMF Laboratory
C9032	9.3	J.-C. Brodovitch (TF)	C9041/3	15.0	All Other Emeritus Faculty
C9033	9.3	SI	C9042	10.9	A. Zhang (TRIUMF administrative assistant)
C9034	9.3	M. Eikerling (F)	C9044	12.1	P. Percival (F)
C9035	9.3	Undergraduate Student Common Room	C9045	10.9	T. Storr (F)
SSB7100	12.4	R. Britton (F)	C9047	12.1	C. Walsby (F)
SSB7102	12.8	G. Agnes (F)	SSB8100	12.4	R. Goyan (TF)
SSB7104	13.1	P. Li (F)	SSB8102	12.7	S. Holdcroft (F)
SSB7106	13.1	P. Wilson (F)	SSB8105	13.1	D. Sharma (TF)
SSB7103	25.9	Graduate Student Common Room	SSB8140	12.1	M. Pinto (VP-Res)
			SSB8144	11.2	U. Kries (TF)

Legend: F = faculty, TF = teaching faculty, EF = emeritus faculty, Tech = Instrument technical support, BISC = Assigned to Biological Sciences, NMR = Major instrumentation coordinator, SI = sessional instructor, MAAS = Manager, Academic and Administrative Services, MLS = Manager, Laboratory Operations.

EXTERNAL REVIEW REPORT

DEPARTMENT OF CHEMISTRY – SIMON FRASER UNIVERSITY

On-Site Visit Dates

March 26th – 28th, 2008

Review Committee

Stephen J. Loeb (Chair) – Department of Chemistry & Biochemistry, University of Windsor

Douglas W. Stephan – Department of Chemistry, University of Toronto

Monica M. Palcic – Carlsberg Research Centre, Copenhagen

David H. Boal (Internal Consultant) – Department of Physics, Simon Fraser University

Context

Over a three day period, the review committee met with all members of the Department of Chemistry including teaching and research faculty, support staff and representatives from both the undergraduate and graduate student population. We toured all the departmental and related facilities and met with senior administrators involved in overseeing the department at different levels. During our formal interviews and social sessions, we consistently asked for candid opinions on the state of the department with respect to a number of major issues related to academic programs and work environment. We also endeavoured to document any minor concerns that were important to particular groups or individuals.

This report is divided into two sections. In the first section, we have summarized our observations under the general headings of 1) Undergraduate Program, 2) Graduate Program, 3) Faculty and 4) Administration. Within each section, we have strived to address how the quality and quantity of a) the department's academic programs, b) the faculty research, c) the administration of the department and d) the departmental environment impacts the four areas listed above. In the second section, we summarize our recommendations with respect to the key points: i) Building and Laboratory Infrastructure, ii) Staffing and Teaching, iii) Undergraduate Equipment and iv) Graduate Program and Student Issues.

1. Overview of Committee Observations

Undergraduate Program

Undergraduate Curriculum - Year 1

The department strives to utilize the best lecturers (research and teaching faculty) in year 1 as a means to attract and retain chemistry majors, but there was some concern that a large number of the year 1 sections were being taught by sessional lecturers. The department and faculty dedicate a staff member, Ray Bachelor, to the development, implementation and exploitation of the Lon-Capa on-line learning tools. This is particularly well utilized in Year 1 courses for assignments and on-line practice questions. A brief demonstration convinced the committee of the versatility and usefulness of this strategy.

Undergraduate Curriculum - Years 2 and 3

The required courses for an undergraduate chemistry major at SFU meet the minimum requirements for the various sub-disciplines of chemistry. The organic requirements are typical of schools across the country. In the areas of physical and inorganic chemistry, the core courses provide only the bare minimum. For example, an undergraduate at SFU is likely to receive only a cursory introduction to main group chemistry and a rather limited exposure to kinetics. Among the faculty, there was support for a new inorganic/physical chemistry course involving group theory and symmetry. While this is a positive, we note that some institutions offer such a course, others do not. Indeed, the committee would prefer to see the addition of a main group chemistry course and an increase in the exposure of undergraduate to basic physical chemistry as the first priorities for new courses.

Undergraduate Curriculum - Year 4

The departmental course offerings for year 4 undergraduates tend to be double numbered with graduate courses. This approach offers a broad range of upper level courses and addresses the demands on teaching loads. Typically in such classes, graduate students are required to perform additional requirements such as a seminar or paper.

Laboratories

The renovations to undergraduate laboratories for general chemistry were very nicely done. The consequence is an inviting, efficient and safe learning environment. The same cannot be said for the physical and analytical laboratories. Not only are there safety concerns with such things as wooden fumehoods, poor ventilation and the absence of proper egress, but the equipment being used is sadly outdated. Most of the equipment is either 25 years old or has been cobbled together from discarded research instruments. There is no doubt this is the department's most urgent need. There is a sad irony here; the SFU Department of Chemistry has some of the best instrumental facilities for research in the world and yet the undergraduates have access to only badly outdated, failing and broken equipment, when it is available at all. In recent years, most institutions have invested significantly in undergraduate equipment providing state-of-the-art facilities for analytical equipment including a series of modern instruments to provide students with hands on training. State-of-the-art analytical tools in an undergraduate laboratory should include items such as gas chromatography, atomic absorption, UV-visible spectrometers, electrochemical apparatus, and a low field (200-300 MHz) NMR spectrometer. Such facilities provide the training employers and graduate supervisors expect undergraduates to have as they enter the work force or go on to graduate school. Any new instrumentation could also be

integrated into other core laboratory courses, specifically organic, inorganic and physical chemistry and would therefore have a positive impact across the entire curriculum. On the downside, a certain amount of extra work would be required to modify the laboratory activities in the respective courses and this is, of course, an expensive proposition.

Student Concerns

The committee met with undergraduate and graduate students who offered a series of both positive and negative comments on the undergraduate program from the perspectives of both students and teaching assistants. In general, they seemed pleased with the atmosphere in the department and the recent renewal of the general chemistry laboratory facilities in particular. On the other hand, they raised a number of concerns. With regard to the laboratories, students felt there needed to be much clearer expectations with respect to the marking of reports. They also would like to see faster feedback, as it seemed multiple reports were submitted before grades were forthcoming, thus propagating errors through subsequent reports. The strategy of double numbered courses appeared to limit the offerings available to fourth-year students and there were complaints about the regularity of senior course offerings. Students also had a number of complaints about the overuse of sessional instructors. The complaints tended to be around inferior communication skills and a lack of teaching experience. Undergraduates complained about the infrequent offering of Chemistry 260 as it is a prerequisite to numerous other courses. Persistent scheduling conflicts arising from the lack of a centralized scheduling system was also raised as a significant issue.

Teaching Loads

The teaching complement in SFU chemistry is comprised of research faculty, teaching faculty and sessional instructors. Research faculty at SFU are required to teach 2 one semester courses over three semesters each year. This is a load typical of research faculty in chemistry departments at larger Canadian institutions (e.g. University of British Columbia, University of Alberta or University of Toronto), but it is somewhat lower than the load at institutions of comparable size. A more typical teaching load at comparable institutions would be 2 one semester undergraduate courses and one graduate course over three semesters. Ironically, the teaching complement at SFU is burdened by the outstanding research success of many of the faculty, which generates well-deserved research positions that come with teaching reductions. While the intent is clearly to reward excellence in research and we do not recommend a change in policy, it must be pointed out that at other institutions such situations are handled differently. At some institutions, no teaching reductions are afforded to research faculty

with the exception of awards that specifically mandate them (Killam, Sloan etc). At other institutions, teaching reductions to a minimum of 2 one semester courses over three semesters are afforded to Canada Research Chairs, University Professors and those holding significant administrative positions.

The teaching faculty provides lectures and oversees laboratory activities. Teachings loads are typically double that of research faculty members. The appointment of such staff are common at many institutions as a strategy to deal with increased teaching demands without increasing the teaching loads of research faculty or creating further demands for research space. In this regard, SFU was one of the first institutions to utilize this concept and has done so with excellent success. The teaching staff at SFU have proven that the appointment of dedicated, highly qualified personnel who have teaching experience and are enthusiastic about teaching is an excellent strategy. This is repeatedly reflected in their teaching evaluations.

The use of sessional instructors is typically meant to be a stop-gap procedure for unique demands arising from sabbaticals, faculty awards (teaching reductions) and as a result of administrative postings. SFU faculty in chemistry have been particularly successful in garnering awards and administrative posts and as a result the department of chemistry has generated a perennial need for a large number of sessional instructors. This is an abnormally high number of sessional instructors relative to situations at most other institutions. The use of regular research or teaching faculty is much more desirable.

The Trimester System

A fundamentally unique feature of the course offerings at SFU is the tri-semester system which provides students with flexibility in terms of schedule. On the other hand, it creates some unique problems with respect to teaching loads and the range of upper level course selections in any given term. As a consequence, the department is forced to walk a very thin line between increased teaching loads and disenchanted students unable to take courses in a timely fashion. This balancing act is not always successful and is a major source of student frustration.

Graduate Program

Students

There has been steep increase in the number of graduate students in chemistry over the past few years from 48 in 2001 to a high of 128 in 2008; the present total is approximately 110. This is a result of hiring excellent new faculty and their success as new researchers. As these new faculty members bring

in an increase in external funding, there has been an increased need for graduate researchers. The reputation of some researchers coupled with fairly aggressive recruiting has resulted in the attraction of more graduate students. This is significant since competing with the University of British Columbia for the same cohort of undergraduates in the same geographic location has always been difficult. Although this is not likely to change, the department of chemistry at SFU has done an excellent job of positioning themselves as a viable alternative. This is, of course, critically dependent on the areas of study available. The creation of two distinct research groups of significant critical mass in terms of manpower, resources and reputation has helped the department distinguish itself in the areas of Materials Science and Chemical & Structural Biology. The majority of the graduate students study in these two areas. Historically, the Nuclear Chemistry program has a positive reputation and there has been an effort to hire faculty with this expertise. It was not clear that recruitment for this program has had the same success and it is likely that attracting new students to this program will remain difficult.

Although the numbers have increased and despite the superb accomplishments of some recent graduates, it is not clear that the overall quality of the present cohort of students is high. A number of faculty voiced the opinion that the overall quality of the present graduate student population was not as good as it could be. We may have been hearing a repeat of the same anecdotal stories but this was not an isolated view. The faculty would like to see an increased emphasis on attracting more scholarship students. The department is encouraged to be selective in the admission process and maintain competitive standards as a reputation for lower admission standards can be extremely detrimental in recruiting efforts.

Graduate Courses

There was universal concern, from both students and faculty, about the number, quality and variety of the graduate course offerings available. The great majority of the graduate courses were "piggy-backed" as senior undergraduate courses. The overwhelming view of the graduate students was that they were participating in undergraduate courses, even if there was a slightly different workload requirement. Most students who were graduates of another Canadian university said they had taken the materials already and wanted to learn something in their new chosen area but could not take courses specific to their needs. More disturbing perhaps, were the numerous reports from graduate students who obtained their B.Sc. degree at SFU, who said they were forced to take courses they had already completed as undergraduates due to the lack of choice. In terms of content, the graduate courses available seemed to mirror the number and availability of research faculty to teach the

courses. The areas of organic chemistry and biochemistry were covered well, physical, analytical and nuclear chemistry were covered adequately but inorganic was severely lacking due, not to the lack of course offerings but to the absence of personnel to teach on a regular basis. Surprisingly little was offered in materials science, nanoscience/nanotechnology given the world-class nature of the 4D Labs. Some graduate students suggested that allowing team-teaching in areas of faculty strength might be a way to offer new courses without significantly increasing faculty teaching loads. The student course load is comparable with those at other Canadian universities, although a few specific requirements should be reviewed. In particular, formalizing seminars into a specific course was seen as unnecessary; the graduate students overwhelming felt that this was "a waste of time". We had discussions with the graduate students about the idea of a course requiring the presentation of an original research proposal. This is quite common, in some format, at other Canadian universities. Whether the topic should be outside the student's current research area, whether there is an instructional component or whether a formal defence is required can vary from program to program but the graduate students we spoke with thought something along these lines would be beneficial. Note – this can be run easily without assigning a formal teaching load to the faculty "in charge" of the course organization.

Graduate Requirements

There was concern that there is no set timeline for committee meetings or a clearly defined set of expectations for all graduate students. The structure of graduate committees and their requirements of each student also appeared to be quite variable. As related to us by the students, the process seemed very *ad-hoc* and applied unevenly. In particular, the graduate students expressed concerns that the requirements for transfer to a Ph.D. were not consistent; some were required to attain a particular GPA while others were required to have published a paper or multiple papers. It was also recounted that a few graduate students were simply continuing their undergraduate projects in the same group rather than carrying out a new project as part of their graduate degree; a practice that obviously seemed unfair to some. To our surprise, the students thought the idea of a comprehensive exam as part of the requirements for Ph.D. candidates was a good idea. This is pretty standard at other Canadian universities and should be seriously considered as a separate requirement from the examination required to transfer from the M.Sc. to the Ph.D. stream. The graduate students also voiced concerns that there was no forum for them to express their views; e.g. student-supervisor issues, a say in the seminar program. They liked the departmental poster session and very much appreciated the support to attend conferences. They felt the faculty were collegial and approachable.

The GF funding was seen as a very important positive. The students were well aware that the basic stipends of \$16,500 and \$18,000 per annum for M.Sc. and Ph.D. students are not competitive, locally or nationally. Although this really only effected the students without a scholarship of some type, it was felt that this produced too large a variation in support from student to student and an air of unfairness related to who your supervisor was and how much he/she would pay to top up the minimum stipend.

Other Graduate Student Items

There were some questions about workman's compensation coverage for graduate students on scholarships working in the laboratory. Are they students or are they employees? It was not clear what the details of the occurrences were, but the department (and university) is encouraged to take this very seriously. It would be completely unfair to expect students to cover their own costs given their meagre salaries.

Faculty

The Chemistry Department faculty is comprised of 7 lecturers, 1 non-teaching lecturer and 25 research faculty. The research faculty distribution is 6 Assistant Professors, 9 Associate Professors and 10 Full Professors. There has been significant turnover and renewal of the faculty since July 2001 with 17 hires; 14 research faculty and 3 lecturers. Of these, 15 remain on staff; one left for health reasons while the other took up a Canada Research Chair elsewhere. This recent hiring has put an enormous stress on both research and teaching laboratory space. The faculty is young, dynamic and interactive with an average age of 42.

The new hires have been excellent as evidenced by successes in obtaining Canada Research Chairs (3), NSERC UFA Awards (1), MSFHR Scholarships (2), LEEF Chairs (1) and NSERC Steacie Fellowships (1). Three research faculty have half-time appointments with secondment to either NRC (2) or TRIUMF (1). In addition to the departmental Chair, other administrative posts held by Chemistry faculty include Vice President Research and Associate Dean of Graduate Studies. One faculty member is on indefinite health leave, another is on a 5-year personal leave. This has resulted in a two-tier system with respect to teaching loads and leaves, along with teaching reductions for major awards, secondments and administrative appointments, insufficient staff to cover present departmental teaching commitments.

Research faculty have been highly successful in obtaining competitive funding from numerous national and provincial sources as well as industrial support. All faculty hold NSERC Discovery grants. The

department funding levels are above the national averages for the traditional Chemistry Panels; GSC 24 and GSC 26. There are internationally recognized teams in Materials Science and Chemical & Structural Biology. The materials group is a model for interactive research that crosses disciplines and departments. While most members of these teams have state-of-the-art laboratories in the newly constructed TASC2 building (4D LABS, the GlycoScience Centre) or in refurbished laboratories, numerous other research laboratories approach "third world" standards. For example, one can contrast the laboratories of Profs. Gates, Britton or Vocadlo with those of O'Neill, Andreoiu or Plettner. This two-tier structure with respect to quality (or not) of research laboratory space requires urgent attention given the needs for young investigators to establish their research programs and attract graduate students.

The normal teaching load is 2 courses for research faculty, 4 courses for lecturers therefore 32 courses can be covered by the research faculty and 28 by the lecturers. This is not sufficient to cover the courses offered by the department. This has resulted in heavy use of sessional instructors, a short-term but economical solution. Replacements for Hill and Pomeroy should be sought, but additional research faculty should not be hired unless NEW laboratory space is available.

It was suggested that a formalized mentoring for junior faculty could be arranged with focus on items such as group management, graduate admissions, publication strategies, etc. This has usually been left to each individual and their respective peer groups to implement. This strategy has been excellent in some areas but lacking in others for various reasons. Formalization of this effort might alleviate some of the discrepancies by providing everyone with the same advice whether it is felt they needed it or not.

Administration

The Department of Chemistry is clearly involved in the administration of the university placing faculty in positions such as vice-president research and associate dean of graduate studies. Internally, the department has a solid committee structure and does a very good job of involving faculty and staff at all levels. It was especially gratifying to see serious participation from teaching and research faculty as well as technical and administrative staff. Overall, the department moral was seen as very good.

A few concerns were expressed by individuals. 1) The webpage is a very important tool for the dissemination of information both internally and externally. The "face" of the department on the web needs to be accurate and up to date as this is also an important recruiting tool for today's students.

This is a big job and almost all successful departments have professional website management; this workload should be taken very seriously when assigned and dedicated to one individual with the appropriate training. 2) The immigration concerns of incoming international students can be complex and there is no direct mechanism in the university to make this transition easy. This can be a hidden workload on departmental office staff. 3) There is a critical lack of departmental space for general meetings, thesis defences, group meetings, etc. The current booking system and method of room allocation are seen as impediments to the efficient operation of an academic department. 4) There were concerns expressed about integrating the admission and administrative processes between the Burnaby and Surrey campuses. 5) Some support staff had the view that there had been a gradual erosion of support for teaching and a resulting increase in their overall workload. In particular, the use of diminished space for undergraduate laboratories and antiquated equipment has placed high demands on staff time in terms of their continuous effort to repair equipment and re-organize experiments "on-the-fly". The organizing and clean-up of numerous class demonstration experiments was also seen as extra work. 6) It was felt important by many faculty and staff to retain the newly acquired financial expert on a permanent basis. This was seen as an essential service that was otherwise enormously time consuming for non-experts. This would also relieve a great number of frustrations expressed by research faculty about the amount of time they were required to spend on repetitive financial problems. 7) A two-tiered system with respect to technical staff was perceived. It was felt that the technical staff associated with the operation of expensive research tools were designated as professional based on their expertise and supervisory roles. These people seemed happy and well supported. On the other hand, other technical staff had huge responsibilities in terms of the breadth of their workload and seemed somewhat frustrated with the lack of recognition of this fact and departmental support for their efforts. In general, the technical staff reported that communication with faculty was good, with open channels for them to voice their concerns. They also reported having very good working relationships with central facilities.

2. External Review Committee Recommendations

Building and Laboratory Infrastructure

The oldest laboratories used for research and teaching are embarrassing and unsafe. Wooden fumehoods are a fire hazard and generally provide poor ventilation. Several of these laboratories are cramped due to outdated design and lack proper egress for evacuation in the event of an emergency. In the long term, *there is a critical need for a new building*. In the short-to-medium term, *it is absolutely essential that a plan for renovating the worst of both the teaching and research laboratories be implemented immediately*. First and foremost, this plan should address any identified safety issues. Secondly, this plan should be used as way to redress the noted inequities in research facilities with particular focus on providing new faculty with sufficient modern infrastructure to ensure their future success.

Staffing and Teaching

There is a definite need for more faculty in order to improve the regularity of the undergraduate course offerings and keep up with accreditation requirements, offer a real set of discipline oriented graduate courses and reduce the department's over reliance on sessional instructors. In particular, it is recommended that i) a main group, inorganic chemist be hired; ii) a bridging replacement for Hill be hired and iii) the hiring of a bio-analytical chemist be considered.

Undergraduate Equipment

The laboratory equipment for use in the undergraduate program is a disgrace. The majority of the instrumentation is outdated by any standard of measurement and is an insult to both the students and their teachers. There is no practical correlation between what the students experience with this equipment and what will be encountered in the "real-world". *The department, faculty and university need to make the upgrading of the undergraduate laboratory equipment a high priority*. This will require a significant investment, but a phased renewal plan over several years, could both ease the financial burden in any given year and provide the time for the department to fully integrate the new instrumentation into courses throughout the curriculum.

Graduate Program and Student Issues

It is recommended that the department undertake a survey of graduate stipends in chemistry across the country and raise their basic rates to *competitive values*; in the range of \$20K/year for a new M.Sc.

We recommend that a *Graduate Student Handbook* be compiled that would outline all the expected program requirements for a graduate student, provide a timeline and highlight important dates.

It is imperative that the current practice of offering graduate courses which are really "piggy-backed" 4th-year courses be minimized. It is recommended that *a clear set of stand-alone graduate courses* be identified and *offered on a regular basis*. It is recommended that the department seriously consider a team taught "core" graduate course for year one graduate students. This could be comprised of several short modules each focusing on a particular advanced area or a sub-discipline. In this fashion, the teaching load increment would be less dramatic than the addition of a full graduate course.

It is recommended that the department offer (or require) some type of graduate course for Ph.D. candidates that would involve the preparation and *defence of an original research proposal*.

It is recommended that the requirement that an M.Sc. student have published a scientific article before being allowed to transfer to the Ph.D stream be dropped.