SIMON FRASER UNIVERSITY

S.02-2

Senate Committee on University Priorities

Memorandum

TO: Senate

FROM: John Waterhouse
Vice President, Academic

RE: Chemistry External Review

DATE: 11 December 2001
Amended

The Senate Committee on University Priorities has reviewed the External Review Report prepared on the Department of Chemistry in April 2001, together with the response from the unit and comments from the Dean and the Vice President, Academic. A subsequent document providing a response by the Chair to the comments of the Vice President, Academic was also considered by SCUP.

The Department should be recognized for its outstanding leadership in the current Chair Dr. Mario Pinto. The Department has been extremely successful in recruiting a first rate group of scholars who complement the excellence of the existing faculty. The Department has a highly collegial environment.

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

1. The Department of Chemistry should be encouraged to continue efforts to successfully recruit more female faculty members. With a number of scheduled retirements in the next three years, Chemistry should be pro-active in seeking to address its current gender imbalance.

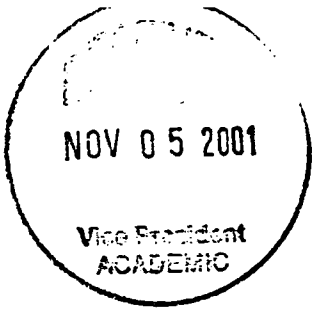
2. The Department of Chemistry should be supported in its request to search for an NSERC University Faculty Award.

MOTION

"that Senate concurs with the recommendations from the Senate Committee on University Priorities concerning advice to the Department of Chemistry on priority items resulting from the external review, as outlined in S.02-2"

SIMON FRASER UNIVERSITY
Department of Chemistry

Memorandum



To: Senate Committee on University Priorities

From: B.M. Pinto, Chair of Chemistry

Date: November 3, 2001

Re: Response to John Waterhouse's comments on the external review of the Department of Chemistry

File:

On behalf of the Chemistry Department, I wish to comment on the items highlighted in John Waterhouse's memo of November 1 regarding the external review of the Department of Chemistry.

Item 1: We are pleased that the Chemistry Department has been recognized as an excellent unit. The enhanced reputation of the Department has resulted from team efforts over a period of several years.

Item 2: The recent faculty renewal together with more aggressive recruiting efforts (see, for example, http://www.sfu.ca/chemistry) have resulted in a dramatic (46%) increase in the graduate student headcount in the Department of Chemistry (see Table 1). This influx of students has been accompanied by a significant increase in the quality of our entering students. There are currently 3 NSERC postgraduate Ph.D. scholarship winners, 2 NSERC/Industry postgraduate Ph.D. scholarship winners, 1 NRC postgraduate Ph.D. scholarship winner, 2 B.C. Science Council GREAT postgraduate Ph.D. scholarship winners, 1 Michael Smith Foundation for Health Research Ph.D. scholarship winner, and 2 C.D. Nelson Ph.D. scholarship winners.

Item 3: We share the concerns of the reviewers and John Waterhouse about adequate resourcing at the present time for a new Environmental Science and Technology program related to alternative fuels and Fuel Cell Technology. Nevertheless, we have seized an opportunity to establish a partnership with the National Research Council (NRC) Innovation Centre and have initiated a program in Fuel Cell Chemistry. Towards this end, Dr. Steven Holdcroft has been seconded (50% time) by NRC to spearhead the fuel cell initiative and to build up a group in this field. As a further commitment to SFU, NRC has agreed to fund 50% of a junior faculty position at SFU in the area of Materials Chemistry related to Fuel Cell Technology, with SFU providing the other 50%. We are currently advertising this position to take effect in April, 2002 (see attached). This

appointment is viewed (by NRC and the Chemistry Department) as only one of several joint appointments with NRC in the future. Such hiring will establish the resources at SFU to mount a special program in Environmental Science and Technology.

Item 4. The Chemistry Department and the Review Committee considered the external demand in the Lower Mainland for a professional program at the M.Sc. level in Analytical/Environmental Chemistry. They concluded that it was not sufficient to warrant a commitment of resources from SFU. The reality here is that the Analytical Industries are better equipped with state-of-the art infrastructure than the Chemistry Department at SFU. Therefore, it makes little sense for the local industries to support a professional program in which students would be trained on lower grade equipment. What *is* desired by the local industries is a firm training of M.Sc. students in the principles and practice of the scientific method. They prefer to then provide the specialized training in their own companies. A good M.Sc. degree in Analytical/Environmental Chemistry from SFU will suffice.

Relationships between the Department of Chemistry and the external Analytical/Environmental community are strong. Dr. Luis Soho of this community is an Adjunct Professor in our Department and provides valuable instruction to our students each year. Dr. Paul Li of our Department receives a grant from the City of Burnaby to evaluate the quality of drinking water. Dr. George Agnes of our Department has been invited to participate in the human genome and proteome initiatives in B.C. with his development of emerging mass spectrometric technologies. Regarding our co-operative education placements, we have no problem whatsoever with placing our co-op students. On the contrary, we cannot find enough students to fill the positions.

We will continue to monitor the *external demand* for a professional program in Analytical/Environmental Chemistry and will take advantage of special opportunities for financial partnerships. It is more likely that there will be a greater demand for initiatives such as Materials Chemistry related to Fuel Cell Technology, as outlined in Item 3 above.

Item 5: We are prepared to accept Dr. Waterhouse's statement that the reclassification of units was based on current figures as well as historical trends in the areas of student enrolments, faculty complement, and staff resources. However, when I inquired about this process from the previous administration, I was informed that the reclassification of the Chemistry Department was based on the number of CFL positions and the annualized undergraduate FTEs. An examination of the CFL positions and the FTEs for 2000/2001 in the Chemistry Department (Type B) versus other experimental science departments, namely the Departments of Molecular Biology and Biochemistry (Type B), Physics (Type B), and Biological Sciences (Type A) (see Table 2) indicates that the Chemistry Department served 209 annualized undergraduate FTEs whereas the Physics and MBB Departments served 132 and 57 FTEs, respectively. The Biological Sciences Department served 248 FTEs. The Chemistry Department performed this function with about 30 CFLs whereas the Physics Department used 26 CFLs, and the Biological Sciences Department used 43 CFLs. One could argue that the Chemistry Department is being penalized relative to Biological Sciences for being more efficient in the administration of its programs. We feel that it is important that a scientific rationale (or formula), instead

of a subjective judgement, be provided to justify the classification of departments as Type A or Type B.

Item 6: We support fully this recommendation and will be searching for an NSERC University Faculty Award candidate in the area of Chemical and Structural Biology, a strategic area of growth in the Department and one that requires considerable service teaching in Organic Chemistry to chemists, molecular biologists, biochemists, biologists, and kinesiologists. It should be noted that two Organic Chemists (E. Kiehlmann and K. N. Slessor) will retire by 2004; Kiehlmann's position was bridged to an NSERC UFA appointment (E. Plettner) and Slessor will be replaced by a Materials Chemist. Both Kiehlmann and Slessor are active in teaching Organic Chemistry and their teaching duties will have to be assumed by new faculty.

The Chemistry Department has been proactive in identifying and encouraging outstanding female candidates in faculty and lecturer searches. The former Associate Vice President, Academic, Judith Osborne has helped a great deal with these recruiting efforts. Unfortunately, these overtures were not successful with three outstanding candidates for faculty positions, mainly because of spousal considerations. However, we were successful in recruiting Sophie Lavieri as a Lecturer. We will continue our efforts to correct the gender imbalance in the Department.

Finally, we comment on the financial support of the research and teaching programs of the Department. The Department is sadly in need of additional funds in the base operating budget to maintain and replace research infrastructure, to replace aging equipment in teaching laboratories, to provide start-up funds to new faculty, and to provide renovation monies to accommodate these new faculty. The Faculty of Science budget is not adequate to support even the present initiatives within the Faculty. Occasional support of major installations such as the nuclear magnetic resonance (NMR), mass spectrometric (MS), X-ray crystallographic, and magnetometer facilities is also required. I hope that such support will be forthcoming from the Vice Presidents' offices. An increase in finances is absolutely necessary if we wish to recruit *and retain* the best faculty and provide a quality education to our students.

B.M. Pinto
Professor and Chair

cc. . W. Davidson, Dean of Science
J. Waterhouse, Vice President, Academic

TABLE 1 – SIMON FRASER UNIVERSITY
GRADUATE HEADCOUNT AND FTE BY FACULTY AND DEPARTMENT

	Headcount			Annualized Full-Time Equivalent		
Faculty/Department	2000-3	2001-3	% Change	2000-3	2001-3	% Change
Applied Sciences	**452**	**476**	**5%**	**135.6**	**137.7**	**2%**
Communication	78	76	-2%	22.9	21.6	-6%
Computing Science	116	121	4%	36.6	36.4	0%
Engineering Science	124	128	3%	34.9	33.0	-5%
Kinesiology	38	37	-3%	11.8	11.7	-1%
Resource & Environmental Mgmt.	90	107	19%	28.1	33.1	18%
Special Arrangement	3	4	-	1.0	1.3	-
Exchange	3	3	-	0.3	0.6	-
Arts	**730**	**769**	**5%**	**207.3**	**220.7**	**6%**
Archaeology	33	46	39%	11.0	14.6	32%
Contemporary Arts	10	9	-	3.3	3.0	-
Criminology	66	68	3%	18.3	21.1	15%
Economics	83	95	14%	25.6	28.9	13%
English	48	44	-8%	14.9	13.7	-8%
French	2	6	-	0.3	2.0	-
Geography	56	45	-20%	14.9	13.1	-12%
Gerontology	19	21	11%	6.1	7.0	15%
History	54	58	7%	16.4	17.6	7%
Liberal Studies	72	90	25%	9.3	12.1	30%
Linguistics	24	22	-8%	6.8	5.8	-15%
Philosophy	10	9	-	3.0	2.8	-
Political Science	36	41	14%	10.6	12.6	19%
Psychology	86	84	-2%	27.9	27.7	-1%
Publishing	34	32	-6%	10.7	9.7	-9%
Sociology/Anthropology	47	45	-4%	14.3	13.6	-5%
Spanish/Latin American Studies	7	11	-	2.0	3.3	-
Women's Studies	17	19	12%	5.1	5.1	0%
Special Arrangement	20	20	0%	6.0	6.3	6%
Exchange	6	4	-	0.7	0.9	-
Business Administration	**344**	**416**	**21%**	**104.4**	**130.7**	**25%**
Graduate Diploma in Business	60	103	72%	17.1	32.3	89%
Day M.B.A.	123	123	0%	34.2	35.0	2%
Executive M.B.A.	71	75	6%	23.3	25.0	7%
Weekend M.B.A.	57	60	5%	19.0	20.0	5%
Mgmt of Tech M.B.A.	31	55	80%	10.1	18.3	82%
Special Arrangement	2	-	-	0.7	-	-
Exchange	1	-	-	0.1	-	-
Education	**641**	**1,124**	**75%**	**149.1**	**205.8**	**38%**
Graduate Diploma in Education	155	608	292%	21.9	67.7	209%
Education (M.A. program)	88	98	11%	21.9	24.1	10%
Education (M.Sc. program)	15	10	-33%	3.4	2.0	-
Education (M.Ed. program)	290	311	7%	74.2	83.1	12%
Education (Ed.D. program)	23	19	-17%	7.0	5.0	-29%
Education (P.hD. program)	70	77	10%	20.3	23.5	16%
Special Arrangement	1	1	-	0.3	0.3	-
Exchange	-	1	-	-	0.1	-
Science	**393**	**432**	**10%**	**126.1**	**138.7**	**10%**
Biological Sciences	122	105	-14%	38.9	33.6	-14%
Bisc (Environmental Toxicology)	14	23	64%	4.4	7.0	58%
Bisc (Pest Management)	22	24	9%	7.3	8.0	9%
Chemistry	50	73	46%	16.7	23.8	43%
Earth Science	16	25	56%	5.3	8.3	56%
Geography	14	13	-7%	4.3	4.3	0%
Mathematics	63	39	-38%	19.8	12.3	-38%
Molecular Biology & Biochemistry	40	53	33%	13.0	17.2	32%
Physics	49	52	6%	15.8	16.6	5%
Statistics	-	21	-	-	6.8	-
Special Arrangement	1	3	-	0.3	0.7	-
Exchange	2	1	-	0.2	0.1	-
University Total	**2,559**	**3,217**	**26%**	**722.6**	**833.4**	**15%**

Notes: a) On-leave students are not included in the F.T.E. calculation, but are included in the headcount. b) Percent change not shown for headcount less than 10 or FTE less than 3.3. c) 1 Annualized FTE = (Full-time + 1/3 Part-time)/3.

Table 2

Faculty of Science Statistics for 2000/01

	# CFL	LI	STAFF	Annualized Undergraduate FTE	Annualized Graduate Headcount
BISC	43.10	1.50	18.25	248.4	148
CHEM	29.80		13.6	209.8	49
EASC	10.00	-	3	34.5	15
MATH	39.10	-	7	440.8	61
MBB	10.00	-	4	57.2	41
PHYS	25.50	0.50	9	132.2	45

DEPARTMENT OF CHEMISTRY
Simon Fraser University

Faculty Position in Electrochemical Materials Science Related to Fuel Cell Technology

The Department of Chemistry at Simon Fraser University (SFU) and the National Research Council (NRC) Innovation Centre invite applications for a tenure track Assistant Professor position in Electrochemical Materials Science to take effect in April 2002, subject to final budgetary approval. The candidate should have interest in Materials Chemistry related to Fuel Cell Technology including electrocatalysis, and electrolyte and electrochemical interfacial chemistry. Outstanding candidates with a commitment to excellence in research and teaching are being sought. The position will be a joint appointment between SFU and NRC, and the candidate will be expected to participate in collaborative research efforts with NRC. The candidate will be expected to develop and maintain both an innovative, externally funded research program, and an excellent teaching record at both the undergraduate and graduate levels.

In accordance with Canadian Immigration requirements, this advertisement is directed to Canadian citizens and permanent residents of Canada. Simon Fraser University is committed to the principle of equity in employment and offers equal employment opportunities to qualified applicants. Applicants should send a complete resume, a research proposal, and a list of three individuals willing to act as referees with their addresses, telephone and/or fax numbers, and email addresses. All correspondence should be sent to Professor B. Mario Pinto, Chair, Department of Chemistry, Simon Fraser University, 8888 University Drive, Burnaby, B.C., Canada V5A 1S6. Competition to remain open until the position is filled.

SIMON FRASER UNIVERSITY

Office of the Vice-President, Academic

Memorandum

TO: Senate Committee on University Priorities

FROM: John Waterhouse, Vice President, Academic

RE: External Review, Department of Chemistry

DATE: 1 November 2001

The report of the External Review Committee of the Department of Chemistry was submitted on April 18, 2001 following the review site visit on March 5-6, 2001. The response of the Department was submitted on June 22, 2001 and the comments of the Dean of Science on October 16, 2001.

My comments on this external review and the submission from the Department and the Dean are as follows:

1. I strongly agree with the reviewers observation that the Department of Chemistry is an excellent unit. The accolades regarding the quality of the undergraduate program, research, and faculty within the Department can be attributed to the outstanding work done by the Department, particularly under the leadership of the current Chair, Mario Pinto.

2. The need for the Department of Chemistry to improve its recruitment of qualified Ph.D. students is an important recommendation by the reviewers. As noted by the Department in their response to the reviewers' report, they are proactively engaging in a variety of areas to be more successful in this area. These initiatives are commendable and should be strongly encouraged.

3. I agree with the reviewers that plans for a new Environmental Science and Technology program were not sufficiently well developed at the time of the review for the reviewers to offer an informed assessment. I share their concern about adequate resourcing of such a program. Additional instructional offerings without recruitment planning tied to the expansion of faculty resources in this area would only seem to exacerbate the heavy demand on existing instructional resources.

4. I believe there is sufficient external demand for the offering of professional programming at the Masters level in Analytical and/or Environmental Chemistry. Further, I believe that consideration of such programming may provide opportunities for developing strengthened relationships with the external community which is essential for increasing co-operative education placements (a highly valued and identified growth area by both the reviewers, the department and the Dean) and in identifying opportunities for enhanced financial partnerships that can assist in the procurement of emerging technologies, state-of-the-art equipment, and potentially facilities expansion. Notwithstanding these issues, I concur with the reviewers that the Chemistry Department should concentrate in the

short-term in building its research profile and developing its new faculty. The Dean's suggestion to delay consideration of such programming for five years is in my view, a too distant timeframe. I would recommend that professional programming at the Masters level in Analytical and/or Environmental Chemistry be considered at the time of the next three year planning cycle (2004).

5. The reviewers, the Department and the Dean all comment upon the reclassification of the Chair's directorship from a Type A to a Type B unit under policy A 13.04. There are comments that this reclassification was undertaken without adequate consideration of the activities, student enrolments, faculty resources, and stage of development of the Department. I wish to correct this inaccurate portrayal of the process which led to the reclassification of units. All departments were comparatively assessed on the basis of current figures as well as historical trends in the areas of student enrolments, faculty complement, and staff resources. This university-wide comparison has established, I believe, relative equity across departments.

6. I concur with the recommendation of the reviewers that the gender imbalance in the faculty complement of Chemistry needs to be addressed. The request by the Department to search for an NSERC University Faculty Award candidate should be supported. With 5 scheduled retirements in the next three years, Chemistry should be aggressive in its encouragement of female applicants. The Department should seek the advice of the Associate Vice President, Policy, Equity and Legal for suggestions in advancing this goal.

c.: M. Pinto
W. Davidson

SIMON FRASER UNIVERSITY

DEAN OF SCIENCE

BURNABY, BRITISH COLUMBIA V5A 1S6
Telephone: (604) 291-3771
Fax Number: (604) 291-3424

Response of the Dean of Science to the Comments/Recommendations of the External Review of the Department of Chemistry and the response to them by the Chair of Chemistry

First let me say that I am very pleased with the review that was carried out on the Department of Chemistry. The Review Team did a thorough job identifying a few areas of concern but overall coming to the conclusion that the department is well organised, has an exceptional leader in Mario Pinto, has been able to recruit excellent new faculty and graduate students, and as a group the faculty are working towards common identifiable goals. This is a very positive review and I concur with the vast majority of their conclusions.

There are some factual errors and overstatements that have been noted and corrected by the Chair of Chemistry. In particular, the formation of the Department of Molecular Biology and Biochemistry on April 1, 2000 not 1997 (p.5) really has had little direct effect on the operation of the Department of Chemistry. IMBB ran both the undergraduate biochemistry program and the graduate program in molecular biology and biochemistry and it could be argued that the Chemistry Department was counting faculty and students that were for all intents and purposes in another department (in the making). Therefore, "The departure of a large number of former female chemistry faculty into the new Molecular Biology and Biochemistry Department" is false and misleading. There were two such faculty and they are Jamie Scott (100% MBB) and Rosemary Cornell (50 % MBB and 50% Chemistry) at this time. This does not mean that the issue of gender equity is not an issue. It is. Erika Plettner is the only full time tenure track faculty member (as opposed to Lecturers). I support Recommendation 20 that Chemistry takes advantage of the NSERC UFA program to correct gender imbalance but would not limit the search to the field of Structural and Chemical Biology. There is arguably a greater need in Materials Science.

In the Faculty of Science, we do not use FTE or headcount as the unit of the undergraduate. We use a weighted course registration that is rather complex and even different from that used by the VP Academic for budget purposes.

The Review Team seems to be confused by the term "Environmental Science". They use this term as if it only applies to Chemistry. Environmental Science is an interdisciplinary undergraduate program that has its own Director and is run out of the Dean's Office. The comments on p.6 are incorrect and misleading.

...2

The concerns about the reclassification of the Chemistry Department from a type A to a Type B have been implemented despite the protests of the Department and the Dean. There do not seem to be any hard and fast rules concerning the criteria for what constitutes a Type A or type B department. These rules should be established and should take into account the number of faculty, the number of students (undergrad and graduate), and the amount of research being carried out by the department (research dollars brought in and peer-reviewed publications produced). The position of Associate Chair in Chemistry has been established and this goes a long way to address the concerns of the Review Team.

Space is a problem for the whole university, but it is a major limitation for expansion or indeed realisation of our present potential in the Faculty of Science. It can only get worse as new more active faculty replace those coming to the end of their careers unless new space is produced by building. With 14 CRCs expected over the next five years, space is the single most important resource in Science. It is hoped that initiatives underway address the existing need for space before seeking space for additional undergraduates.

The nomination of faculty and staff, irrespective of department, for major awards is a priority in the Faculty of Science. All Chairs should be active in this regard as well as the Dean. The Grants Facilitator, Dr. Adrienne Drobnies, is co-ordinating this effort and the recent results in the BC Science Council Awards attest to this commitment.

The Review Team were probably not fully informed about the credit given to CHEM 481, especially with respect to related courses in other departments. The Chair of Chemistry has clarified the situation.

The tutorial system is a hallmark of Simon Fraser and an effective way of dealing with large lecture classes. However, it is not the only method available. Other schemes such as open tutorial labs, and computer assisted personal assignments are equally valid and effective ways to help undergraduates learn. Often it is a combination of these methods that work best and Chemistry is to be commended for its innovative approach in this area.

Co-op continues to be encouraged in Science. The numbers are growing, in part because the co-op co-ordinators are now housed physically among the departments rather than in the Maggie Benson Centre. A Chemistry/Physics co-op co-ordinator, Maggie Verity, has been hired and is in place in an office adjacent to the one used by the Chemistry Student Union. She has been given a high profile.

The concern about "release time" from teaching for Lecturers is a negotiated workload and therefore not an item for the Review Team.

The Review Team expressed their strong approval and endorsed the quality of the undergraduate program in Chemistry. I agree with them. There is no need for new required courses at this time and I believe the Department is constantly monitoring the situation and is best placed to make such changes as are required. This is particularly true for the proposed Environmental Science and Technology Program.

The Review Team did not seem to be fully aware of the training that is available and, indeed mandatory, for graduate students before they are allowed to be a Teaching Assistant. There is always room for more specialised training when labs are concerned but I am sure that the Chemistry Department has this in hand.

The issue of safety is campus-wide when it comes to working late in research labs and in walking at night alone on campus. There are schemes in place (e.g., Walk Safe) to make the environment safer and I have personally seen more activity by Campus Security Patrols. The University infrastructure does not lend itself to card keys. I believe reasonable measures are already in place to address the concerns raised in Recommendation 13.

The Review Team (p.12) did not seem to understand that the Teaching Assistantship budget is tied to the need for teaching undergraduates in tutorials or labs and that it is not meant primarily to be a source of graduate student support. As the younger faculty establish themselves they will be able to attract more scholarship winners as graduate students. This is in fact happening and is well documented by the Chair in his response. The number of graduate students is climbing rapidly as is the quality of intake. It is still common across Canada to admit a student into an MSc program rather than go directly into a PhD. The number of transfer requests is not unusual.

The question of a course-based Masters in Analytical or Environmental Chemistry is definitely premature at this time and should not be considered for at least five years.

The Review Team appreciated the hiring plan developed by Chemistry and the Dean supports and applauds the Department (and especially the Chair) for their wisdom in identifying key areas of concentration. Joint initiatives with other departments are to be encouraged and the Dean is not aware of "systemic impediments" that might hinder these collaborative efforts.

The meaning behind Recommendation 23 is not clear. The Faculty of Science is always receptive and pro-active in seeking funding opportunities for faculty.

A new Department Assistant has been hired to replace Ms. T. Evans (Recommendation 24) who left to pursue her career elsewhere. A reclassification of this position is in order given the workload associated with this dynamic department.

The Chemistry Department in total is very active in seeking external funding for major pieces of equipment. I have no concerns here and in fact think that they are an example to other departments.

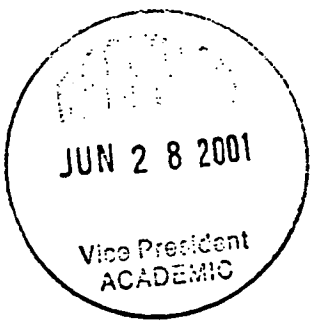
In conclusion, the Review Team did an excellent job investigating the Chemistry Department in a thorough and professional manner. No one can dispute the quality or the experience of the members of the Review Team. Therefore, when they state, "the Chemistry Department is an excellent unit"; "This undergraduate program can justifiably claim to be one of the best in country"; "The research operation and reputation is very strong, especially in Materials Science and in Chemical and Structural Biology"; "On-going faculty recruitment has added excellent scientists"; etc., then everyone has reason to feel proud of their colleagues. Much of this is a reflection on the Chair of Chemistry, Mario Pinto, who has done an outstanding job leading and marshalling the collective power of the faculty and staff. It is very reassuring that the many positive aspects of the Chemistry Department were recognised by the Review Team.

William S. Davidson,
Dean of Science

c. Chair, Chemistry

SIMON FRASER UNIVERSITY
Department of Chemistry

Memorandum



To: J. Waterhouse, Vice President, Academic

From: B.M. Pinto, Chair of Chemistry

Date: June 22, 2001

Re: Responses to the External Reviewers' Recommendations

File:

Please find attached the response of the Chemistry Department to the external reviewers' recommendations.

Thank You.

B.M. Pinto
Professor and Chair

Attch.

13.

Response of the Chemistry Department to the Comments/Recommendations of the External Review Team
Prepared by B.M. Pinto
June 27, 2001

1. Factual Errors

We wish to correct a few statements of fact presented in the "Overview of the Department".

P5: The FTE count cited is actually a headcount and is misleading. This statement should be replaced with the statement, "The Department had 425 annualized undergraduate FTEs in 2000-2001 out of a Faculty of Science total of 2,430, i.e. 17.5%".

P5 The statement is made that there was a departure of a large number of female chemistry faculty into the new Department of Molecular Biology and Biochemistry (DMBB). In fact, there were only two female faculty in Chemistry, Drs. R. Cornell and J.K. Scott, who are now members of the DMBB.

P5 Regarding the nuclear chemistry positions, the statement should read, "convert some of the nuclear chemistry positions through impending retirements into other positions", not just Materials Science positions.

P6 Regarding the classification of the Department as Type A or Type B, "impending classification" should be changed to "reclassification".

2. Responses to the Specific Comments/Recommendations

i) Recommendations Related to Undergraduate Teaching and Curriculum

The Departmental Undergraduate Studies Committee (DUGSC) was pleased to see the very positive evaluation of the Chemistry undergraduate program. The Committee's responses to the reviewer's recommendations in this area are:

Viewpoints and Comments from Undergraduates

Recommendation 5

The Department has used a rolling teaching plan for years that provided teaching schedules 1 year in advance. However, very recently, the DUGSC has been working on a course-offering schedule that would predict the offerings for **four years** with tentative teaching assignments for two years and a firm commitment for one year. It is hoped that the Chair will be able to provide the teaching resources to meet this schedule. With this schedule and an individualized course audit, the students should be able to more easily plan their academic program and avoid delays due to missed courses.

Recommendation 6

The Committee felt that there was some confusion between the reviewers and the students they met concerning the workload of the undergraduate research course, CHEM 481, relative to similar courses in MBB. The MBB courses are at times

spread over 2 semesters. In any case, it is the policy of the Department to ensure that the individual instructors limit the workload of the students to that appropriate for the hours of credit given. The Committee does not feel that the best interests of the students or the program would be served by increasing the credit for CHEM 481.

Recommendation 7

The Department reluctantly took the step of converting regularly scheduled tutorials in the large enrolment course to open tutorials (a drop in format) due to resource limitations. This followed the practices in other Science Departments where the change was considered to be pedagogically beneficial. Nevertheless, as resources permit, these large enrolment chemistry courses do offer a mixture of the 2 tutorial formats. This mixed offering helps both those who wish a more structured tutorial and those who wish to get a quick answer to their current problem.

Cooperative Education

Recommendation 8

The Committee is very much in favour of the recommended increased chemistry COOP support. It is our understanding that the COOP program is currently searching for a full time chemistry COOP coordinator that would address this recommendation.

Lecturers and Senior Lecturers

Recommendation 9

Although the working conditions of faculty is not within the mandate of the DUGSC, it supports the recommendation that lecturers be given additional time to further their expertise and develop new course material. At present, Senior(Lecturers) are entitled to one non-teaching semester after eight semesters of teaching. Increasing enrolments without additional resources has placed a strain on the teaching program. This increase has led to an increase in the number of laboratory sessions that must be offered for a given course. The Senior(Lecturers) carry a heavy teaching load in that most of them are involved with large enrolment courses. They have lost most of the time they have had for renewal or development activities during a teaching semester, with a resultant loss to the overall teaching program.

With the recent change in the Teaching Appointments structure from Lab Instructors I and II to Lecturers and Senior Lecturers it is anticipated that Lecturers will be teaching a wider variety of both laboratory and lecture courses. Even now, some of our Lecturers teach as many as five different courses in one year. Teaching a variety of courses requires more time for preparation and for development of course content.

The Chemistry Department has initiated discussion on means by which increased development time could be provided for (Senior)Lecturers.

Curriculum Issues

It should be clarified that the CHEM 381 course that the reviewers suggested should be created has already been approved and is to be given for the first time in 2002-1.

Recommendation 10

The Department has just completed a major curriculum revision and is now making final adjustments to fine-tune the course offerings. It is felt that some time should pass to assess these changes before making any major new changes. The concept of generating 'streams' has been discussed but will await further consideration until more experience with the present curriculum is obtained.

Recommendation 11:

The proposal for an Environmental Science and Technology Program is in the early stages of consideration by some members of the Department. These ideas have not progressed to the point of consideration by the DUGSC. The Committee concurs with the reviewers that it is premature to consider implementation of this program at this time.

ii) Recommendations Related to the Graduate Program

The Department Graduate Studies Committee (DGSC) was generally pleased with the comments of the external review team.

Recommendation 1

The DGSC agrees with this recommendation and has taken a proactive approach to the problem of recruitment. The DGSC has made an effort to attract more national scholarship award winners to the graduate program. Three NSERC PGS A scholarship holders have already committed to Ph.D. studies in the Department in 2001-3. In addition, two industrial sponsors (Methanex and Xerox) were recruited to support NSERC industrial postgraduate scholarships, and an NRC graduate scholarship was secured. In addition, during the last year a new endowment fund for a graduate student scholarship was solicited from a former Chemistry alumnus, Dr. J.D. Harrison. This Fall, the first Harrison Endowment Scholarship will be awarded to a worthy graduate student.

Comment by review team: p11, 1st paragraph, line 3

The DGSC anticipates that the number of graduate courses taught per semester will increase as recently appointed faculty assume a full teaching load. In fact, this will have an effect in the 2001-3, 2002-2, and 2002-2 semesters.

Comment by review team: p11, Recommendation 12

Students already receive training in pedagogic skills during "TAday". However, the DGSC agrees that implementation of an instrument training session for TAs in particular courses would be beneficial.

Comment by review team: p11, 1st paragraph of section "Viewpoints from Chemistry Faculty and Administration"

Currently (2001-2), there are 53 graduate students (32 Ph.D. and 21 M.Sc.); however, we have received acceptance notices from 15 new graduate students and are awaiting replies from 5 students who have been admitted to the University. In addition, there are 8 other students (4 NSERC PGS A holders) who are considering SFU for their graduate work. Thus, we anticipate that in 2001-3, the total graduate student

enrolment in Chemistry will be about 70 students.

Comment by review team: p12, 2nd paragraph of section "Viewpoints from Chemistry Faculty and Administration"

We agree with the review team that "such a level of requests (for transfer from the M.Sc. to the Ph.D. program) and resulting transfers are common in many Chemistry Departments at other Canadian universities." Students who do not show adequate evidence of independent research in their B.Sc. degree are usually admitted to the M.Sc program, with the proviso that they may request transfer to the Ph.D. program upon satisfactory performance in research and course work. This is a common practice across Canada.

Comment by review team: p12, Recommendation 14

The DGSC agrees with the recommendation.

iii) Other Recommendations

Recommendation 2

The Chemistry Department is out of space! Significant reallocation of space has already taken place to accommodate the newly appointed faculty and recently acquired equipment. The reallocation has caused some tension. In the most recent change, the Analytical Chemistry teaching laboratory was reassigned to the Canada Research Chair, Dr. N.R. Branda. In order to accommodate any future hires, new space will have to be identified elsewhere, e.g. Discovery Park or the Science Technical Workshops.

Recommendation 3

The Chair currently nominates faculty for internal, national, and international awards. A nominating committee charged with this duty will be struck in the Fall, 2001, as suggested by the review committee.

Recommendation 4

Regarding the reclassification of the Chemistry Department as a Type B department, we object very strongly. The Department provides very extensive service teaching with a significant laboratory component. In the 2000/2001 fiscal year, twenty-two faculty members and 4.5 lecturers served 425 annualized undergraduate FTEs out of the Faculty of Science total of 2,430, i.e 17.5%. In comparison, 36 faculty and 5.5 lecturers/laboratory instructors in the Department of Biological Sciences served 520 annualized undergraduate FTEs, i.e 21.4%. The organization of the teaching duties for the efficient offering of the undergraduate program, coupled with the faculty renewal in the past 4 years (10 faculty and 3 lecturers), the necessary space reallocation, grant mentorship programs, and the management of facilities, instrumentation, technical support staff (7), secretarial staff (3), and administrative staff (4) provide a challenging task for the Chair of the Chemistry Department if he/she has a very active research program.

The Chair is very active in formulating a vision for the Department and in spearheading initiatives to achieve this vision. The Department has gone through an active period of faculty renewal that has resulted in a higher research profile for the

Department both within SFU and externally. In the 1999/2000 fiscal year, twenty-two faculty members attracted $3,070,934 in external research grants. This represents 25.2% of the total external research funding attracted by faculty members in the Faculty of Science. In comparison, thirty-six faculty members in the Department of Biological Sciences attracted $4,071,730 (33.4% of Faculty funding) in external research grants. Faculty renewal has continued and this Fall there will be 25 Chemistry Faculty, 5 (Senior)Lecturers, and 4 associate members with primary appointments in DMBB. The faculty renewal has also led to a steady increase in the number and quality of graduate students. In the last three-year period, the Department has graduated 16 M.Sc. and 22 Ph.D. students. This Fall, there will be approximately 70 graduate students enrolled, with about 5 NSERC postgraduate scholarship winners, 2 NSERC industrial postgraduate scholarship holders, 1 GREAT award winner, and 1 NRC scholarship winner.

The undergraduate curriculum in the Chemistry Department has undergone extensive revisions and changes in the past three years to offer a more efficient and exciting Chemistry program. In 1999, the Major and Honours undergraduate programs in Chemistry received accreditation from the Canadian Society for Chemistry. The number of graduating students with a Major or Honours degree in Chemistry has increased in the past few years from 16 in 1997 to 32 in the year 2000. We expect to graduate 36 such students in the year 2001. In the summer of 2001, there were 7 NSERC undergraduate fellowship winners, 16 research assistants, and 12 students doing independent research study courses.

The Chair is shocked that the extremely positive growth in the Department would be rewarded by a demotion in status. In view of the on-going expansion, the service teaching component, and the complexity of operation of the Chemistry Department, we strongly urge the senior administration to reverse the decision to reclassify the Department as a Type B department.

Recommendation 13

We agree with this recommendation.

Recommendation 15

We agree strongly with this recommendation. The latest faculty salary settlement has rectified this anomaly. Morale is certainly higher, and Dr. J. Osborne, Associate V.P., Academic should be commended for initiating this action.

Recommendation 16

We agree with this recommendation.

Recommendation 17

The Canada Research Chair in Materials Science, Dr. N.R. Branda, has already been appointed. An additional position in Materials Chemistry (Dr. K.N. Slessor's retirement position) has been earmarked for September, 2004. Furthermore, negotiations have already begun with Dr. L. Dalton, a Materials Scientist, for a Tier 1 CRC position in 2003.

Recommendation 18

We agree with this recommendation and will take further steps to establish a more recognizable, higher profile Materials Science unit.

Recommendation 19

This recommendation will require cooperation between Departments and the assignment of joint positions to more than one unit by the senior administration.

Recommendation 20

We agree strongly with this recommendation. The Department has only one female faculty member. This inequity must be corrected! We request permission to search for a NSERC University Faculty Award candidate in the high priority area of Chemical and Structural Biology for the Fall, 2002.

Recommendation 21

We agree with this recommendation and will take further steps to establish a more recognizable, higher profile Chemical and Structural Biology unit.

Recommendation 22

We agree with this recommendation. We will continue to plan this new initiative with the expectation of additional hiring in this area.

Recommendation 23

We agree with this recommendation. We are aggressively pursuing the establishment of two NSERC Industrial Research Chairs for R.H. Hill (sponsor: EKC Technology Inc.) and S. Holdcroft (sponsor: Ballard Power Systems).

Recommendation 24

Given the complexity of operation of the Chemistry Department and the multiple duties assumed by the Department Assistant, we have requested a reclassification of this position to a higher grade. We have also posted the position to identify a capable individual to replace Ms. Evans.

Recommendation 25

A grant proposal for upgrading the 600 MHz NMR spectrometer has been submitted to the Canada Foundation for Innovation and the B.C. Knowledge Development Fund (PI: Pinto). Another grant proposal for a 500 MHz NMR spectrometer, with multiple users from the Departments of Chemistry and Molecular Biology and Biochemistry, has already been prepared (PI: Pinto) and will be submitted to NSERC in the competition for major installations in the Fall, 2001. We are hopeful that part of the 2001 infrastructure monies from the Province to SFU will be forthcoming for use as matching funds or institutional contributions for the CFI and NSERC grant proposals, respectively. A CFI application has also been submitted, with UBC as the lead institution, for mass spectrometers. Dr. G. Agnes of the Chemistry Department is SFU's representative on this application. If successful, the Chemistry Department will acquire two mass spectrometers. Local infrastructure monies will be required for the appropriate renovation of the laboratory to house the spectrometers. If unsuccessful, we will apply to NSERC for funding in the 2002 major installation

competition and infrastructure monies will be required as an institutional commitment towards the cost of a mass spectrometer.

External Review

Department of Chemistry, Simon Fraser University

March 5-6, 2001

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BACKGROUND

Background. The external review team received the following documents prior to their review:

1. Simon Fraser University Calendar
2. Graduate Studies Fact Book
3. Curriculum Vitae for Chemistry Department Faculty
4. Chemistry Department Self Study with statistics on enrollments and research grants etc.
5. Previous External Review (September 1994) and departmental response
6. Canada Research Chairs - Strategic Research Plan of Simon Fraser University
7. Senate Guidelines for External Reviews and Terms of Reference
8. President's Agenda and Organisational Charts
9. Review Committee Schedule (see schedule of interviews at end)

The external review team was asked by Dr. John Waterhouse at the outset to consider a number of specific issues in addition to those in the terms of reference document:

1 The extent of focus by the chemistry department on the research interface with other units
2 The impact and direction of the Chemistry faculty renewal in progress
3 Is Chemistry successfully covering a broad range of subdisciplines in research and teaching?
4 How important is the Nuclear Chemistry area with respect to points 2 and 3?
5 Should the department be doing more in Environmental Science?
6 Is there interest in a professional Master's program in Analytical Chemistry which is course-based and has differential fees?
7 There is concern that there aren't enough graduate students in Chemistry even though they should have sufficient resources to attract more
8 Why does Chemistry make frequent requests to upgrade students from M.Sc. status to Ph.D. status?

These issues were discussed with Chemistry Department members and recommendations to address them are made by the review team in the context of this document.

SYNOPSIS OF REVIEW TEAM'S EVALUATION

Overall the Chemistry Department is an excellent unit which provides very extensive service teaching and has a highly successful, well-liked, undergraduate program. This undergraduate program can justifiably claim to be one of the best in the country. The Department's research operation and reputation is very strong, especially in Materials Science and in Chemical and Structural Biology. The on–going faculty renewal has added excellent scientists who have the potential to make this department one of the very top, not only at SFU, but within Canada. The Department is also well-poised to develop two additional unique areas, namely Nuclear Chemistry (in conjunction with TRIUMF) and Environmental and Analytical Chemistry. Clearly the faculty and the Chair, Professor Mario Pinto, have done a truly outstanding job in building and renewing this unit. The external review team also felt that the SFU Administration appears to be strongly supportive of the Department's efforts to improve its stature and capabilities.

A major challenge faced by the Department is improvement of recruitment of highly qualified Ph.D. students (ideally more scholarship holders). This requires making potential applicants aware of the special strengths of Chemistry at Simon Fraser University in light of strong competition from other institutions, including nearby University of British Columbia. Success in this will depend not only on active recruitment strategies, but also on:

1. increased graduate scholarships (with consequent reduction in average teaching assistant load)
2. improved inter-departmental consultation and collaboration in the key focus areas
3. improved facilities in the areas of NMR and mass spectrometry
4. continued aggressive fund-raising for faculty chairs
5. increased faculty visibility and status via successful nomination for awards and recognitions
6. adequate research space

The external review team has made a series of 25 recommendations within this document, of which many key ones will impact on the above issues. Others can be viewed as suggestions for improving or fine-tuning of a well-run operation.

OVERVIEW OF DEPARTMENT

Overview and Chair's Comments. An overview of the department was provided by the background documents as well as by the presentation of the departmental chair, Dr. Mario Pinto. Currently there are 21 faculty and 4.5 lecturers, with the former teaching an average of two semesters per year. The lecturers teach two courses per semester with a one semester break every three years. The Department has a substantial teaching load with a FTE student total given as 4,335 for the 2000/01 fiscal year. The number of majors or honours chemistry students graduated was given as 32 in 2000 (up from 16 in 1997) with an expected total of 36 in 2001. The number of graduate students in 1999/2000 was 43 (27 PhD and 16 M.Sc.). The creation of the new Department of Molecular Biology and Biochemistry (MBB) in 1997 has led to a reduced faculty, graduate student and undergraduate student complement (seen in statistical summaries), despite the fact that some faculty hold joint appointments in both departments. However, the Chemistry Department has been increasing its undergraduate and graduate enrollments since that time.

About two thirds of the department has been replaced in recent years through faculty renewal, which has led to a very research active and energetic group of professors. Only about three of the 21 regular faculty do not hold NSERC operating grants, and the total external research funding for 1999/2000 was $3,070,934 (steady rise since 1997). The department is planning to expand two primary areas, namely Materials Science and Chemical-Structural Biology, as well as two smaller and more specialized areas, Nuclear Science and Environmental Science. CRC Chairs in the major areas are being recruited, with a Tier2 Chair in Materials Science pending. The Chair's areas of concern with respect to research include the need for additional faculty, space and improvement in the quality of graduate students. Currently graduate students must undertake extensive teaching assistantships throughout their stay. Because of external competition from UBC and other institutions, the quality and number of graduate students is not as high as might be desired. For example there are relatively few NSERC scholars and a large proportion of the graduate students are in the M.Sc. program. The department realizes that it must specialize in certain areas, and there are considerable discussions as to whether to continue the current Nuclear Science Program (presently ca. four faculty) or whether to convert some of these position through impending retirements into Materials Science positions. There is also some concern about gender and equity issues with the departure of a large number of former female chemistry faculty into the new Molecular Biology and Biochemistry Department. However, in this respect Dr. Erika Plettner has been hired under the NSERC University Faculty Award Program. Dr. Pinto also

believes that the department has failed to achieve the deserved amount of external recognition in terms of awards for its faculty and may lack some confidence as a result. Environmental Science wants to expand by hiring additional faculty and providing additional courses. At present it has approximately five B.Sc. students registered and the proposal is to have one NSERC Chair and one CRC Chair in this area.

Dr. Pinto also expressed some concern about the impending reclassification of the Chemistry Department from a "Type A" to "Type B" due to its decrease in size after the creation of the Department of Molecular Biology and Biochemistry. He felt that this may make the Chair's position less attractive in the future given the large student teaching load and complexity of operation and facilities. The external review team is not sufficiently informed of SFU internal operations to make an accurate judgement about this. However, there is no doubt that a chemistry department undergoing faculty renewal with extensive instrumentation, facilities, support staff, heavy service teaching and cooperative program is a more challenging task for a chair than many other types of departments which lack these.

Viewpoints and Comments from Vice Presidents and Deans. The team met individually with Dr. Bruce Clayman (VP Research), Dr. William Davidson (Dean of Science), Dr. Jon Driver (Dean of Graduate Studies), and Dr. Judith Osborne (Associate VP Academic). The two deans are relatively new in their positions, but appear very well-informed of activities and issues in the Chemistry Department. The division of duties between the various offices is similar to what is common in many universities. The administration appeared to be supporting strongly the core academic mission of the science departments, including chemistry. The need for graduate scholarships was expressed by the Dean of Graduate Studies, echoing messages heard from many quarters. One of the obvious effects of the low number of graduate fellowships is the need for graduate students to take on a great deal of teaching assistant work throughout their studies, which thereby extends their program length. Research space is also a key problem, apparently University-wide, but it is clear that expansion of programs and renewal of faculty will place great pressure on increased allocation of this valuable resource to Chemistry.

Recommendation 1: Efforts should be made to increase scholarship support to graduate students so as to enable them to dedicate more time to research and reduce the level of TA commitment. Some of these efforts could be initiated by the department in partnership with the university's advancement/development office.

Recommendation 2: Additional space for experimental chemistry will need to be located to accommodate proposed new research-active faculty, including Canada Research Chairs and NSERC Industrial Chairs or University Faculty Awards. Whether this can be done within the existing allocation to Chemistry will need to be examined very carefully.

Recommendation 3: A committee within the Department should actively focus on nomination of both junior and senior faculty for both national and international awards. These may include recognitions from the Canadian Society for Chemistry, the federal and provincial governments, the Alfred P. Sloan Foundation and the American Chemical Society as well as others.

Recommendation 4: The proposed reclassification of the Chemistry Department should be re-examined in light of its on-going expansion, service teaching and complexity of operation.

UNDERGRADUATE TEACHING AND CURRICULUM

Viewpoints and Comments from Undergraduates. The undergraduate Chemistry program is viewed as excellent, well-structured and very well-liked by the undergraduate students. Its strengths include a highly successful co-op program and great flexibility due to the trimester system, which is viewed as a unique positive attribute by the students. The students especially praised the quality of teaching and the personal interactive atmosphere created by the Chemistry faculty. The undergraduates did express concerns that the co–op program sometimes conflicts with required courses, and that scheduling of upper level courses (limited by instructor availability and departmental resources) can make it difficult for them to complete their degree program in four years. An issue mentioned by both the undergraduate and the graduate students was the importance of knowing the course schedule two years in advance so that they could plan their courses to finish the B.Sc. degree or the required graduate courses in a timely manner. Many students also felt that the undergraduate research course CHEM 481 entailed a level of work that was out of proportion with the meager 5 credits they received. They perceived that in other departments (e.g. MBB) students receive 10 credits for work of equal time and intellectual commitment. Another theme emerging from undergraduate discussions was the reduction in the number of tutorial classes given. Traditional tutorials appear to have been replaced to a considerable extent with "open tutorial" drop-in centres where undergraduates may obtain help with course materials. This was seen as a negative development by many.

Recommendation 5: The scheduling of courses, especially with year-round instruction is complex. However, the department may wish to re-examine its course scheduling with the goal of enhancing the prompt completion of the requirements for the majors and honors chemistry program.

Recommendation 6: The department may wish to consider increasing the number of credits given to the undergraduate research course, CHEM 481

Recommendation 7: Restoration of regularly scheduled tutorials in strategic courses should be considered. Tutorials are an extremely valuable component of undergraduate chemistry teaching, especially in large classes.

Cooperative Education. As indicated above, all concerned—faculty, lecturers, the co-op coordinator (John Simms), students—are enthusiastic about this program, and most undergraduates who

met the external review team are participating in it. The main concern voiced by several groups, is the desirability of providing more upper division chemistry courses in the summer, such that undergraduates who take a co-op position in the Fall semester are not disadvantaged later in finding courses that would let them complete their B.Sc. on time (see above). A suggestion was made to have on the transcript the name of the company where each co-op experience occurred. The review team noted that the current coordinator (who is one-half time) will be moving in May to a full-time position with the Dean of Science Office, and that a full-time chemistry co-op coordinator will be hired.

Recommendation 8: A replacement chemistry co-op coordinator should be hired as planned. This is viewed as essential for the continued success of the program.

Lecturers and Senior Lecturers. This group of teaching-only faculty performs an absolutely essential function in the department. Although primarily charged with instructing the laboratory portions of chemistry courses, most also give regular lectures in a significant number of courses. In their absence, the teaching loads of regular research-active faculty in the Chemistry Department would be considerably heavier than those typical of other universities with significant research activity. To replace their teaching function and maintain current loads for research-active faculty, it would be necessary to recruit at least two tenure-track faculty members for each lecturer. The Lecturers and Senior Lecturers in SFU's Chemistry Department are a dedicated, hard-working, highly professional group, who were pleased with the recognition they receive. Their contract, however, permits them only one semester off out of every nine. In a system with year-round instruction this seems entirely too low a level of release time to permit them to update their teaching material, introduce new laboratory curricula and ensure that they are able to easily maintain an appropriate level of professionalism.

Recommendation 9: Lecturers and Senior Lecturers should be given approximately twice the "release time" from teaching that they are currently permitted.

Curriculum Issues. A number of faculty interest groups, including inorganic, physical, analytical/environmental and organic chemistry expressed desire to add courses to the curriculum. Examples of proposed changes include: establishing CHEM 331 as a required Inorganic/Physical course in which symmetry, group theory and spectroscopy would be taught; increasing frequency of offering CHEM 415 (Analytical); development of a 4th year course in environmental science and technology which would also encompass alternative energy sources and sensors; and creation of an optional course CHEM 381 in intermediate organic chemistry for chemistry majors. However, the review team noted

that the department recently revised its curriculum after extensive discussion. The team also felt that the imposition of additional requirements would reduce flexibility, and that the program would become less attractive to undergraduate students. In addition, unless a considerable number of new faculty were hired, teaching load would increase substantially.

The creation of an ambitious non-traditional Environmental Science and Technology (EST) Program was also suggested, with the proposed new 4th year environmental science and technology course (see above) as the first step. Such a course and program could be extremely valuable if properly planned and executed. However, the proposal for the EST Program did not yet seem to be sufficiently developed to allow the team to form an accurate opinion regarding its present merits. Given existing departmental teaching commitments, it is also uncertain whether sufficient resources are available to make this program immediately viable. This is not meant to be a negative statement regarding the potential value of implementing such a program in the future, but rather a statement of its current state of development.

Recommendation 10: The present curriculum is effective, substantial and well-balanced. New required courses should not be added to the undergraduate curriculum in the next year or two. The department could consider establishing "thematically named" streams (materials stream, biological stream, etc.) to their honors and majors program through which students would be given greater flexibility to concentrate in an area of interest.

Recommendation 11: The proposed Environmental Science and Technology Program requires further planning and resources before possible implementation. The question should be re-examined when a more concrete plan is created.

GRADUATE PROGRAM AND CURRICULUM

Viewpoints and Comments from Graduate Students. Chemistry graduate students are very enthusiastic about their studies and research experience, and would like to see more Ph.D. students in the program. They did express some concern that there are few if any lecture courses exclusively for graduate students. This can be a problem for former SFU undergraduates who enter the graduate program as they normally have already had most of the relevant courses. The graduate students feel that their teaching load is substantial, and that there is a lack of graduate student fellowships compared to support for colleagues at other universities (see recommendation 1 above). There also appears to be considerable interest among the graduate students for at least some formal training (pedagogy) to assist them for their first semester of teaching. The external review team noted that there is little in the way of formal instruction of graduate students on how to be effective teaching assistants, and that in many courses there are no regular TA meetings. Laboratory supervisors (Lecturers) and technical staff also noted that many graduate teaching assistants needed extensive help on use and management of laboratory equipment, and that problems could be alleviated by more regular advance instruction (see also below under Facilities). Interestingly, a number of female graduate students indicated that they did not feel safe working in the research laboratory in the evenings (as is common at many institutions) because of potential criminal activity. They suggested that increased campus security patrols and a system of electronic door locks with card keys would be desirable.

Recommendation 12: A formal one or two day session on specific pedagogic and organizational skills required for teaching of "chemistry as a laboratory science" to undergraduates should be instituted for graduate students at the start of each term. Special instrument training should be required of TAs who teach in instrument-intensive lab courses. In this regard, a system of regular TA meetings may be helpful in many courses.

Recommendation 13: The university administration should examine evening security to decide whether the perception of danger is accurate. Reasonable measures should be taken to address this issue.

Viewpoints from Chemistry Faculty and Administration. The overall graduate program appears to be in good shape, but an increase in both the number of graduate students and in the relative percentage of Ph.D. students would be desirable. Acquisition of more national scholarship winners (NSERC holders) would be especially welcome, and aggressive recruitment of such individuals is

needed, perhaps with the aid of additional financial incentives. Generally the research faculty felt that the graduate students should do significantly less service as a teaching assistant, with more support on fellowship and research funds (see recommendation 1 above). At the same time, there was a feeling that additional teaching assistantship support to the department would be very welcome to reduce the burden on current teaching assistants, and thereby shorten their program length and increase research productivity. Whether the department can actually reduce the time to the Ph.D. is uncertain—many similar chemistry Ph.D. programs in the United States average 5.1 to 5.4 years.

During the initial meeting with the administration, the review team was asked to examine why the Chemistry department has so many requests to upgrade M.Sc. candidates to Ph.D. candidates. This appears to originate from the SFU requirement that a graduate student have demonstrated some research accomplishment before being admitted into a Ph.D. program. Some of the current Ph.D. candidates are directly admitted into that program based on their undergraduate research accomplishments, whereas others have to prove themselves in the M.Sc. program before advancing further. However, such a level of requests and resulting transfers are common in many chemistry departments at other Canadian universities.

The administration also asked the review team to examine establishment of a course-based professional Master's degree in Analytical or Environmental Chemistry with a possible view to continued education and distance education programs. There was a suggestion of possible differential fees to assist support of such a program. This idea, which is clearly applicable and popular within the overall Simon Fraser University mandate, is rare in chemistry areas. The general consensus in discussion with Chemistry faculty was that the demand and the teaching resources for this type of program are presently insufficient to allow immediate implementation. With its relative youth, the chemistry faculty should build its research profile and fulfill its regular teaching mandate as a first priority and then, as the number of faculty and resources increase, possibly examine undertaking programs such as a professional Masters.

Recommendation 14: A course-based Masters degree in Analytical or Environmental Chemistry should not be added in the immediate future.

FACULTY AND RESEARCH

Assistant Professors. The external review team met individually with the recently-hired assistant professors in a variety of chemistry areas. All of the assistant professors appear to be excellent scientists—a tribute to the department's strong recruitment efforts. They all found the department to be hospitable and generally very well-organized. They felt that they received outstanding mentoring from senior faculty and the chair. These younger faculty also appreciated that they were given adequate space for rapid growth, teaching relief in the first year (e.g. a single course) and reasonable start-up funds (e.g. experimentalists obtained ca $100,000 over two years). Individuals who started several years ago sometimes had to wait up to 6 months for renovations, but such delays appear to have been eliminated for more recent hires. As a group, the junior faculty appear to be very successful in attracting graduate students and acquiring external funding. There was a legitimate case made regarding salary inequities which have resulted from the policies of the university regarding recent scale increases and lack of retroactive adjustment.

Recommendation 15: Salary inequities resulting from timing of hiring of individuals in comparable positions are very demoralizing, and the University should do its best to eliminate these as a high priority.

The Future of Nuclear Science in the Chemistry Department. The committee examined points raised in the nuclear chemists' position paper provided as preliminary information. Many of the current nuclear science faculty are retiring, and there is controversy about whether to replace these individuals with researchers in other areas or to continue the relatively unique activity in nuclear chemistry. The completion and successful operation of ISAC-I at TRIUMF, and the funding of new building and construction of ISAC-II provide an unique experimental capability for studies with radioactive beams with a state-of-the-art facility which is only a short commute from SFU. (The incoming TRIUMF Director also has major research interests in studies with ISAC-I and –II.) The department is in an enviable position to take advantage of this new experimental capability for studies of exotic nuclei, nuclear astrophysics, transuranium chemistry and superheavy elements, materials science and nuclear medicine. It is also important to note that ISAC-II will be the only major North American radioactive beam facility from the period of its completion in 2004-05 until at least 2011, which is the earliest that a proposed, very expensive, "rare isotope accelerator" can be approved and constructed in the United States.

Recommendation 16: The external review committee recommends that 1.5 nuclear chemistry faculty positions be maintained with another 0.5 coming from a joint appointment at TRIUMF. This would take advantage of the new facilities at TRIUMF, provide enough mutual intellectual support for nuclear chemistry in the department, and permit the small but quite significant nuclear science minor to be maintained. This can be especially attractive if these scientists need few resources at the Burnaby Campus site. A key requirement is that the individuals hired in nuclear chemistry should be able to interact scientifically with their colleagues in the Chemistry Department.

Materials Science. The Chemistry Department has correctly identified Materials Chemistry as a major thrust for future recruitment. This theme is also identified by SFU as one of its areas of concentration in the Strategic Plan produced for the CRC Chair program. This field is very strong at SFU and involves several other departments (e.g. Physics and Engineering). Internal cohesion among members of the materials group is informal, yet synergies have been established through research collaborations and participation in the Pacific Centre for Advanced Materials and Microstructures (a joint initiative with UBC formed partly as a CFI venture). The review team was also impressed with the plans for creating a CFI and BCKDF funded materials analysis laboratory, for which an impressive level of private-sector funding has been identified. This concentration of analysis instrumentation would also create an opportunity to construct new space to house the facility. However, the review team felt that even greater synergy could be created among the materials scientists at SFU through the development of a more identifiable entity with theme-based programs and events such as a materials seminar series. The Chemistry Department's aspiration for at least two new positions in this area (one CRC Chair and one additional position bridged to a retirement in 2002) seems very reasonable. This would allow the scope of teaching in upper division materials-related courses to be expanded. Some suggestions were made that the granting of FTEs along strict departmental lines (especially in a climate where new departments are being created) together with the fear that the formation of new cross-disciplinary groups would lead to the formation of other new departments discourages interdisciplinarity. If such systemic barriers to interdisciplinary development do exist, efforts should be made to address them.

Recommendation 17: The Department's plan for two positions in materials chemistry (including one CRC Chair) should be implemented.

Recommendation 18: The materials scientists at SFU with interdisciplinary membership in several departments should form a more recognizable and identifiable subunit (but not a separate department) which could then undertake theme-based initiatives (e.g. joint seminars, consultation on recruitment of faculty, collaborative projects etc.).

Recommendation 19: Systemic impediments (if any exist) for departments to seek joint positions or to engage in joint planning for positions in order to achieve interdisciplinary goals should be addressed.

Chemical and Structural Biology Group. At the request of the review team, an additional 15 minute session was scheduled with the supporters of the chemical and structural biology initiative within the Chemistry Department. This proved to be a very large group having many of the members of the Department of Molecular Biology and Biochemistry (MBB) as well as all the individuals who hold joint appointments in both departments. It is clear that this is an active area with extensive collaborations in both established and emerging research endeavours. Certainly the chemical and structural biology group is a main strength of the Chemistry Department. Discussions with individual faculty members reveal there is a certain level of tension between the Department of Chemistry and the relatively new Department Molecular Biology and Biochemistry with respect to undergraduate teaching, resources and graduate curriculum. The creation of a separate MBB department has reduced the numbers of graduate students, undergraduates and faculty in Chemistry, as can be seen from the statistical summaries. It has also shifted the gender balance such that the Chemistry Department now only has one female faculty member. Although many individual faculty members in the two departments collaborate successfully within the chemical and structural biology initiative, there is some lack of communication and consultation despite many common program and recruiting goals. The departments also do not seem to hold many joint meetings or seminars. The group plans a search for a female candidate for an NSERC University Faculty Award position be initiated in the fall of 2001.

Recommendation 20: The Chemistry Department should continue to strive to correct the gender imbalance created by the separation of the MBB Department. The NSERC University Faculty Award program, which has been successfully used in the past, should be pursued as a source of funds as planned.

Recommendation 21: The chemical and structural biology initiative should be supported and enhanced through improved consultation and joint initiatives with MBB, perhaps as suggested above for the materials science program.

Environmental Chemistry. Although this is a very important area, the external review team met only two faculty members who expressed active interest in further expansion of this program. Although it is listed as a secondary initiative of the Chemistry Department by the departmental chairman, Professor Mario Pinto, the plans for this are not yet well-developed and planning for the program is still at an early stage. Suggested addition of courses in this area will put an additional burden on the department's teaching commitments unless new faculty are hired.

Recommendation 22: The environmental chemistry initiative requires further planning and development, along with additional hiring in this area (if feasible), before implementation.

Recommendation 23: There is a very strong need for aggressive fund-raising for additional support of faculty Chairs.

RESOURCES, FACILITIES AND SUPPORT

Library. The review team met with the departmental library committee, Ms. Natalie Gick (Chemistry Liaison Librarian) and Mr. Todd Mundle (Head of Collections at SFU Library). Mr. Mundle presented an excellent overview of the SFU Library and its relationship to the Chemistry Department. He also elaborated on the various databases (e.g. Beilstein, crystal structure databases, STN) and the interlibrary loan system which is available to researchers in the Department. The general perception was that the library system is highly organized with excellent access for chemistry research. Although the lack of a medical school may result in certain types of journals not being available in the system, these can be readily acquired through interlibrary loan. Overall the impression is one of a very well functioning library.

Departmental Business and Facilities Management. The review team met with the laboratory coordinator/student advisor, Dr. Ken MacFarlane, and the departmental assistant/office manager, Ms. Teri Evans. Both of these individuals presented an overview of their duties and operations. Ms. Evans is the business manager who takes care of the budget as well as supervising and actually completing a large number of secretarial duties. Unfortunately, she plans to leave to continue graduate studies in the near future. Dr. MacFarlane has a Ph.D. in Chemistry from UBC and is responsible for a large array of departmental functions. In addition to being the coordinator for both teaching and research laboratories, he is also: the supervisor of seven technical staff; the key person involved in undergraduate registration and advising; the individual responsible for departmental safety and security; the person who controls purchase and management of departmental equipment, materials, supplies and renovations. It is clear that both of these individuals are uniquely talented and very hard-working. Replacement of Ms. Teri Evans will be absolutely essential and probably difficult to achieve with an individual with the same capabilities. Space for instrumentation and research and teaching were listed as key problems that confront the department. Another important issue is the eventual replacement of teaching instruments even though function and maintenance is very good at present. Not much space is left for expansion of the Department through new hiring.

Recommendation 24: It is essential that, if Ms. Evans leaves as planned, she be replaced by an individual capable of assuming her multiple duties within the Chemistry Department.

Technical Staff and Support Facilities. The department lists five teaching technicians and two facilities technicians. In addition there is a senior technical person (Dr. Alan Tracy) who supervises the NMR facility, does a great deal of the NMR training and assists supervision of graduate students. All of the technical staff appear highly capable, professional, dedicated and hard working. Overall, the operations seem very well-run and provide the necessary facilities to support the research efforts. Some technical staff did express a desire for a greater level of communication with the academic personnel responsible for the teaching labs in order to better coordinate the operation. The staff also advocated more extensive training of the graduate teaching assistants, especially in instrumental labs (see also recommendation 9 above). An important issue impacting the department's research capability is the need for increased space. For example, Dr. Z. Ye would like to have separate furnace lab to house his six high-temperature furnaces for reasons of personal safety resulting from the volatilization of toxic materials. There was also some concern whether the central machine shop was adequately staffed, and there seems to be a temporary problem with long waits for glass blowing requests. The review team did note that researcher access to certain basic instrumentation, in particular high field nuclear magnetic resonance (NMR) and modern mass spectrometry (MS) is not as extensive and routine as at many institutions.

Recommendation 25: Researchers within the Chemistry Department should seek major external funding for new NMR and MS research equipment as soon as possible.

SYNOPSIS AND OVERALL SUMMARY - See First Section

REVIEW COMMITTEE SCHEDULE

MONDAY MARCH 5TH		
8:00	8:45	VP Academic - Dr. John Waterhouse VP Research - Dr. Bruce Clayman Dean of Graduate Studies - Dr. Jon Driver Dean of Science - Dr. William Davidson Director, Academic Planning & Resources - Ms. Sue Roppel
8:45	9:45	Chair of Chemistry, Dr. B.M. Pinto - Overview of the Department
9:45	10:15	Technicians
10:15	10:45	Lecturers
10:45	11:15	Laboratory Coordinator - Dr. Ken MacFarlane Departmental Assistant - Terri Evans
11:15	11:45	Co-operative Education - John Simms
12:00	1:15	Lunch, Diamond University Centre - Graduate Studies Committee (Andy Bennet, George Agnes, Gary Leach, Erika Plettner, Zuo Ye)
1:30	2:00	Library Committee - Holdings (Danny Leznoff, George Agnes, Vance Williams, Pete Wilson) with Natalie Gick, Science Librarian and Todd Mundle, Head of Collections *
2:00	2:30	Materials Scientists (Steve Dodge, Brett Heinrich, Ross Hill, Steve Holdcroft, Karen Kavanagh, Gary Leach, Danny Leznoff, Jeff Sonier, Mike Thewalt, Simon Watkins, Vance Williams and Zuo Ye) *
2:30	3:00	Inorganic Faculty Group - Curriculum
3:00	3:30	Physical Faculty Group - Curriculum *
3:30	4:00	Analytical Faculty Group - Curriculum *
4:00	4:30	Nuclear Faculty Group - Curriculum and Nuclear Science Minor
4:30	5:00	Organic Faculty Group - Curriculum
5:00	5:30	Review Committee Meeting
5:30	7:00	Reception: Diamond University Centre with Faculty, Staff, Graduate Students

TUESDAY MARCH 6TH		Room SSB8114 unless otherwise specified	
8:00	8:10	Dr. Erika Plettner - Assistant Professor, Bio-organic	
8:10	8:20	Dr. Josh Wilkie - Assistant Professor, Theoretical	
8:20	8:30	Dr. Vance Williams - Assistant Professor, Materials Organic	
8:30	8:40	Dr. Pete Wilson - Assistant Professor, Synthetic Organic	
8:40	8:50	Dr. Danny Leznoff - Assistant Professor, Inorganic	
8:50	9:00	Dr. Paul Li - Assistant Professor, Bio-analytical	
9:00	9:30	VP Research, Dr. Bruce Clayman - Research Profile of the Department	SSB8114
9:30	9:50	Dr. Zuo Ye - Associate Professor, Materials - Moskovits Dr. George Agnes - Associate Professor, Analytical - Cerny Dr. Andy Bennet - Associate Professor, Physical Organic -Vederas	C8078 SSB8114 SSB8140
9:50	10:10	Dean of Graduate Studies, Dr. Jon Driver - Graduate Students and Postdoctoral Fellows	SSB8114
10:10	10:30	Dr. Rosemary Cornell -Professor, Lipid Biochemist, DMBB Moskovits Dr. Keith Slessor – Professor, Bio-organic -Vederas Dr. Bill Richards – Professor, Protein Biochemist, DMBB - Cerny	SSB814 C8078 SSB8114
10:30	11:30	Graduate Students	SSB8114
11:30	12:00	Dean of Science, Dr. W. Davidson - Status of the Chemistry Department within the Faculty of Science	SSB8114
12:00	1:00	Lunch, Diamond University Centre - Undergraduate Studies Committee (Ralph Korteling, Ross Hill, Paul Li, Ken MacFarlane, Evelyn Palmer, Josh Wilkie, Pete Wilson)	
1:15	1:30	Chemical and Structural Biology Group	SSB8114
1:30	2:00	Undergraduate Students	SSB8114
2:00	2:20	Associate VP Academic, Dr. Judith Osborne - Resources and Space	SSB8114
2:20	2:35	Dr. Ralph Korteling - Professor, Nuclear - Cerny Dr. Paul Percival - Professor, Physical - Moskovits Dr. Steve Holdcroft - Professor, Materials Vederas	C8078 SSB8114 SSB81

TUESDAY MARCH 6TH		Room SSB8114 unless otherwise specified	
2:35	2:50	Dr. Dipankar Sen -Professor, Nucleic-acid Bioch, DMBB -Vederas	SSB8140
		Dr. John D'Auria - Professor, Nuclear - Cerny	SSB8114
		Dr. Ross Hill - Professor, Materials - Moskovits	C8078
2:50	3:30	Review Team meeting	SSB8114
3:30	3:40	Dr. B.M. Pinto - Chair	SSB8114
3:40	4:30	Meeting - President's Conference Room, Strand Hall	
		VP Academic - Dr. John Waterhouse	
		VP Research - Dr. Bruce Clayman	
		Dean of Graduate Studies - Dr. Jon Driver	
		Dean of Science - Dr. William Davidson	
		Director, Academic Planning & Resources - Ms. Sue Roppel	