

SIMON FRASER UNIVERSITY
Senate Committee on University Priorities
Memorandum

S.07-3

*As amended
by Senate
8 Jan 07*

TO: Senate
FROM: John Waterhouse
Chair, SCUP
Vice President, Academic
RE: Department of Mathematics
External Review
DATE: December 19, 2006

The Senate Committee on University priorities (SCUP) has reviewed the External Review Report on the Department of Mathematics, together with responses from the Department and Faculty, 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 Mathematics and the Dean of the Faculty of Science on priority items resulting from the external review.

The report of the External Review Committee for the Department of Mathematics was submitted in April, 2006 following the review team's site visit, which took place April 5 – 7, 2006. The response of the Department was received in early October, 2006 and the response from the Dean on October 18, 2006.

The Review Committee found the department to be 'in very good condition' and was very impressed by the significant improvements that have taken place since the last review. The Committee made a number of recommendations and there was general agreement on these recommendations from the Department and the Dean.

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

1. Faculty

- Consider targeting its searches on faculty that can make connections and bridge across different research groups in the Department.
- ~~Address the under~~ representation of female faculty in the Department.
- Ensure appropriate recognition is made of excellence in teaching in the Department.

to attempt to increase the

2. Research Centres

- Continue to support PIMS, IRMACS and MITACS.

3. Undergraduate Education

- Rather than offering certain advanced courses only every second year consider the possibility of consolidating some of these courses and running them each year.
- Form a joint committee with the School of Computing Science to review issues of overlap and discuss opportunities for future cooperation.
- Re-evaluate the workload of lecturers and with the Dean, consider the adequacy of resources for the running of Q courses.
- Review the adequacy of resources for promotional material for undergraduates.

4. Graduate Education

- Review recruitment packages for PhD students for their competitiveness.
- Explore the possibility of offering more research topics courses.
- Ensure that PhD students are involved in a regular and systematic evaluation of their progress towards graduation.

5. Space

- Provide a centrally located student common room for undergraduates and other improvements as inventory becomes available.

6. Staff

- Review the levels of staff both for secretarial and systems support.
- Review the process to improve the coordination of faculty activity around undergraduate advising and the staff appointed for this purpose, particularly during registration periods.

7. Faculty Restructuring

- Participate fully in the process initiated by the Vice President Academic for reviewing the effectiveness of the Faculty structure at SFU.

Cc; Mike Plischke, Dean Faculty of Science
Tom Archibald, Chair, Department of Mathematics

SIMON FRASER UNIVERSITY
Office of the Dean of Science

MEMORANDUM

TO: Bill Krane, Associate VP
Academic

FROM: Dr. Michael Plischke, Dean
Faculty of Science

RE: **External Review of Mathematics** DATE: October 18, 2006

I have now received the response of the Department of Mathematics to the report of the External Review Committee (ERC) and will briefly comment on both documents. Since the Department has accepted in whole, or in part, all but one of the formal recommendations, there is no need for a lengthy discussion on my part. The ERC's report is very positive, especially in regard to the strategic plan of the Department to distinguish itself from local and national competitors and thus to carve out a unique niche in Canadian Mathematics. The three main research groups in the Department (discrete mathematics, number theory, algebra and applied mathematics) are all characterized as very strong in an international context.

In its response to the ERC report, the Department highlights an issue that it feels was not adequately addressed in the report, namely the acute shortage of space. There is no question that both Mathematics and Statistics and Actuarial Sciences are woefully under resourced as far as space is concerned. This applies to all categories (faculty offices, support staff space, graduate student seating, undergraduate student society space). However, it must be pointed out that there is no obvious "quick fix" that is possible within the Science space envelope. Schools in the Faculty of Applied Sciences bound the two departments on all sides and, unless there is the political will in the higher administration to do some reallocation between Faculties, there is no attractive solution available. Both Mathematics and Statistics and Actuarial Sciences are keen to grow and I support their ambitions. However, the only new office space available to Science is located in Chemistry and TASC II and I don't imagine that new faculty hired into the mathematical departments will find it attractive to be housed there.

I will now comment on a selection of the ERC's recommendations.

Recommendation 2: A position, preferably senior, should be targeted to address the under representation of female faculty members.

The Department and I agree that this should be a priority. I am prepared to fund a more senior appointment if a suitable female candidate can be identified.

Recommendation 4: Since mathematics plays a key role within SFU and should continue to do so, any anticipated reorganization of faculties and departments should

engage the Department in its planning and in particular should guarantee that the unique strengths in Mathematics are preserved.

I believe that the natural home for Mathematics is in the Faculty of Science. The Departmental response, however, is more ambiguous.

Recommendation 6: The Centre for Experimental and Constructive Mathematics should report directly to the Chair of the Department of Mathematics, since CECM space is considered to be part of the space of the Department of Mathematics. Currently CSC occupies no departmental space, however if that situation were to change it also should report to the Chair of the Department of Mathematics.

The Department does not accept this recommendation. My sense is that the Department and the CECM have come to an arrangement for the use of the CECM space that is equitable for both parties and I therefore agree that a change in reporting structure is not necessary at this time. The CSC is a Schedule B Center and it would not be appropriate to have it report to the Chair of Mathematics.

Recommendation 9: Mathematical courses in computational areas should remain under the control (or joint control) of the Department of Mathematics. This is crucial to sustain the health of the mathematics educational mission.

I assume that this recommendation stems from a feeling in the Department that faculty in Computing Science would like to have preferential access to the MACM courses that were in large part developed by mathematicians. I agree with the Department that its emphasis on computational aspects of mathematics should continue to be reflected in the undergraduate teaching that its members do.

Recommendation 11: Resources to support the Mathematics endeavours at Surrey should be allocated as quickly as possible, with direct involvement from the Mathematics Department in determination of these. The success at the Surrey campus requires prompt attention to resources allocation.

I believe that this recommendation has its origin in opinions provided to the committee by an intermittently disgruntled faculty member based at Surrey. I am certain that the situation, as far as clerical support at Surrey is concerned is well in hand.

Recommendation 12: The workload of the lecturers should be reevaluated. In particular, their already heavy schedules will be affected by new remedial courses; therefore resources should be allocated to provide the additional undergraduate advising that will be needed.

The workload of teaching faculty is an issue throughout the Faculty and will be discussed at a higher level in the near future.

Recommendation 20: Employ an adequate number of permanent systems support personnel. A permanent systems manager is indispensable for the proper functioning of the Department, both for its educational mission as well as to support research activities.

If CECM reports to the Department (Recommendation 6) then the Panel recommends that 1 1/2 systems support positions be allocated to support the Department.

The funding from my office for the existing limited term systems support person came from carryover funds in a previous fiscal year. Carryover funds will not exist at the end of the current fiscal year. The cost of a systems consultant is roughly the same as an Assistant Professor, Step 4 and this is the trade-off that will be necessary if the position is to be base-funded.

Michael Plischke

c: Tom Archibald

Department of Mathematics Response to 2006 Departmental Review

The review of the Department of Mathematics was found by the Department to be a useful exercise. It gave us an opportunity to think about our direction and to consider what our greatest needs are. We were likewise very content with the professionalism of the team, as well as with the assistance we received from the office of the Vice-President Academic. And for the most part we were very content with the recommendations, which we interpreted as saying, in essence, that we were on a good course and should continue to make decisions much as we have been doing. We were particularly pleased by the general tenor of comments such as the following:

"The fundamental observation is that the Department of Mathematics is in very good condition. It plays a central role in the educational and research activities of the University and it is well positioned to keep doing so along the major strategic lines of SFU ... The Review Panel is quite impressed by the significant improvements that have taken place since the last review in 1998. ... The Department of Mathematics now contains predominantly young, vibrant faculty members who are extremely enthusiastic; collegiality among different research areas and groups is evident."

While the review did bring most of our perceived problems to the fore, it neglected to speak as strongly as we would have like concerning our space problems. Together with the Dept. of Statistics and Actuarial Science we face very serious space resource problems, and this has been brought to the attention of the Dean repeatedly. This is currently being explored by the Dean and finding some resolution will continue to be a major priority for us.

Apart from space issues, the main resource-related issues brought up by the reviewers had to do with staff. Their recommendations for improved advising, reduction of lecturer workload, and secretarial backup imply additional staffing, given the fact that existing staff, though highly experienced, has really no latitude for additional work. Their recommendation for ongoing computing technical support also would imply continuing our temporary technician position. We support both of these ideas.

While all of the recommendations seemed to us thoughtful and well-intended, there were a few places where full agreement was not possible. The main suggestion we reject is that the Centre for Experimental and Constructive Mathematics should report directly to the department. Otherwise, our detailed responses to are given below.

Recommendations and responses

Research Faculty

Recommendation 1: The Department of Mathematics should target its faculty searches on faculty who can make connections and bridge across different research groups in the Department. The Department is in a hiring mode, with at least 2 untargeted positions at this point. This represents an important opportunity.

Response: Since this writing we have been asked to restrain hiring due to the financial situation of the university. However, we currently plan one hire at Burnaby as area open.

and we will be looking for exactly this kind of opportunity. We see the Industrial Mathematics program currently under development as a further opportunity for departmental integration.

Recommendation 2: A position, preferably senior, should be targeted to address the underrepresentation of female faculty members. There is a need to enlarge the representation of women among the faculty. This is a problem that is hard to solve at SFU or elsewhere, in particular if there is some degree of seniority in the position. Success in this recruitment requires special incentives and the support of the SFU administration.

Response: We strongly support the idea that we need additional female faculty at all levels, with the need at senior level being particularly critical. We note that at present we have no authorization for a senior-level hire, and further that senior women frequently present the additional obstacle of a spousal hire in mathematics. We have explored the potential in some cases but so far we have not found a solution here. It is our plan to continue to investigate this.

Recommendation 3: Untenured faculty should be relieved of service duties as much as possible. Particular attention should be paid to those faculty members whose research productivity is apparently suffering.

Response: Since a very large percentage of the department is not tenured, we can't agree to follow this suggestion. We need the energy and imagination of newer faculty in making departmental practices current. However, we do aim to provide teaching relief for those faculty early in their careers who are taking on significant service assignments. The Chair has looked carefully at the committee assignments of those with research productivity problems and adjustments have been made which should greatly alleviate this problem.

Recommendation 4: Since mathematics plays a key role within SFU and should continue to do so, any anticipated reorganization of faculties and departments should engage the Department in its planning and in particular should guarantee that the unique strengths in Mathematics are preserved.

Response: The Department of Mathematics agrees wholeheartedly that our effectiveness should not be reduced by any faculty reorganization. We currently are functioning well within science, though this does not mean that a reorganization would not present significant opportunities. We hope for full consultation in this regard.

Research Centres

Recommendation 5: SFU should continue its investment and support of PIMS, IRMACS and MITACS. Each plays a pivotal role in the national and international visibility of mathematics at SFU. In particular, it is of fundamental importance that IRMACS continues to develop as a resource for the entire university.

Response: The Department benefits significantly from these entities in a variety of ways and will continue to support them fully.

Recommendation 6: The Centre for Experimental and Constructive Mathematics should report directly to the Chair of the Department of Mathematics, since CECM space is considered to be part of the space of the Department of Mathematics. Currently CSC occupies no departmental space, however if that situation were to change it also should report to the Chair of the Department of Mathematics.

Response: The Department does not support this recommendation. It would muddy the staff resource situation with CECM. At present CECM looks after its own technical support in an agreement with IRMACS. As for space, we have a symbiotic relationship with CECM that makes it an attractive site for housing graduate students of CECM members in the department. The fact that this is treated as our space in some contexts has not posed planning or resource problems thus far.

Education and Training

Recommendation 7: A departmental colloquium and/or a Distinguished Lecture Series should be initiated. These provide an avenue to get together in a common scientific activity faculty and students with possibly different research interests.

Response: We support this recommendation and are taking the opportunity of the PIMS anniversary symposia this year to try to generate a broader departmental interest in speakers.

Recommendation 8: If more frequent offerings of advanced undergraduate courses are not possible then existing courses should, in some cases, be consolidated. This is offered as a possible solution to the current practice of offering some courses only in alternate years.

Response: We support this recommendation, emphasizing the words "in some cases". Our template of offerings is posted on the website, and we attempt to plan requirements so that prerequisites can be met even when courses are offered only every other year. This does entail planning on the part of the student, and the fact that this has emerged as a problem seems to point to the fact that for some students our system of advising is ineffective. We are currently examining ways to improve undergraduate advising, and with revisions to our undergraduate offerings we hope to be able to identify potential majors while they are in first or second year and meet with them to discuss their plans.

Recommendation 9: Mathematical courses in computational areas should remain under the control (or joint control) of the Department of Mathematics. This is crucial to sustain the health of the mathematics educational mission.

Response: We completely agree with this statement.

Recommendation 10: The University, Faculty, and Department should move quickly to provide a centrally located small student common room for undergraduates with generous hours available. The current (partial) solution to the undergraduate student lounge is totally unacceptable and a speedy solution is crucial to ensure the (social) quality of life for mathematics students and to help build a sense of community.

Response: We accept this recommendation. We are currently investigating the possibility of using a portion of rebuilt graduate student space as space for our undergraduate student union on a trial basis. While we can ill afford to give up the space for grads,

temporary graduate student office space may be found in CECM or IRMACS. This would permit us to house the MSU, provided that they can use the space appropriately.

Recommendation 11: Resources to support the Mathematics endeavours at Surrey should be allocated as quickly as possible, with direct involvement from the Mathematics Department in determination of these. The success at the Surrey campus requires prompt attention to resources allocation.

Response: We would very much like to see the spirit of this recommendation put in place as soon as possible. We now have access to secretarial support at Surrey for the equivalent of two days weekly. Surrey faculty are also being encouraged, we hope effectively, to make use of Burnaby staff as appropriate. We now have representation on the steering committee of the Learning Commons at Surrey, which is helping in the planning of workshop/lab space. However, direct intervention of the Department Chair with the Surrey Executive Director seems to be necessary frequently for problems that ought to be possible to resolve at the staff level. We look forward to the evolution of the reporting structure in a way that will allow a clearer input of departmental priorities.

Recommendation 12: The workload of the lecturers should be reevaluated. In particular, their already heavy schedules will be affected by new remedial courses; therefore resources should be allocated to provide the additional undergraduate advising that will be needed.

Response: The Department is keenly aware that the lecturers are a valuable resource that it is tempting to overuse. Lecturer workload is mandated by the university policies. The Department has worked, and will continue to work, to try to identify more clearly the service component of the lecturer's job, so that the distinction between teaching-related activity and service will be clearer. The Department is also working to move jobs that can be handled by staff away from the lecturers (for example, web maintenance) to the extent that this is possible given staff workload and capacities. The idea that we should have a staff-level advisor is an attractive one to the Department. To some degree concern about the demands from the new remedial courses has been allayed by the fact that student demand was lower than anticipated, together with the fact that good advance planning by the lecturers made the diagnostic procedures go smoothly.

Recommendation 13: The Department and University should consider nominating Malgorzata Dubiel for a national 3M Teaching Award.

Response: We plan to do this. We congratulate her as a recent recipient of a national award from the Pacific Institute for Mathematical Sciences.

Recommendation 14: Funding should be allocated for adequate promotion of the undergraduate programs and initiatives of the Department, including glossy brochures, leaflets, posters, etc.

Response: We accept the spirit of this recommendation. It is certainly true that our paper promotional material is lacking. Our web site also needs work in this regard and we have been devoting resources to this.

Recommendation 15: Ph.D. recruitment packages should be reviewed in light of the current situation in mathematics nationwide to determine if they are competitive and, if not, to make them competitive.

Response: We increased our PhD and MSc funding commitments beginning this fall so that students making satisfactory progress will receive funding guarantees for 4 and 2 years respectively. The amounts are still lower than we would like. In particular it is difficult to compete with the UBC tuition waiver for doctoral students.

Recommendation 16: The Department should explore mechanisms to offer more research topics courses.

Response: We agree with the idea that we should diversify our graduate offerings and the ways in which graduate credit may be obtained. Discussion is ongoing and this recommendation has already been useful.

Recommendation 17: The Department should ensure that students are involved in a regular and systematic evaluation of their progress towards the PhD degree, including periodic meetings with the Supervisory Committee. This is currently done but its application is not uniform across the graduate student body.

Response: We agree, and have modified the nature of written reporting so that annual progress is more clearly monitored. Faculty have been informed that regular meetings are expected. We have also mandated the Graduate Studies Committee to make sure that student progress and reporting is taking place on schedule.

Staff

Recommendation 18: Provide adequate backup for the secretarial work. This almost certainly entails the allocation of additional staff.

Response: We agree that backup is necessary. Staff have met and agreed to take on modified duties, within the terms of their job descriptions, in order to ensure that critical tasks are backed up when possible. Additional staff would certainly be helpful in this regard and this would be an additional function for a staff member charged with advising. In connection with the new remedial courses we have had an additional staff member for the period from mid-July to mid-October, and it has made a tremendous difference to the good functioning of the department since she has been providing some backup for the undergraduate secretary as well as doing advising for the remedial course.

Recommendation 19: Explore better means to coordinate between the faculty members doing undergraduate advising and the staff responsible for undergraduate advising, in particular during registration periods.

Response: We agree that this should be done as smoothly as possible. The recommendation will form part of our general effort to redesign our advising.

Recommendation 20: Employ an adequate number of permanent systems support personnel. A permanent systems manager is indispensable for the proper functioning of the Department, both for its educational mission as well as to support research activities. If CECM reports to the Department (Recommendation 6) then the Panel recommends that 1 1/2 systems support positions be allocated to support the Department.

Response: The Department strongly agrees that we need an ongoing systems support position. At present we share 1.5 people with Statistics, one full-time and one part-time, but the full-time position is a temporary position which terminates in Aug 2007. Turning this position into an ongoing one would make a great deal of sense to us. The shared-resource support from the Network Support Group that we were using previously was not popular for a variety of reasons.

Respectfully submitted
Tom Archibald

Simon Fraser University
Report of the Department of Mathematics
External Review Panel
April 5-7, 2006

Charlie Colbourn
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Richard Lockhart (Internal Member)
Department of Statistics and Actuarial Science
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April 8, 2006

1 Overview

The members of the External Review Panel wish to voice their gratitude to the members of the community at all levels including staff, undergraduate and graduate students, teaching and research faculty, and administration for their hospitality, guidance and interactions during their visit. Professor Tom Archibald and his faculty colleagues in the Department of Mathematics were open, candid and most helpful in support of our exercise. The self-study document was carefully prepared and provided an accurate assessment of the current situation in the Department. Many people expressed great praise for Professor Tom Archibald for his leadership skills, for being a consensus builder and for defending the faculty interests. We certainly agree.

A short visit does not permit one to grasp the details of the manifold activities of the Department of Mathematics fully. Nevertheless this panel presumes to make observations and recommendations; once further elaborated upon by individuals within the institution with more detailed knowledge, we trust that these will be helpful to the University and the Department. Before stating particular strengths, weaknesses and recommendations, it is desirable to indicate major observations from which these derive.

The fundamental observation is that the Department of Mathematics is in very good condition. It plays a central role in the educational and research activities of the University and it is well positioned to keep doing so along the major strategic lines of SFU. Indeed the key role that the Department plays within SFU is quite unusual in comparison to other Departments of Mathematics in institutions of higher education in North America. This unique key role of Mathematics deserves special mention and is central to our review.

The Review Panel is quite impressed by the significant improvements that have taken place since the last review in 1998. In particular there was then perceived a tension between the "Applied" and "Pure" Mathematics groups. Whatever polarization may have existed in the past is certainly manageable now; the strengthening of the Industrial Mathematics area with the second CRC Tier I appointment will help further to bridge these two groups. The Department of Mathematics now contains predominantly young, vibrant faculty members who are extremely enthusiastic; collegiality among different research areas and groups is evident.

The Department is relatively small, with no pretensions to cover the breadth of the mathematical sciences. It has strong programs in three areas: Applied Mathematics (including PDEs, Numerical Analysis and Scientific Computation), Number Theory and Algebra (including Computational Algebra, Computational Number Theory and Pure Number Theory), and Discrete Mathematics (including Graph Theory, Combinatorics, and Combinatorial Algorithms). These areas enjoy commonality that outweighs their differences: Each has an applied focus and a computational approach. By investing in this profile the Department has secured a valuable scientific niche in Canada and elsewhere.

2 Strengths

The Panel heard directly from the undergraduate students that the Department is among the "greatest departments in SFU". The faculty are available, knowledgeable, helpful, and enthusiastic. They go out of their way to enhance the educational and research experience for undergraduates. This strong endorsement from the students was unsolicited, and speaks strongly to the strength of the Department.

2.1 Research Faculty

The discrete mathematics group is among the top ten such groups in the world. The CRC Tier 1 appointment of the distinguished scholar Bojan Mohar has occurred, along with very strong recent hires at junior levels. The group has high visibility internationally, and its members are often found as keynote speakers at major conferences and workshops. They

have successfully rejuvenated and maintained the long-standing excellence of the group in this area at SFU.

The group in number theory and algebra has developed a unique ongoing collaboration (including shared grants, seminars, students, and postdocs) with UBC, forming together one of the largest and more influential number theory groups in North America. Their computational and theoretical research themes are both of excellent caliber. They also have a distinguished scholar at the helm, Peter Borwein. The panel notes particularly their excellent recent hires, including one who was awarded one of the largest entry level grants in Canada. This group has received national recognition through the award of a Leadership Strategic Initiative grant from NSERC in a highly selective competition.

The applied mathematics group is currently led by an internationally recognized scholar in numerical analysis and scientific computation, Bob Russell. It has an emerging younger group in partial differential equations, working at the forefront of mathematical problems issuing from materials science. The new Tier I CRC appointment for which the recruitment process is well underway will add leadership (which will be needed when Bob Russell retires) and further strength in the applied analysis area. Evidence of their strength includes their involvement in the organization of the major international conference in applied mathematics, ICIAM 2011.

Funding levels in all three groups are above national averages and all research faculty members are currently being funded.

The Department of Mathematics is well positioned to play a central role in the 2005-10 SFU Strategic Research Plan, in particular in the Communication, Computation and Technology initiative.

2.2 Research Centres

The reputation of the Department of Mathematics has attracted to SFU three major research centres for mathematics: PIMS, IRMACS and MITACS. Mathematics at SFU serves as a key site for the Pacific Institute of Mathematical Sciences (PIMS), the central site for a Networks of Centres of Excellence program in Mathematics of Information Technology and Complex Systems (MITACS), and houses the Interdisciplinary Research in the Computational and Mathematical Sciences Centre (IRMACS). This concentration of large international centres is *unique*. They put SFU "on the map", and represent major scientific resources at the national and international levels.

The commitment of these centres to SFU is a remarkable strength, impacting everything from forefront research endeavours to outreach initiatives. Equally the commitment of the senior administration to these centres is a key strength of Mathematics at SFU. The Department is taking an active role in using these centres; one particular benefit of PIMS is the engagement of faculty members in Collaborative Research Groups that support ongoing collaboration among researchers who are separated by geography or institution.

Each of these centres makes a significant contribution, and we must emphasize that their contributions are *complementary*. What differentiates all of these centres?

PIMS is at present a collaborative arrangement among six universities in western Canada, funded by NSERC as well as the provincial governments. Recently it received the largest

grant by the National Science Foundation (NSF) in the United States ever awarded to a proposal submitted from outside the United States. This is an exceptional endorsement of its international impact, and the major role of SFU in PIMS is key to the strength of Mathematics at SFU. PIMS provides strong support for graduate students, postdoctoral fellows, seminars, and scientific meetings (among other things in a list too long to include here!).

Using funds from the Canada Foundation for Innovation, IRMACS has changed dramatically the quality of life among faculty, postdocs and grad students of the Department of Mathematics by providing space and facilities to support advanced research and educational projects. The research faculty in Mathematics have found good ways to benefit from it, and the university as a whole should appreciate IRMACS as a tremendous resource to conduct and encourage interdisciplinary research within a mathematical context.

MITACS is among the largest Networks of Centres of Excellence of Canada. It plays a crucial role in graduate student internships, funding research projects that are cutting edge applicable and industrial mathematics, and forming collaborative ventures that span industry, government, and all levels of the academic institutions. It collectively coordinates activities at 48 Canadian universities, and it is housed at SFU. This national visibility is a great strength for Mathematics and indeed for all of SFU. SFU is a major per capita recipient of MITACS funding, and its presence at SFU has served to attract CRC chairs, and enable the new Industrial Mathematics major. The industry internships at MITACS serve to supplement the academic experience strongly.

Although it may seem that there are many centres connected to the Mathematics Department at SFU, the spirit of cooperation makes them work together and with the Department very effectively. Tangible evidence of this close collaboration includes: the upcoming international workshop on sequences and codes, with support from PIMS, facilities from IRMACS, and the involvement of faculty members in the Department; and the collaboration among MITACS, IRMACS, PIMS, and the Department on the applied and industrial mathematics programs, including involvement in the hosting of ICIAM 2011 in Vancouver (indeed two faculty members serve on the Organizing Committee). The visibility at the international level is beyond question, and the healthy relationship among these centres, the Department, and the senior administration is an unquestionable strength.

The Department participates in two smaller centres. CECM, the Centre for Experimental and Constructive Mathematics, serves as a development site for internationally used MAPLE software and hence provides a strong profile in the symbolic algebra discipline. CSC, the Centre for Scientific Computation, organizes a well attended seminar series with PIMS funding. These are focal points of specific departmental strength, serving a more local need than the three main centres.

2.3 Education and Training

The Department has an *excellent and committed* group of lecturers! These individuals carry a large and complex workload professionally and remain enthusiastic. Relations between research faculty and lecturers are very healthy.

There is an excellent outreach program (for example, the Taste of π program). The

lecturers and research faculty work together on outreach, and indeed this is also a joint effort of the Department with PIMS, MITACS, and IRMACS. The panel applauds them all not just for the outreach efforts, but also for the very effective collaboration among such a wide variety of groups. It is great to see them all working together so well.

The new undergraduate curriculum revision is a strength, and the interest in maintaining it is a further strength. The new program in Industrial Mathematics, and the concentration in Operations Research at Surrey, deserve particular mention here, but efforts across the curricular spectrum are strong.

The graduate program has a very healthy ratio of graduate students to research faculty.

The extensive involvement of undergraduates in research is a very real strength, and to us reflects the truly applied and computational profile of the Department.

A strength provided by both SFU and the presence of MITACS is the availability of co-op placements and MITACS internships.

3 Weaknesses

In this section, some issues that do not warrant separate recommendations later are also included.

3.1 Research Faculty

The faculty of the Department of Mathematics is a relatively small group engaged in a remarkable number of activities spanning undergraduate education, graduate supervision, postdoctoral mentoring and research. The fact that junior faculty are heavily involved in service duties may lead to fragility and may impair the expected progress of their research programs.

Although different groups in the Department have a well thought out vision for education, training and research, there remains a need for planning at the *departmental* level as it particularly impacts curricula and the coherence of the research programs.

There are few *departmental* scientific activities that may attract faculty and students from different areas of research, such as a colloquium of the Department and a Distinguished Lecture Series.

3.2 Research Centres

The recent proliferation of centres may put the Department in a vulnerable position concerning future space and resource allocation for day-to-day operations in teaching. As an example, the CECM space is considered to be departmental space although currently it is not directly under the control of the Department of Mathematics.

3.3 Education and Training

Fragmentation of space is detrimental for collegiality, for the integration of students and postdocs in the fabric of the Department, and may have an adverse effect in the quality of

educational, scientific and social life of the Department.

3.3.1 Undergraduate Education

The undergraduate students associated with the mathematics program have lost their centrally located common space; the current undergraduate student lounge is unacceptable. This is crucial to the quality of social life for students and to help building a sense of community. This is an essential part of mathematics education that is not achieved in the same manner as in the sciences through shared laboratory activities. Recruiting and maintaining mathematics majors requires a central place to meet informally.

Undergraduate instructors should be reminded of the importance of choosing the right textbook and, more importantly, they should be urged to use the book that they have selected. This is an intermittent problem.

The Department should investigate the reasons why the GPA of upper level mathematics courses is below the norm in related disciplines, as this may negatively impact opportunities for students' graduate and job placement.

The students expressed frustration with the current departmental practice of offering some courses only in alternate years. To some extent, entering the program in an even or an odd calendar year may determine what their academic preparation ends up to be. While faculty members thought (in all programs) that advising for this is adequate, students (in all programs) voiced this as a concern.

The workload of lecturers should be revisited in light of their tremendous and invaluable involvement in teaching, advising, and outreach activities. As their duties evolve, their workload requires continuous reassessment.

In a number of interviews the Panel was told that the Department has not been adequately involved in the planning at the Surrey campus, and that allocations of resources are based on program FTEs instead of enrollment FTEs. This a serious problem, whether real or perceived. We did not visit the Surrey campus, and cannot personally attest to the problems, but the perception of difficulties is widespread.

Promotional materials of undergraduate programs and related activities (for example, glossy brochures, posters, etc.) seem to be lacking, in sharp contrast to the excellent promotional material for the centres.

3.3.2 Graduate Education

Ph.D. recruitment packages are not perceived (by both graduate students and faculty members) as being competitive with what other Canadian mathematics departments offer.

The graduate programs should offer research topics courses on a more frequent basis. This is needed to enhance and even maintain the quality of the current graduate programs.

A progress assessment, including an annual meeting with the Supervisory Committee and a thorough progress report, is not currently expected from all graduate students on a regular basis.

Some graduate students are unaware of departmental mechanisms for dealing with academic problems.

The Ph.D. time to graduation is a concern that the Department seems to be currently addressing.

3.4 Staff

A back-up secretarial staff member is non-existent. This may threaten the functioning of the Department and may prevent students being well served in a timely fashion. Even staff vacations may currently disrupt departmental operations in an unacceptable manner.

Better coordination between staff involved in registration and availability of undergraduate advisors is needed, mostly during registration periods. Students can experience difficulty finding a faculty advisor during periods when there is time pressure to complete the registration process.

The current systems support is totally inadequate. Having a full-time systems manager is fundamental for the educational mission of a department that is proud of its computational character, for bringing that into the classroom, and for research activities of the faculty members unaffiliated with a centre.

4 RECOMMENDATIONS

4.1 Research Faculty

Recommendation 1: The Department of Mathematics should target its faculty searches on faculty who can make connections and bridge across different research groups in the Department. The Department is in a hiring mode, with at least 2 untargeted positions at this point. This represents an important opportunity.

Recommendation 2: A position, preferably senior, should be targeted to address the underrepresentation of female faculty members. There is a need to enlarge the representation of women among the faculty. This is a problem that is hard to solve at SFU or elsewhere, in particular if there is some degree of seniority in the position. Success in this recruitment requires special incentives and the support of the SFU administration.

Recommendation 3: Untenured faculty should be relieved of service duties as much as possible. Particular attention should be paid to those faculty members whose research productivity is apparently suffering.

Recommendation 4: Since mathematics plays a key role within SFU and should continue to do so, any anticipated re-organization of faculties and departments should engage the Department in its planning and in particular should guarantee that the unique strengths in Mathematics are preserved.

4.2 Research Centres

Recommendation 5: SFU should continue its investment and support of PIMS, IRMACS and MITACS. Each plays a pivotal role in the national and international visibility of mathematics at SFU. In particular, it is of fundamental importance that IRMACS continues to develop as a resource for the entire university.

Recommendation 6: The Centre for Experimental and Constructive Mathematics should report directly to the Chair of the Department of Mathematics, since CECM space is considered to be part of the space of the Department of Mathematics. Currently CSC occupies no departmental space, however if that situation were to change it also should report to the Chair of the Department of Mathematics.

4.3 Education and Training

Recommendation 7: A *departmental colloquium* and/or a Distinguished Lecture Series should be initiated. These provide an avenue to get together in a common scientific activity faculty and students with possibly different research interests.

4.3.1 Undergraduate Education

Recommendation 8: If more frequent offerings of advanced undergraduate courses are not possible then existing courses should, in some cases, be consolidated. This is offered as a *possible* solution to the current practice of offering some courses only in alternate years.

Recommendation 9: Mathematical courses in computational areas should remain under the control (or joint control) of the Department of Mathematics. This is crucial to sustain the health of the mathematics educational mission.

Recommendation 10: The University, Faculty, and Department should move quickly to provide a centrally located small student common room for undergraduates with generous hours available. The current (partial) solution to the undergraduate student lounge is totally unacceptable and a speedy solution is crucial to ensure the (social) quality of life for mathematics students and to help build a sense of community.

Recommendation 11: Resources to support the Mathematics endeavours at Surrey should be allocated as quickly as possible, with direct involvement from the Mathematics Department in determination of these. The success at the Surrey campus requires prompt attention to resources allocation.

Recommendation 12: The workload of the lecturers should be re-evaluated. In particular, their already heavy schedules will be affected by new remedial courses; therefore

resources should be allocated to provide the additional undergraduate advising that will be needed.

Recommendation 13: The Department and University should consider nominating *Malgorzata Dubiel* for a national 3M Teaching Award.

Recommendation 14: Funding should be allocated for adequate promotion of the undergraduate programs and initiatives of the Department, including glossy brochures, leaflets, posters, etc.

4.3.2 Graduate Education

Recommendation 15: Ph.D. recruitment packages should be reviewed in light of the current situation in mathematics nationwide to determine if they are competitive and, if not, to make them competitive.

Recommendation 16: The Department should explore mechanisms to offer more research topics courses.

Recommendation 17: The Department should ensure that students are involved in a regular and systematic evaluation of their progress towards the PhD degree, including periodic meetings with the Supervisory Committee. This is currently done but its application is not uniform across the graduate student body.

5 Staff

Recommendation 18: Provide adequate backup for the secretarial work. This almost certainly entails the allocation of additional staff.

Recommendation 19: Explore better means to coordinate between the faculty members doing undergraduate advising and the staff responsible for undergraduate advising, in particular during registration periods.

Recommendation 20: Employ an adequate number of permanent systems support personnel. A permanent systems manager is indispensable for the proper functioning of the Department, both for its educational mission as well as to support research activities. If CECM reports to the Department (Recommendation 6) then the Panel recommends that 1 1/2 systems support positions be allocated to support the Department.