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**MEMORANDUM**

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|------------------|----------------------------------------------------------------------|--------------|-------------------|
| <b>ATTENTION</b> | Senate                                                               | <b>DATE</b>  | February 10, 2012 |
| <b>FROM</b>      | Jon Driver, Vice-President, Academic and<br>Provost, and Chair, SCUP | <b>PAGES</b> | 1/1               |
| <b>RE:</b>       | Centres and Institutes Renewal Applications (SCUP 11-58)             |              |                   |

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At its December 7, 2011 meeting SCUP reviewed and approved the renewal of the Centre for Scientific Computing for a five year term.

The renewal application is attached for the information of Senate.

Encl.

c: N. Haunerland

A handwritten signature in blue ink, appearing to be "Jon Driver", is written over the text "c: N. Haunerland".

Norbert H. Haunerland, Ph.D.

Associate Vice-President, Research  
Professor of Biological Sciences

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TO: Sarah Dench, Secretary  
Senate Committee on University Planning (SCUP)

FROM: Dr. Norbert Haunerland

DATE: November 15, 2011

RE: Centre and Institutes Renewal Applications



Policy R40.01 specifies the end dates for the existing research Centres/Institutes. Enclosed please find the application for renewal for the Centre for Scientific Computing due this year.

## RESEARCH CENTRE/INSTITUTE RENEWAL APPLICATION

Reporting Period: April 1, 2006 March 31 2011

Pursuant to S.F.U. Policy R40.01, the Director of each Research Centre or Institute (hereafter referred to as "the Centre") is required to submit a renewal application every five years.

**Once the Director of the Centre completes the form, it should be forwarded to the Faculty Dean or Vice-President Research, no later than June 30<sup>th</sup>.**

1. Name of the Centre: **Centre for Scientific Computing**

2. Director of the Centre

Name: Robert Russell

Phone Number: \_\_\_\_\_ 24819 \_\_\_\_\_

Expiry Date of Term as Director: \_\_\_\_\_ June 30, 2012 \_\_\_\_\_ Fax Number: \_\_\_\_\_ 24977 \_\_\_\_\_

Office Location: \_\_\_\_\_ K10532 \_\_\_\_\_ Director's Email: [rdr@cs.sfu.ca](mailto:rdr@cs.sfu.ca) \_\_\_\_\_

Web Address of Centre:

<http://www.sfu.ca/vpresearch/centres+institutes/scientificcomputing.html>

Generic Centre Email: [sandie@pims.math.ca](mailto:sandie@pims.math.ca) (Administrative support)

3. Centre Description: (The description below was taken from the most recent SFU Calendar.)

Motivated by the expanding role of scientific computation and mathematical modeling in science and engineering, the Centre was formed to bring together interdisciplinary research teams from various Simon Fraser University faculties. The major purpose of the Centre is to provide Simon Fraser University with a visible focus for computational research both on campus and in the wider Pacific Rim research community. Specifically, the Centre's goals are to facilitate discussion between scientific computing research groups (through seminars, workshops, conferences) to provide advanced instruction in computational techniques and applications (through graduate and post-doctoral programs), and to actively foster joint research ventures between members of the Centre and workers in industry, government and laboratories.

4. Provide a detailed list of accomplishments of the Centre for the past five years.

The primary research activity of the Centre has been its weekly seminar series, which brings computational scientists and engineers from universities and industrial research centres throughout the world to SFU to discuss their research in scientific computing related problems. Their areas of research include applied/computational mathematics, computer graphics/visualization, business/economic modeling, engineering (e.g., image processing), earth sciences, physics, and, representing some of more recently hired SFU faculty members interests, computational linguistics, statistical computation, and

mathematical biology. Often talks are held jointly with other departments such as Computing Science (especially the Vivarium group) and Physics and with UBC. There are over 25 talks per year. (See attachment for a list of this year's speakers.)

In 2004, the CSC opened a multi-disciplinary research facility, the Scientific Computing and Imaging Research Facility (SCIRF), which was funded through a successful CFI application on fuel cell applications and run by the CSC Board of Advisors. For part of the past 5 year period, the CSC had a Fulbright Chair in the area of remote sensing. It was funded by the SFU Administration (President, VP Research, and Deans of Applied Science and Arts) at \$75,000 per annum.

A CSC Lab serving primarily graduate students and postdoctoral fellows is located in PIMS space. It utilizes computer equipment purchased through NSERC funding obtained by CSC members (the numerical analysts in Mathematics and computer graphics and visualization researchers in Computing Science). It is the major space used by students and PDFs working in the computational and applied mathematics group. The CSC through its members in the latter group has had various collaborations with the CECM and IRMACS. For example, the apex of the CSC seminars, the CSC/PIMS Distinguished Speaker Series, is held in the main IRMACS auditorium.

##### 5. Has your Centre accomplished its goals?

With members of the CSC getting together before and after weekly seminars, there has been great synergy which has led to a number of research collaborations and joint supervision of graduate student, as well as successful BIRS Workshop proposals (often between professors from different departments) and MITACS projects (between people from different universities). As a result, the CSC certainly fulfills the University's requirement for Research institutes "to facilitate collaborative multi-disciplinary research between different Faculties and/or multi-university initiatives and to provide research-related services to the community."

A couple of more ambitious goals are yet to be achieved. It was planned that the CSC set up formal interchanges with research institutions internationally, e.g. the Graduate School on Computational Engineering at the Technical University Darmstadt and the Interdisciplinary Center for Scientific Computing (IWR) at the University of Heidelberg, but arrangements for these were not completed because of reduced effort from the Director due to illness. Likewise with a proposed interdisciplinary MSc: a rough proposal for base budget funding to mount MSc and PhD degree programs in Scientific Computing was being prepared, and the Dean of Graduate Studies as well as Chairs in Mathematics, Computing Science, and Engineering Science endorsed the development

of the graduate program in scientific computing in principle, but further effort would be required to overcome administrative hurdles.

The CSC has been very successful in fostering collaborations between its members and industry and governmental organizations and laboratories. A selection of a few of the collaborations for which its Board of Advisors played a key role during the past 5 years are the following:

A long-term collaboration with Teck Metals Inc. has been led by Stockie in the area of atmospheric pollutant dispersion modelling. Several graduate students have developed new methods for estimating pollutant emissions using ground-level measurements of contaminants at Teck's lead-zinc smelter in Trail BC. Planning for future work by graduate students on extending this work to other contaminants and validating the results using more advanced numerical techniques is underway.

Ghassan Harmaneh, Torsten Moeller and Manfred Trummer collaborate with MIRG (the Medical Imaging Research Group) at VGH, directed by Dr. Anna Cellier on various aspects of single photon emission computed tomography (SPECT). SPECT is a nuclear medicine imaging modality mostly used for functional imaging, e.g., for myocardial perfusion or kidney clearance. The group is involved in research on methods for use when a dynamic behavior is imaged. For instance, instead of using data collected over a typical 20 minute scan to reconstruct one single image, a time-sequence of images (a movie) is reconstructed from an equal sized data set. The problem entails many computational and mathematical challenges. The group's work has resulted in a number of joint publications. It has held joint grants, and a number of graduate students have completed their studies under joint supervision.

A new project led by John Stockie has recently been undertaken involving a long-term research project on modelling of sap flow in maple trees. It is funded jointly by the North American Maple Syrup Council and the MITACS NCE. Several graduate students and postdoctoral fellows are involved, and future work will engage other faculty in mathematics and biology.

A number of potential projects are in early discussion stages. One engineering project involves work with a local insurance assessor on 3D modeling for a better and faster car damage assessment. Another is a project to simulate the flow of traffic on the new South Fraser Perimeter Road that serves the DeltaPort. It is being developed by CSC members and a local engineering firm representing Delta Chamber of Commerce and a consortium of transport authorities. Another project, involving software development for imaging applications on cell phones, is in early planning stages between CSC members and software consultants. The projects should have substantial graduate student involvement.

6. Briefly describe your Centre membership and organization structure, as a separate document, attach a full membership list.

The CSC membership includes around 50 fulltime SFU faculty. A Board of Advisors consults with the Director on important matters. (See attached membership list.)

7. Provide a summary of financial resources attracted and used, both from the **University** and **external sources**. (Attached a separate document, if necessary.)

| Period | Source | Purpose                | Total Budget |
|--------|--------|------------------------|--------------|
| Year 1 | PIMS   | Distinguished Speakers | \$5,000      |
| Year 2 | PIMS   | Distinguished Speakers | \$5,000      |
| Year 3 | PIMS   | Distinguished Speakers | \$5,000      |
| Year 4 | PIMS   | Distinguished Speakers | \$5,000      |
| Year 5 | PIMS   | Distinguished Speakers | \$5,000      |

N.B. In addition, a sum of about \$5,000 (in total), given to the from the SFU Administration when the CSC began, has been used sparingly to cover occasional CSC expenses, and minor funding from PIMS is used each year to cover a portion of visitor expenses.

8. Please identify the university resources, if any, provided to your Centre.

**Space:** In addition to the two Labs mentioned above, two offices provided through PIMS in TASC2

**University Personnel:** Some secretarial support provided by the PIMS Administrative Assistant and some temporary web support by the Computer Science Graphics and Visualization Lab technical support staff.

**Major Equipment:** None

**9. How has your Centre enhanced research over and above what would have been accomplished by an individual faculty member?**

The amount of discussion of research problems, actual research collaboration, and joint graduate student supervision among faculty members from SFU and elsewhere would have been an order of magnitude less had there not been the weekly interaction amongst CSC members.

**10. Provide a rationale for the continuation of your Centre.**

Scientific computing has become a lynchpin for doing science and engineering throughout the world and in particular at SFU, as evidenced by the growing number of new faculty who rely on computational techniques to do their basic research. At SFU the activities of the applied and computational mathematics group (which is nearly half of the Department of Mathematics) take place primarily within the Centre for Scientific Computing. Virtually all of the other faculty members doing research involving scientific computing to a significant degree are also members of the CSC. It is a time of continued success for the Centre, which prides itself on its emphasis on the scholarship of its members and a grassroots structure. It has an energetic Board of Advisors which takes great pride in the CSC's current projects and optimistic about several projects now in their planning stages.

**11. List your Centre's goals for the next five years.**

In light of this year's review, there has been recent discussion amongst some of the more active (mostly young) CSC members, and several priorities have been identified:

- Continue to secure funding for the Seminar Series, particularly the very successful Distinguished Speakers Series
- Secure stable CSC web support (and use the resulting web visibility as a recruitment tool to attract more new students)
- Submit an NSERC equipment grant proposal to secure new computing equipment for the PIMS/CSC labs
- Investigate some type of integrated graduate degree program in "Scientific Computing", perhaps as a joint ENSC-MATH-STAT-CMPT program
- In the longer term, submit a larger funding request for the CSC, e.g., in the envelope of a more ambitious CREATE or Strategic Network grant proposal

**12. Describe other changes planned upon renewal (e.g. membership, organization structure, etc.).**

It is timely to do a survey of all of the CSC membership to determine each member's desired level of continued participation. As well, the Advisory Board will be reconstituted, bringing in some new faces. (Broader scale plans regarding new projects are as discussed above.)

**13. Provide an updated calendar description if different from the old listing on the first page.**

Sufficient for now

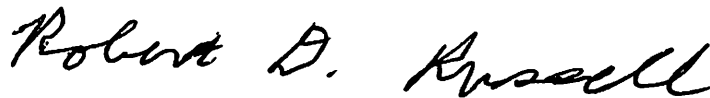
**14. Outlook for the future and other comments, by the Director of the Centre:**

The University's recent change in its structure for Centres, such that there will no longer be "Schedule A and Schedule B" Centres but only ones facilitating research mainly within a Faculty -- with Institutes doing the facilitation between different Faculties -- means that the CSC in its current form would not have been approved in the first place as a Centre. That is to say, a strict interpretation of policy at this point would require the CSC to either call itself an Institute or its structure to be focused primarily on one Faculty (e.g., under the Dean of Science). It is unclear to me whether or not the SFU Administration will interpret this policy strictly in its renewal process.

The feedback I received from the most active CSC faculty members was that by the Centre should maintain a multidisciplinary (and multi-faculty) focus representative of the discipline of Scientific Computing itself and more appropriate for obtaining future grant funding in related fields of research. The CSC is in a position where on the one hand it is the focal point on campus for many faculty members whose research takes a very interdisciplinary approach to applied mathematics and computer science, and on the other hand, it has no significant internal SFU financial support. This is not a surprising situation given the way projects are often funded within universities and given that emphasis has been placed on bringing top researchers together but not so much on putting big projects together.

At the end of my term as CSC Director, the abilities of its active members are certainly sufficient to maintain its activities, and with enough commitment, to take it to another level.

Signature of the Director of the Centre/Institute



Date: January 23, 2012

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Director

**Faculty Dean – Centres Only**

a. Comment on the Centre's performance:

b. Comment on future Faculty support for the Centre (financial, teaching release, space, etc.):

c. Recommendation:

Date: \_\_\_\_\_

**Vice-President Research - Institutes Only**

a. Comment on the Centre's performance:

The Institute fulfilled its mandate through a well established seminar series, for which it annually receives external funding. It is closely aligned with PIMS

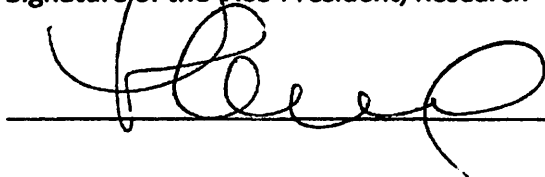
b. Comment on future University support for the Centre (financial, teaching release, space, etc.):

no specific university support needed. Centre funded through PIMS

c. Recommendation for renewal:

~~that~~ Institute is active and successful. PIMS is a priority for STU, and application of math/computing.

Signature of the Vice-President, Research



Date: 11/21/2011

## Board of Advisors:

T. Moeller, Computing Science  
 R. Russell, Mathematics (Director)  
 S. Ruuth, Mathematics  
 J. Stockie, Mathematics  
 L. Trajkovic, Engineering Science

## Administrative Support:

Sandie Dielissen, PIMS Administrative Assistant

## Other Members:

P. Borwein, Mathematics  
 R. Fetacau, Mathematics  
 L. Goddyn, Mathematics  
 M.C. Kropinski, Mathematics  
 D. Muraki, Mathematics  
 M. Monagan, Mathematics  
 N. Nigam, Mathematics  
 A. Oberman, Mathematics  
 P. Tupper, Mathematics  
 M. Trummer, Mathematics  
 J. F. Williams, Mathematics  
 R. Wittenberg, Mathematics  
 B. Bhattacharya, Computing Science  
 M. Drew, Computing Science  
 M. Ester, Computing Science  
 G. Hamarneh, Computing Science  
 L. Hafer, Computing Science  
 P. Hell, Computing Science  
 R. Krishnamurti, Computing Science  
 G. Mori, Computing Science  
 J. Pei, Computing Science  
 C. Sahinalp, Computing Science  
 K. Wang, Computing Science  
 R. Zhang, Computing Science  
 J. Bechhoefer, Physics  
 M. Hayden, Physics  
 G. Kirczenow, Physics  
 M. Wortis, Physics  
 D. Bingham, Statistics  
 R. Lockhart, Statistics  
 T. Swartz, Statistics  
 I. Bajic, Engineering Science  
 F. Beg, Engineering Science  
 K. Gupta, Engineering Science  
 J. Jones, Engineering Science  
 J. Liang, Engineering Science  
 B. Roitberg, Biology  
 K. Delaney, Biology  
 E. Palsson, Biology  
 D. Allen, Earth Sciences  
 A. Calvert, Earth Sciences  
 G. Flowers, Earth Sciences  
 D. Stead, Earth Sciences  
 R. Bencay, Economics  
 B. Ben Youssef, Interactive Arts and Technology (Surrey)