SIMON FRASER UNIVERSITY

Senate Committee on University Priorities
Memorandum

TO: Senate **FROM**: Jon Driver
Chair, SCUP and
Vice President, Academic

RE: Cognitive Science Programme **DATE**: December 18, 2008

The Senate Committee on University Priorities (SCUP) has reviewed the External Review Report on the Cognitive Science Programme, together with responses from the Programme Director and Dean of the Faculty of Arts & Social Sciences, 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 Cognitive Science Programme and the Dean of the Faculty of Arts & Social Sciences on priority items resulting from the External Review.

The report of the External Review Team* for the Cognitive Science Programme was submitted in April 2008 following the review team's site visit. The response from the Cognitive Science Programme and the response from the Dean were received in September and October 2008 respectively.

The Review Team viewed the Programme as an 'excellent one that is on the right track, and poised to continue moderate enhancement and expansion'.

SCUP recommends to Senate that the Cognitive Science Programme and the Dean of the Faculty of Arts & Social Sciences be advised to pursue the following as priority items.

1. Undergraduate Programmes

o Consider the revision of the undergraduate curriculum with the addition of a perception/visual cognition course, a psycholinguistics course and the inclusion of opportunities for undergraduate research.

2. Graduate Programmes

o Pursue the establishment of a Master's programme.

3. Faculty

o Continue to search for a CRC chair as advertised.
o When funding allows, seek from the Dean of Arts & Social Sciences, an additional appointment in the Programme.
o Continue to encourage member Departments to hire in Cognitive Science areas when searching for faculty.
o Continue to seek ways of facilitating the availability of associated faculty to teach within the Programme.

4. Research

o Continue to facilitate the development of the Phonology and Cognition laboratory and increase the involvement of the Spatial Cognition and Interactive Expertise in Natural and Computational Environments laboratory in training students in perception and cognition.

5. Administration

o Formalize the roles and commitments among member units and institute regular meetings to discuss scheduling and other administrative issues that may arise.
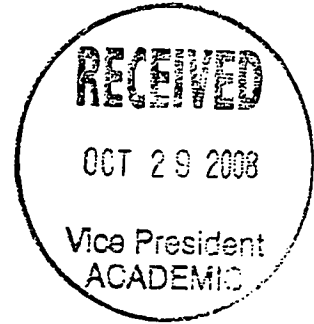
* Review Team

Dr. Barbara Landau (Chair) - Johns Hopkins University
Dr. Douglas Mewhort – Queen's University
Dr. Greg Carlson – University of Rochester

CC   L Cormack, Dean, Faculty of Arts & Social Sciences
         F. Popowich. Director, Cognitive Science Programme

Faculty of
Arts and Social Sciences

MEMO

Faculty of
Arts and Social Sciences
Office of the Dean

Street address
Academic Quadrangle
Room 6168
Burnaby, BC Canada
V5A 1S6

778-782-4415 (Tel)
778-782-3033 (Fax)
www.sfu.ca/arts (Web)

Mailing address
AQ6168
8888 University Drive
Burnaby, BC Canada
V5A 1S6

ATTENTION, Bill Krane, Associate VP Academic

FROM   Lesley Cormack, Dean, FASS

RE   Cognitive Science External Review

DATE   October 28, 2008

I am very pleased with this positive and helpful external review of the Cognitive Science Program, which confirms that this is a strong program, well positioned to move to the next phase. As far as resources allow, I am in general agreement with the recommendations of the external review committee and am happy to work with the Cognitive Science Steering committee in order to move forward those recommendations possible to implement within the current budget climate. Let me mention a few that I think are critical.

Faculty resources
I agree with the review that replacing Jeff Pelletier at his retirement this year is crucial. As soon as it was clear that Dr. Pelletier was retiring, I ensured that the CRC would remain in Cognitive Science and we have now advertised for this position.

Seconding faculty and/or developing ways to allow interdisciplinary teaching

This is a larger issue than just for the Cognitive Science Program. I am not sure whether the specific ways forward suggested by the external review committee will be the most effective (particularly given how few resources are available), but it is clearly crucial to find a way to allow associate members to teach in the program in a way that does not damage their home departments' ability to offer their core curriculum. Likewise, we must negotiate a compromise with regards to administrative credit, especially for the director.

Undergraduate Program
The external review committee is in a far better position than I to evaluate what is needed and desirable in the Cognitive Science undergraduate program and I urge the Cognitive Science Steering committee to take these recommendations seriously (which I believe they are doing). *3.*

Faculty of
Arts and Social Sciences

Graduate Program

I think that it is timely and appropriate to think about a Masters program at this time. I would need to understand better how this could build on the undergraduate curriculum, but I am happy to encourage the Cognitive Science Steering committee to consider this step. Likewise, I think the recommendation to find a niche for the SFU Cognitive Science program is exactly right.

Administrative coordination

These also seem to be sensible recommendations and most are easily undertaken.

The greatest challenge for Cognitive Science is encouraging participation from all the cognate areas involved. The report speaks of the need to engage Psychology more, as well as the need to have Computer Science more willing to consider Dr. Popowich's administrative work as director significant. I believe that Cognitive Science is a great model for a different kind of interdisciplinarity at SFU, and one that we should be both facilitating and emulating. This external review tells us that this is the way to go.

LC/rt

Cc: F. Popowich, Director, Cognitive Science Program

H.

Jon Driver
Vice President Academic
Simon Fraser University

September 29, 2008

Dear Jon

The Cognitive Science Steering Committee has had the opportunity to review the External Review Report of the Cognitive Science Program dated April 2008. Overall, we feel that the report does provide an accurate assessment of the program, and we have broad support for the recommendations that it contains. Given that the reviewers have noted that the "Cognitive Science program may provide a model for the development of other interdisciplinary programs at SFU", we would like not only to respond to the recommendations, but also work with the rest of the university community to ensure that appropriate actions follow from this review process. However, in the remainder of this document, I would like to focus on the broad recommendations of the report.

1. Undergraduate Program

The report provides specific recommendations for the addition of several courses (including research courses), along with suggestions for how to support these additional courses, through the hiring of new faculty, developing mechanisms for team teaching, and allowing teaching from faculty members having home departments outside of Cognitive Science. Additionally, the report provides some possible strategic directions and foci for the undergraduate program.

In response to these recommendations, the Cognitive Science Program will propose a revised undergraduate curriculum, with a time frame to be determined in conjunction with discussion with the office of the Dean of Arts, and with the office of the Vice President Academic. The revised curriculum should also be considered in the context of the recommendation to hire a new tenure track faculty member, and additionally filling the soon to be vacant Canadian Research Chair position in Cognitive Science (which will be discussed in item 3, below).

2. Research

The reviewers noted that the research labs are very strong, but had specific recommendations related to facilitating the development of Dr. Alderete's lab, and increasing the involvement with Dr. Fisher's lab.

5.

In response to these recommendations, the Program will work with the Department of Linguistics to provide what additional support it can to Dr. Alderete from the infrastructure in place in the current Cognitive Science lab. The Program has already started increasing its involvement with Dr. Fisher's lab, through the formulation of a new CREATE proposal involving Dr. Fisher, which would involve a (future) Cognitive Science Graduate Program (see item 4, below).

3. Faculty Development Needs

The external review stressed the importance of replacing Dr. Jeff Pelletier, who is retiring from SFU, and his position as Canadian Research Chair (Tier 1) in Cognitive Science. It further recommended a new faculty appointment in Cognitive Science (modeled after the appointment of Dr. Mark Blair), plus encouraging (and perhaps giving incentives to) other units for hiring in Cognitive Science relevant areas, and arranging for secondments from other units.

The Cognitive Science Program has recently been given approval to fill the soon to be vacant position of Canadian Research Chair in Cognitive Science. The current university-wide freeze on new positions does not affect the CRC position, but it does affect the creation of other new positions. The Program recommends a joint meeting of the Dean plus the chairs of the member departments (Computing Science, Linguistics, Philosophy, Psychology) to determine how to best address these faculty development recommendations in the current environment, and in the future. A joint meeting of these individuals should be held on an annual basis. This meeting could also examine the recommendations from item 5 below, and determine appropriate actions. These individuals will be provided with the report of the external review committee, plus they can request any additional background materials that may have been available to the review team.

4. Graduate Program, and Raising the Program Profile

The report states that "the time is right to develop a graduate program" at the Masters but not the PhD level, and provides many suggestions for how such a "niche" program could be structured and supported. It also notes that this would be an appropriate way to raise the program profile and attract funding.

The Cognitive Science Program will constitute a graduate program committee to develop a proposal for a Masters degree in Cognitive Science, in consultation with the member units. Furthermore, the Program will merge its outside speaker series with the defining cognitive science speaker series, and increase the focus on inviting external speakers to participate.

6.

5. Administration of the Program

The external review team observed that although the administrative structure of the program works, there needed to be increased formalization of roles with respect to the four member units.

Some specific recommendations related to scheduling, access to classes, and joint promotion of programs will be addressed through the recommended semesterly meetings between the Cognitive Science program manager, and program managers of the member units.

To deal with administrative contributions of faculty members, the Cognitive Science Program will explore if each of Computing, Linguistics, Philosophy and Psychology will be able to contribute the equivalent of one faculty member's service contribution on an annual basis. That is, an associate member of Cognitive Science who has a home department outside of Cognitive Science could count service to the Cognitive Science Program as their full university service contribution for specific period of time.

In conclusion, the Cognitive Science Program would like to thank the external review members, faculty, staff, and students who participated in the review process. The Program looks forward to working with members of the university community to follow up on the recommendations made in the report.

Sincerely

Dr. Fred Popowich
Director, Cognitive Science Program
Simon Fraser University

7.

Report of the External Review Committee:
The Cognitive Science Program at Simon Fraser University
April 2008

Executive Summary

We, the members of the External Review Committee for the Cognitive Science Program, find that the current program is an excellent one that is on the right track, and is poised to continue moderate enhancement and expansion. Strengths include key participating faculty from the core member units, new laboratories that provide exciting research experiences for undergraduates, a very talented set of undergraduate majors, and successful development of courses that form a coherent curriculum for the majors and that appeal to a broad range of majors at SFU. These strengths can be enhanced by measures outlined below. We also find that there are significant vulnerabilities for the program, and these will require that the administration take specific steps to ensure that the program remains viable and grows to its potential. These include supporting faculty development needs, adding modestly to the current undergraduate curriculum, and facilitating and supporting participation of additional faculty who are currently under-utilized in the Program, in part by setting up administrative measures that will allow faculty from individual units to participate in the program without having undue negative impact on their home departments. In order to succeed in implementing enhancements and protecting against vulnerabilities, the administration should take a strong supportive position, providing appropriate resources for the program to continue its success. By doing so, there may be an added benefit beyond developing the program itself: The Cognitive Science program may provide a model for the development of other interdisciplinary programs at SFU.

Undergraduate Program:
The program is currently strong, but could be enhanced by additional curriculum development and by facilitating additional participation of faculty without penalizing home departments.
Specific recommendations:
- Add a perception/visual cognition course.
- Add a psycholinguistics course.
- Add a capstone course (COGS 400), perhaps in combination with a research experience.
- Allow students to earn credit for doing research.
- Institute a formal system of faculty mentoring for students.
- Provide appropriate resources for home departments that facilitate program teaching.
- Develop a mechanism that allows team teaching (perhaps one course/term).
- Develop faculty (see below).

Research
The research labs are currently very strong and support excellent research experiences for both undergraduate and graduate students. Because research experiences promote education and faculty development, and serve as the basis for funding, enhancements are in order.
Specific recommendations:
- Facilitate the development of Dr. Aldrete's lab.
- Increase the involvement of Dr. Fisher's lab to train students in perception and cognition.

Faculty Development Needs

The faculty members who participate in Cognitive Science are strong, but there are needs to address an impending loss, to further develop faculty whose appointments are in the program, and to facilitate the participation of faculty from other units without penalizing their home departments. Serious consideration should be given to adding strength in areas that may have natural homes in Psychology.

Specific recommendations:

- Immediately pursue replacement of Dr. Pelletier, and designate this position specifically for Cognitive Science. This position is crucial to continued intellectual leadership of the program.
- Make a single new appointment (FTE) in the Cognitive Science program, with the home department determined by discussion with the Steering Committee. The appointment should parallel and be modeled after the highly successful appointment of Mark Blair
- Provide secondments to the Cognitive Science program, allowing allocation to be determined by the program's needs, and through discussion with key members of participating departments.
- Encourage member departments (and possibly give them incentives) for hiring in Cognitive Science- relevant areas. Examples include hires in language learning, psycholinguistics, cognitive neuroscience of language, and visual perception/cognition.

New Programmatic Directions: A graduate program

The time is right to develop a graduate program at the Master's level. The program is not ready at this time for a Ph.D. program.

Specific recommendations:

- Develop a 2-year Master's program in Cognitive Science, with a niche of providing strong research-based training for students who will then move on to either industry or to strong Ph.D. programs in Cognitive Science and/or related fields.
- Build the curriculum around the existing undergraduate core courses, including both undergraduates and graduate students in some of the same courses.
- Provide funding of at least one fellowship and two TAs per year, with the goal of drawing remaining funding from grants.
- Build on resources in units such as Computing Science, Education, and the School of Interactive Arts and Technology and Education.

Administration of program

The administrative structure of the program works at present, but some adjustment must be made to formalize the role of member units vis a vis the program.

Specific recommendations:

- Encourage formalizing commitment among member units by having Program Managers from all units meet at least once a term to coordinate class scheduling.
- Ask member units to provide a number of designated Cognitive Science seats for classes that are difficult for students to get into.
- Put links on member unit homepages to the Cognitive Science Program (and vice versa).

- Formalize the administrative contribution of the Director by negotiating administrative release with his/ her home department (currently Computing Science, home department of Director Popowich).

Possible strategic directions and foci for the undergraduate program

Two foci for the program would serve to further promote existing links across units, enhance interdisciplinary research, and support efforts to gain funding.

Specific recommendations:
- Consider an added focus on human language processing, acquisition, and dissolution under brain damage, using resources in Linguistics and Psychology to build this bridge
- Consider an added focus on computational modeling, filling an existing gap and building bridges across Computing Science, Cognitive Science, and Psychology.

These foci have natural links to issues in health and information technology, respectively, and could therefore also serve as themes for funding.

Raising the program profile at SFU and attracting funding

Raising the program profile can be done by creating a niche graduate program, increasing cross-disciplinary grants along the lines of more general scientific themes, and developing distance-learning components of the Cognitive Science curriculum.

Specific recommendations:
- Create a niche graduate program.
- Support and expand joint meetings with other Universities in Canada to identify natural collaborations.
- Create faculty working groups to identify themes that could cross-cut interests and serve as the basis for generating larger-scale grants, e.g. via CTEF and Canadian Institute for Health Research.
- Explore themes concerning Language in the Mind/Brain (in conjunction with development of Cognitive Neuroscience), Endangered Languages (in conjunction with the First Nations Project), and Computational Modeling.
- Explore distance learning for components of the Cognitive Science curriculum.

We would like to conclude by emphasizing that the Cognitive Science program has grown admirably since the last review, despite quite limited resources. It is currently an excellent program, and it has reached this point through the vision, energy, and dedication of the faculty who have been most actively involved in Cognitive Science. We urge the administration to strongly support continued efforts to develop this program.

Greg Carlson, Ph.D.
Barbara Landau, Ph.D. (Chair)
Doug Mewhort, Ph.D.

The External Review Committee

Report of the External Review Committee:
The Cognitive Science Program at Simon Fraser University
April 2008

We, the External Review Committee (Carlson, Landau, Mewhort) met from April 2-5, 2008 to evaluate the current status of the Cognitive Science Program at SFU. We met with a broad range of faculty who participate in the program, Chairs of all participating units, undergraduate students who are current majors in Cognitive Science, and administrative staff for the program, as well as members of the University administration. This report addresses the issues we see as key for the present and future status of the program. Answers to specific questions posed to the Committee (in the Terms of Reference) are provided at the end of our report.

Background

The last review, completed in May 2001, found that the undergraduate program was not sustainable as it was. The report recommended that the program either revert to a former structure (a very small "elitist" program) or else move towards a full-scale program, which would entail substantial increase in participation by core Cognitive Science faculty as well as increased support from the University. Specific recommendations for the latter included hiring a senior faculty member via the Canada Research Chair mechanism, developing the undergraduate curriculum (especially teaching of COGS 100 by core faculty and reinstating COGS 400), increasing participating of Cognitive Psychology, and facilitating the participation of faculty in the key member departments (Philosophy, Linguistics, Computing Science, Psychology) by removing administrative roadblocks. As we will discuss below, there has been remarkable success in developing a full-scale undergraduate program since the last review. Many of the recommendations from the 2001 review have been adopted and implemented, and the program has grown to expectation, despite quite limited resources. There is now a full-scale undergraduate program with a major and a newly approved minor, as well as significant increase in research involvement among students and other enhancements that now make the Cognitive Science program a firm reality. The future for Cognitive Science at SFU offers opportunity for additional growth in the program at the undergraduate level, and the real possibility of a graduate program. These would, however, require some additional resources as well as administrative changes that would facilitate deeper involvement among core faculty in the program.

The Cognitive Science program in 2008: Overview

In 2008, the Cognitive Science program has grown to expectation and is thriving, despite the fact that it has had access to quite limited resources. Changes since 2001 are numerous. We describe them briefly below, followed by more lengthy discussion focusing on some concerns regarding each of these and suggestions for improvement and further enhancement.

1. Faculty. Three members of the faculty are presently the driving force behind the Cognitive Science program: Dr. Fred Popowich (Computing Science, Director of the Program), Dr. Jeff Pelletier (Canada Research Chair), and Dr. Mark Blair (the only appointment strictly speaking in Cognitive Science). Of these, both Pelletier and Blair have been appointed since the last review. Pelletier, hired as the crucial senior hire, now occupies a Canada Research Chair, but will be retiring in January 2009, leaving a serious gap in the Cognitive Science faculty. In particular, Pelletier provides the kind of senior intellectual leadership that is crucial to any small

and growing program. Blair is an Assistant Professor hired with his position formally in the Cognitive Science program and his home department is Psychology. Both of these new appointments have, by all accounts, made an enormous difference to the Cognitive Science program both in terms of intellectual contribution, energy, and commitment to Cognitive Science. Popowich was Director of the program at the last review, and still remains an energetic and effective force for the program; however, his position as Director is still an "overload" from his primary appointment in Computing Science. In addition to these three key faculty members, there have been additional faculty hires in Philosophy, Linguistics, and Computing Science, whose interests are relevant to Cognitive Science (and who are interested in participating in the program). A total of 12 Associate Members (across units) are listed in the program's self-study (and there appear to be additional faculty who have Cognitive Science expertise but are not so listed). Because of new appointments both in Cognitive Science and in other units, the faculty situation is considerably stronger than it was in 2001. Still, there are significant needs for both faculty replacement (Pelletier) and additions; and especially, for changes in administrative policy that will allow the existing faculty to serve in the Cognitive Science program without penalizing their home departments.

  2. Research. A Cognitive Science laboratory supervised by Drs. Pelletier and Blair has been established, complete with impressive computing equipment and eye-trackers, which allow cutting edge methodologies for studies of cognitive processing. The space also has a seminar room and multiple rooms for cognitive testing. This lab has become a place of intense research activity by both undergraduate Cognitive Science majors, and graduate students in the key disciplines (e.g. Psychology, Philosophy, Linguistics, Computing Science). In addition to the Pelletier/ Blair lab, Dr. Wang (Linguistics) has a new lab with equipment to carry out studies of evoked potentials in the brain (EEG/ ERP studies) during language processing; she also has access to brain imaging technology (fMRI) in a nearby facility and has a number of students working with her. The combination of equipment across the labs-- eye-trackers, EEG, and fMRI capabilities-- affords students the opportunity to develop a rich set of experimental and computational skills. The labs also provide a less obvious but equally important function: They provide the physical location for students to gather, promoting a sense of community that is rare in a school with many student commuters. This intellectual community, small though it is, provides an important part of the "glue" for the program and provides a unique opportunity for undergraduates to see how science proceeds.

  There is another lab planned within Linguistics (phonetics and phonology, Aldrete), but this is awaiting another faculty appointment in Phonology. This lab would be an important component of the undergraduate experience in Linguistics and Cognitive Science, especially as many undergraduate Linguistics majors later go on to Masters programs in Speech Pathology. Finally, there are labs in the School of Interactive Arts (Fisher), in Education (e.g. Winne), and in Psychology (e.g. Ribary; Weeks) that could also host Cognitive Science students, but there is less direct involvement by these individuals in Cognitive Science at present.

  3. Undergraduate program. The Cognitive Science program has produced over 80 undergraduate major degrees and currently has 24 majors. The number has declined a bit over the past two years, most likely linked to the new minor in Cognitive Science, which was recently approved (and currently has a number of applicants). By all accounts, the Cognitive Science majors are an intellectually vigorous bunch; faculty uniformly told us that these students stand out in class as some of the most talented undergraduates at SFU. The curriculum for the Major has become solid. There is a broad-based introductory course in Cognitive Science (COGS 100),

which is taught by Blair and is available without prerequisite; the course has attracted students from across a wide range of majors. It has been approved as a breadth course in three areas (Humanities, Social Sciences, Sciences) and is a natural place for students who would like a science course but do not see themselves as heading towards a science major. Enrollment at present is around 100 per term, with the course offered twice per year. There is also a new intermediate level course (COGS 200, taught by Aldrete) which then takes undergraduates into a more focused consideration of Cognitive Science. Finally, there are two 300-level courses, one of which is Special Topics (COGS 300, taught by a range of faculty) and a new course on Consciousness (COGS 310, taught by Blair). The only course that remains to be developed (or reinstated) is COGS 400, a capstone course. This should be done in the near future (more below).

  4. Seminar series. There are currently two seminar series and a conference series. One of the colloquium series has outside speakers; the budget for this is rather low, and so talks only occur several times a year. The second series-- Defining Cognitive Science—is new since the last review; it has been designed and developed as part of a plan to bring together the faculty and students at SFU who are interested in Cognitive Science. Faculty give talks on their own work, providing the audience an opportunity to see the range of Cognitive Science issues addressed by the existing faculty. This series is by all accounts quite well-attended by both students and faculty and is a crucial component of the "community-building" that is necessary for interdisciplinary programs whose faculty span different departments. The conference series was started in 1988, and has regularly produced published volumes (Vancouver Studies/ New Directions in Cognitive Science). Jeff Pelletier is now the General Editor of the series. The list of conferences over the past ten years is impressive, covering a wide range of topics.

  In sum, the Cognitive Science program in 2008 is substantially different from its former self: It has several strong new faculty members, it has vibrant new labs that provide strong research experience at both undergraduate and graduate levels, it has a solid curriculum and it has attracted intellectually strong students in good numbers. We now turn to more detailed discussion of each of these, highlighting the strengths of the existing program along with vulnerabilities that must be addressed if the program is to be maintained and grown in accord with its potential. We start with the Undergraduate program, because the recent and projected growth of this program has real implications for the issue of resources.

The Cognitive Science program in 2008: Strengths and vulnerabilities
1. Undergraduate program
a. Quality of programming, suite of offered courses

  The undergraduate program now offers several strong courses that take students through a quite broad-based look at Cognitive Science, introducing students to the idea of the interdisciplinary study of the mind. The curriculum has four required courses for both the major and the minor, with remaining courses drawn from existing courses in Philosophy, Psychology, Computing Science, and Linguistics. The introductory course, COGS 100 (Exploring the Mind), has no prerequisites and draws from a wide range of potential majors. It has been taught by Mark Blair for several terms, and has received excellent reviews; enrollment has been climbing and is now around 100 per term, with the course offered twice a year. The course has found a terrific niche: It introduces a wide range of potential majors to the ideas of Cognitive Science, and nurtures potential new majors. Because the course has no prerequisites, and fulfills a number of breadth requirements it is likely to become even more popular in the coming years. In

addition, the new minor (recently approved) should add to enrollments. The course has wide appeal-- to people who know they are interested in scientific study of the mind, and to those who might not view themselves as scientists, but are interested in language and cognition and can discover an interest in science through this content area. The course draws about equally across genders, unlike some other natural sciences, and so has the added potential of promoting and securing scientific skill sets for people who might not otherwise pursue science.

Following the broad introductory course is the new offering COGS 200 (Foundations of Cognitive Science), currently taught by Aldrete (Linguistics). The course covers several areas of Cognitive Science in more depth, and the readings are challenging. Aldrete is carefully monitoring the students' evaluation of the readings in order to gauge level of complexity, and it will likely undergo revision. Two upper level courses are COGS 300 (Selected Topics), taught by a range of faculty on their specific interests, and the new COGS 310 (Consciousness), taught by Blair.

The students drawn to the Cognitive Science appear to have some unique characteristics: The faculty unanimously told the committee that these majors are among the best at SFU. We met with a group of students, and also heard research presentations in the Pelletier/ Blair lab. They are intellectually strong, lively, and definitely excited about interdisciplinary study of the mind. There is a strong sense of community held by these students.

Along with the Program Manager (Senaratne), students carried out a survey of Cognitive Science majors who have gone through the program. Of these respondents, roughly 10 reported going to graduate school (6 Ph.D.s, 2 MAs, 1 MSc, 1 LLB). This is a high rate, and confirms that the majors are getting good preparation for graduate school; it also raises the issue of whether the program is ready for a graduate component, which we address later in the report. The remainder of the students surveyed reported going on to a range of professions such as web interface designer, speech pathologist, senior technical writer/editor, and law, again indicating that they have gotten a good (and useful) education.

b. Possible enhancements

There are several areas in which the curriculum could be strengthened. One concerns a major gap in the curriculum—there is no serious course on perception and/or visual cognition, which is a key component of Cognitive Science. Although some perception is covered in Aldrete's COGS 200, and more is covered by Fisher's version of COGS 300 (Special Topics), there is really no single course that provides students with an education on basic perception (either vision or audition) as it dovetails with cognition. One part of the problem is that there is no obvious faculty member on the Burnaby campus who could or would teach such a course. The usual home to such a faculty member would be the Psychology Department; however, the involvement of Psychology is at present limited and there is no faculty member who is trained in perception/ visual cognition and who has a Cognitive Science orientation. There are two possible solutions. One is to engage Fisher (who currently teaches on the Surrey campus) more actively in the Cognitive Science program. From our conversation with him, we believe that he would be interested in doing this, but geographical realities make it very difficult to figure out how to make it work. Since he is uniquely capable of filling the perception gap, the administration and faculty could work to regularize his participation in the program. A second solution is to target a hire in visual perception; this would presumably take place in the Psychology department.

A second gap in the curriculum is the absence of a psycholinguistics course. This is very important for a Cognitive Science program whose focus is language, and could naturally be

offered as one of the COGS 300 courses (special topics), or as one of the courses offered by either the Linguistics or Psychology department. At present, there is no faculty member in Psychology who would naturally teach such a course, and a new hire in Psychology in this area would provide an excellent addition to the program. The other option is to offer such a course within Linguistics, perhaps taught by one of the current faculty.

The third gap is one that is acknowledged by faculty and students alike: This is the lack of a capstone course, COGS 400. The students emphasized that they felt a real need for some integrative course at the upper end (like the integrative COGS 100); they also expressed a real interest in combining such a course with some research experience. At present, a number of Cognitive Science majors do participate in research (see below); however, they do not at present get any course credit for this. One possibility that the committee raised was for a senior year experience that included a COGS 400 capstone course in the first semester, in which faculty could work with students identifying key broad issues, and then a second semester in which interested students could work with a faculty mentor on a specific research project. This could culminate in student presentations of projects at the end of the year. Students seemed to find this very appealing, and also felt that earning course credit for working in a lab would be very appropriate.

A fourth opportunity for enhancement concerns mentoring of students who are Cognitive Science majors. At present, students are advised by the Program Manager (Shamina Senaratne), who ably assists students in selecting and registering for the courses they need. This is apparently standard at SFU and we are not questioning this role. However, there is a different role—that of mentoring—that can only be carried out by faculty. Mentoring naturally occurs for students who work in faculty labs; but not all students will elect to do research. Cognitive Science students should have individual faculty members to advise them about such issues as who might serve as an appropriate research mentor, what graduate programs are best suited to the student's interests and talents, how to pursue funding opportunities (such as the summer NSERCs, two of which have been obtained by Cog Sci students for summer 2008), etc.

c. Concerns

The most serious vulnerability that the program faces is that of faculty resources. In a nutshell, there is only one appointment fully in the Cognitive Science Program, and although there are many additional faculty who participate in the program, the home departments of these faculty are stretched and there are no real mechanisms for "crediting" faculty who teach in the program. Another problem is the relatively weak involvement of Psychology. At present, Mark Blair is the only faculty member with a home department of Psychology who is strongly involved in the program. Cognitive Psychology is one of the core disciplines of Cognitive Science, so it would be very desirable for Psychology to increase its involvement. We have already noted that there is a conspicuous absence of any core course in psycholinguistics or higher-level perception; there are other areas of cognition that are very relevant, such as cognitive neuroscience and cognitive development, but these are not currently represented in the program.

. Two examples can help illustrate the faculty resource problems. First is the case of COGS 300, Special Topics. A range of faculty have taught this (appropriately, since the topics range over faculty interests.) However, when a faculty member from, say, Linguistics, teaches this course, the Linguistics department automatically loses the expertise of that person, who will not be teaching his/her regular departmental courses. Often these will be core courses that can and should be taught by someone with real expertise in the area. The Cognitive Science courses

cannot and should not be taught as overloads. At present, there is compensation to the department, but this is limited, and may not be enough to attract well-qualified people who could teach the relevant core course(s). A similar situation holds for other required Cognitive Science courses such as COGS 200, which is currently taught by Aldrete (Linguistics). In general, it is a problem for every course that is a specific Cognitive Science course other than COGS 100. There must be a mechanism for allowing core faculty to teach in the Cognitive Science program without compromising the quality of the regular core courses taught in the home department. Extended secondments (along with limited-term departmental appointments) may provide a solution to this problem, as discussed below in the section on Faculty Development Needs.

A second example concerns COGS 100, currently taught by Blair, who is at present the only appointment that is really *in* the Cognitive Science program. His teaching load includes this increasingly popular course, which at present is offered twice during the year, and is heavily enrolled. Although he has done a remarkably effective job of attracting increasing numbers of students, the course cannot sustain additional growth unless additional faculty take on teaching this course along with Blair, or he is relieved of teaching other courses. The course should be protected against becoming a large-scale "service" teaching course, which would dilute its effectiveness. If there is interest in larger enrollment, offerings of more than two terms, or distance learning components, it will have to receive more staffing.

Associated with this faculty resource problem is that fact that, although Cognitive Science is inherently an interdisciplinary science, there is no provision at all for team teaching. That is, people cannot get credit for teaching a course if they co-teach with another faculty member. Yet, co-teaching (especially across departments) is one of the most effective ways of providing students with the reality of multiple approaches, along with all of their warts—differences of opinion, difficulties in understanding another discipline's culture, etc. Team-taught courses would be an extremely effective vehicle for really introducing students to the idea of multi-disciplinary work, and a mechanism for doing this should be found. Some simple solutions include double listing of a course (in Linguistics and Psychology, e.g.) and allocating equal credit to faculty members who participate in such a course.

A final concern revolves around the difficulty of scheduling Cognitive Science courses. Students do have some problems getting the courses they need; according to the students, this is particularly pressing for Psychology courses. We address this concern in the section on Administration of the program

Recommendations for Undergraduate Program:
- Add a perception/visual cognition course.
- Add a psycholinguistics course.
- Add a capstone course (COGS 400), perhaps in combination with a research experience.
- Allow students to earn credit for doing research.
- Institute a formal system of faculty mentoring for students.
- Provide appropriate resources for home departments that facilitate program teaching
- Develop a mechanism that allows for team teaching (perhaps one course/term).
- Develop faculty (see below).

2. Research

We have already commented on the impressive Pelletier-Blair lab for Cognitive Science, and the presence of other labs for studies of brain and mind already in place at SFU. We visited the Pelletier-Blair lab and both observed the facilities and heard undergraduate and graduate

student presentations. The lab is populated by students across the four core disciplines, and the research that is being carried out is truly interdisciplinary, e.g. philosophy students carrying out experiments that would pass muster in a psychology lab, psychology students carrying out studies based on linguistic theory, etc. The excitement and energy among the students is palpable, and the level of interaction across faculty, graduate students, and undergraduates is high. Undergraduate students have received summer NSERC grants to carry out research in the lab; they are also presenting papers at conferences, and even co-authoring papers for publication. The intermingling of faculty and students at different levels of experience is an outstanding model for mentoring; there is no large distinction drawn between undergraduates and graduate students, producing what appears to be a very healthy environment for intellectual development.

We did not visit other labs, but spoke with several faculty members who have active on-going labs that are currently — or should be, increasingly — very involved in the Cognitive Science program. Dr. Wang's lab (Linguistics) carries out research on language and the brain, using experimental methods in combination with brain-imaging techniques such as EEG/ ERP and fMRI. Dr. Aldrete (Linguistics) does primarily computational and formal work in phonetics and phonology, but he has been allocated lab space, with the goal of creating a Phonology lab, in conjunction with an appropriate hire in Linguistics. One other lab is seriously under-utilized; this is Fisher's lab, whose geographical home is Surrey. Fisher's research focuses on the nature of perception especially as it pertains to worlds we ourselves have created (i.e. virtual reality worlds). This is a naturally strong fit for the Cognitive Science program, and could support strong research experiences for students in an area other than language.

The lab component of the Cognitive Science program is strong, and should be nurtured. If the facilities can be enhanced, they should be. But even given the existing capabilities, they are capable of supporting a strong research-oriented Cognitive Science program for undergraduates, and even a strong two year-graduate program (discussed below). The labs compare favorably to other Cognitive Science programs in Canada. For example Queen's University offers a joint degree across Computing Science, Linguistics, Philosophy, and Psychology, and is comparable to SFU in terms of the range of courses offered, with about 10-20 majors declaring in their third or fourth year. But the lab facilities at SFU are far superior, suggesting that it is capable of occupying a strong niche among Cognitive Science programs in Canada.

Recommendations:
- Facilitate the development of Dr. Aldrete's lab.
- Increase involvement of Dr. Fisher's lab to train students in perception and cognition

3. Faculty development needs

We base our discussion of faculty needs on the current program and sensible projections of its growth in the near future. At the same time, we will raise the issue of whether the time is right for a graduate program in Cognitive Science (we think it is; see below), and emphasize that whatever is needed to grow the current program will also be the minimal requirement for establishing a graduate program.

The Cognitive Science program is facing faculty resource challenges of three types. First, Jeff Pelletier currently occupies a Canada Research Chair (home departments Philosophy and Linguistics), but he will be retiring as of January 2009. This means a major loss of senior intellectual leadership and programmatic vision. It is urgent to *immediately* replace him with an energetic, visionary senior faculty member who is committed to Cognitive Science. Pelletier will

be hard to replace, but this must be done if the Cognitive Science program is to continue even in its present form.

We recommend that the administration immediately pursue replacement of Dr. Pelletier, and that this position be specifically designated for Cognitive Science. One possibility would be to put this position into the Cognitive Science program, with an associated home department (as with Blair's appointment). Another possibility would be to search widely for a cognitive scientist whose appointment would be within one or more of the component departments. We think that the Steering Committee will be best able to determine which of these plans is best.

The second challenge concerns the small number of faculty literally *in* the Cognitive Science program-- those who can dedicate all of their intellectual energy to sustaining and developing the program. At present, only Blair has his appointment in the program. We believe that it is time for the administration to provide one new full time tenure-track faculty appointment specifically *in* the Cognitive Science program. This would provide added substance to the program, and could support further planning for the program as it develops a graduate component. A new appointment would also naturally serve the need to have an intellectually rigorous and systematic COGS 400 capstone course (possibly with a research component), thereby solving the problem of who-- among the already stretched faculty—could take on this responsibility.

The area of a new appointment should be the concern of the Steering committee. However, we note that it would be important to make a hire as good as Mark Blair—in the sense of hiring someone with the same commitment to community-building, someone who is committed and able to build bridges among disciplines. We further note that an appointment that enhances Cognitive Psychology end of Cognitive Science—perhaps in perception, cognitive neuroscience or psycholinguistics-- would make sense.

The third challenge concerns the dearth of faculty actually "available" (for credit) to teach Cognitive Science courses. As we outlined earlier, faculty are stretched thin in their home departments, and department chairs are naturally loathe to give up faculty time to a separate program without having their own teaching needs met with appropriately experienced and knowledgeable faculty.

Possible solutions to the current problem of faculty teaching resources include:

- Secondments. As we understand this mechanism, these could be provided to component departments to provide teaching release so that faculty could teach in the Cognitive Science program without penalizing their home departments. Given that secondments mean allowing a regular faculty member to teach in the Cognitive Science program (possibly for several years), the home departments would best be served by providing funds for a limited term faculty member (e.g. a 2-year Assistant Professor appointment). This would attract solid candidates for the position, and insure that the core courses in the home department are taught by people with the right level of expertise. One version of this would be to provide the Cognitive Science program with funds that could then be. offered to the relevant departments in accord with teaching needs in Cognitive Science (and in collaboration with departments themselves). *Note that we are not suggesting this as a substitute for the faculty replacement/addition we have discussed above; rather they should be an additional step.*
- Hiring opportunities within other departments. To the extent that other departments are committed to the Cognitive Science program, departments could be encouraged to make hires that are Cognitive Science relevant. Examples including hiring within Philosophy

18

to continue building strength in the philosophy of language and mind; hiring with Linguistics to continue building strength in language, focusing on language learning and/or psycholinguistics; hiring within Psychology to build strength in psycholinguistics, cognitive neuroscience of language, and perception.

Recommendations:

- Immediately pursue replacement of Dr. Pelletier, and specifically designate this position for Cognitive Science. This position is crucial to continued intellectual leadership of the program.
- Make a single new appointment (FTE) in the Cognitive Science program, with the home department determined by discussion with the Steering Committee. The appointment should parallel and be modeled after the highly successful appointment of Mark Blair.
- Provide extended term secondments to the Cognitive Science program, allowing allocation to be determined by the program's needs, and through discussion with key members of participating departments.
- Encourage member departments (and possibly give them incentives) for hiring in Cognitive Science- relevant areas. Examples include hires in language learning, psycholinguistics, cognitive neuroscience of language, and visual perception/cognition.

4. New programmatic directions: A graduate program?

We believe that the time is right for SFU to start a graduate program in Cognitive Science. This is suggested by the current success of the undergraduate program, the involvement of graduate students from the component disciplines, regular inquiries from students about a graduate program, and uniform enthusiasm on the part of all faculty members who we interviewed. The concerns that we heard were *not* related to the idea of creating a strong graduate program at SFU; rather, they had to do with the possible downside to departments who could — given the present resource limitations — suffer further if a program were started without sufficient resource support. Based on all this, we see the following as viable.

The program should be a Master's program, but it is not ready (at present) to become a Ph.D. program. In addition, we think that a Master's program would provide more appeal to students than a Certificate program, and would have more "value" for students as they move on to further graduate study and/or jobs in industry, health, or education. Assuming continued growth and support of the department along the lines already discussed, there will be adequate faculty to support a strong research-based Master's degree, which would likely require a 2-year program. A 2-year program is necessary in order to have a substantive research component; it takes up to a year to develop a research project, then additional time to complete it and write it up for publication. The courses that are currently offered could be cross-listed with the graduate program, and graduate students could have an additional separate tutorial or enhancements in readings, where necessary. (This is the design used by the Johns Hopkins program.) Research labs are in place to provide strong research experiences.

The program needs to occupy a special niche in order to attract students. We think this is possible if it is designed as a strongly research-based Cognitive Science program that prepares students to move into either a) a strong Ph.D. program in Cognitive Science, Psychology, Linguistics, Philosophy, Education, Computing Science; or (b) industry. The model of providing a strong Masters degree that results in placement in a top Ph.D. program is already in place at SFU in the Philosophy department, so mechanisms for placing students in Ph.D. programs will be familiar to faculty. The model for moving students into industry is already in place in the

p 19

Computing Science department; and the Chair of this unit told us that CS students with strong Cognitive Science training will be increasingly attractive to industry. In addition, faculty in some of the other affiliated units have strong links to industry. Examples include Winne's lab, which moves students into education-related fields; and Fisher's lab, which trains students in issues related to human-computer interaction.

There are already indications that students would be interested in such a program: There are regular inquiries about a graduate program, and a number of the undergraduate majors already go on to other graduate programs. The strong undergraduate majors may, in fact, be interested in a program that is a combined BA/MA Cognitive Science program; some version of a 5- year program could be designed to take advantage of this, e.g. if research experiences begin in the third year of undergraduate study.

There are several issues and concerns that would need to be addressed in the development of a graduate program. First is the question of how the curriculum would be designed, given the existing resource limitations. If the program is small (which it should initially be), some of the existing courses could be cross-listed for use in the graduate program, with suitable enhancements for the graduate students in the class. For example, the introductory course for graduate students could be built on COGS 200, and COGS 300 could naturally serve as a more focused course for graduate students. Courses already offered for graduate students in Computing Science, Linguistics, Philosophy, and Psychology could serve as upper level courses. Courses in psycholinguistics, cognitive neuroscience, and perception would be an important component of a graduate curriculum.

The second concern is funding of graduate students. Students would need to be supported by a combination of fellowships, TAs and grants held by faculty; it would be best to provide at least one fellowship and perhaps two TAs per year, with the remaining funding being supplied by grants. Based on this plan, it would be reasonable to have a first entering class of 4 or 5 students. With a two-year program, there would be 8-10 students at any one time. Combined with the active upper level undergraduates, this would likely create critical mass.

If a graduate program is pursued, it will be critical to make use of the resources in associated units. Three such units/resources include a) the connection with Computing Science, for which Cognitive Science graduate courses, and perhaps even a joint degree, could provide a growth area to what might otherwise be a steady state of enrollment (i.e. pure Computing Science degrees); b) the school of Education (in particular, Phil Winne's lab and the students in Educational Psychology who might elect to take graduate courses in Cognitive Science while doing research in Education); and c) the School of Interactive Arts/Technology (e.g. Fisher and his lab).

Recommendations:
- Develop a 2-year Master's program in Cognitive Science, with a niche of providing strong research-based training for students who will then move on to either industry or to strong Ph.D. programs in Cognitive Science and/or related fields.
- Build the curriculum around the existing undergraduate core courses, including both undergraduates and graduate students in some of the same courses.
- Provide funding of at least one fellowship and two TAs per year, with the goal of drawing remaining funding from grants.
- Build on resources in units such as Computing Science, Education, and the School of Interactive Arts and Technology and Education.

5. Administration of program

The program currently has a Program Manager (60% time), who is dedicated and energetic, and has participated in all aspects of the undergraduate program. The position seems to work well for the program, although if the undergraduate program grows, and/or if a graduate program is initiated, the position will likely need to grow, possibly to a full-time position.

There are several concerns about the interface between the Cognitive Science program's administration and that of other units that need to be addressed. One concerns the difficulty of scheduling Cognitive Science courses so that they have attractive day/ time assignments that do not conflict with other relevant departments' offerings. For example, Cognitive Science has not had any morning classes, simply because all of these slots are occupied by other relevant departments. At present, this situation is being handled by the Program Manager, who contacts other department managers when scheduling is being done. However, this solution is somewhat ad hoc, and can be improved. We suggest that core participating departments minimally agree to have a "scheduling" meeting (once for each term) for Department/Program Managers, so that they can develop a regular way to mesh their class schedules to avoid conflicts. Another part of the solution is for each department to have links on their websites to the other participating departments, including class scheduling; once the conflicts are worked out, the website could show Cognitive Science majors all possible classes along with days/times.

Another kind of scheduling difficulty was reported by students as they try to get into upper level Psychology classes—required for some tracks of the Cognitive Science major. Because these upper level classes are open *only* to Psychology majors and minors (in our understanding), Cognitive Science students must declare as minors to enroll, then they later "undeclare" before graduation. This is creative, but hardly a solution. It should be possible for Psychology to allocate some small set of seats for Cognitive Science majors/ minors in order to avoid this situation. The Chair of Psychology understands the problem, and seemed quite amenable to working with Cognitive Science to resolve the issue.

A related issue is the more general question of how the units can formalize their commitments. At present, there is a Steering Committee for the program as well as a wider group of Associate Members. It would make sense for the administrative staff from Cognitive Science and the member departments to meet regularly to discuss scheduling along with other student issues that may arise. In addition, member departments should put a Cognitive Science program link on their home page websites, and perhaps indicate the administrative "point person" for each unit, e.g. who could answer student questions about the coordination of each home department with the program.

A final issue concerns the position of Program Director, and its administrative status. Fred Popowich is currently the Director. He does an outstanding job of guiding the program, building consensus among the members of the Steering Committee, and doing all of the work that being Program Director entails. This position is currently carried out as an overload, which is unfair in the extreme. The Director should be credited for his service to the Cognitive Science program, perhaps by being relieved of other administrative responsibilities. That is, his responsibilities in Computing Science should be negotiated in the context of his contribution to Cognitive Science. This again is a question of working with Computing Science to ensure that they understand the importance of the Cognitive Science program, and Popowich's administrative duties in the program.

Recommendations
- Encourage formalizing commitment among member units by having Program Managers from all units meet at least once a term to coordinate class scheduling.
- Ask member units to provide a number of designated Cognitive Science seats for classes that are difficult for students to get into.
- Put links on member unit homepages to the Cognitive Science Program (and vice versa)
- Formalize the administrative contribution of the Director by negotiating administrative release with his/ her home department (currently Computing Science, home department of Director Popowich).

6. Possible strategic directions and foci for UG program

We have already indicated that the link with Psychology could be significantly strengthened. One strategic direction that could naturally engage Psychology is a focus on human processing, acquisition, and dissolution of language under brain damage. Such a focus is clearly relevant to the broader issue of health sciences, and would encompass linguistically sophisticated research into the determinants of impairment in language learning and deficit following brain lesions in adulthood. This focus is a natural part of Cognitive Neuroscience, an important discipline closely allied to Cognitive Science. New faculty in both Linguistics and/or Psychology could be hired to teach courses on psycholinguistics and language learning, which could build on existing offerings in Linguistics. Moreover, such a focus would naturally enhance the existing research capabilities, which include EEG, MEG, and fMRI, supporting a strong part of a graduate program in Cognitive Science, as well as the undergraduate program.

A second area that could be developed is that of computational modeling of cognition, including areas such as learning, memory, language and perception. The Psychology department currently has expertise in Cognitive Neuroscience-- the biological perspective on cognition-- but it lacks expertise in computational modeling of those phenomena. This focus would fill a gap in the interface among Psychology, Computing Science, and Cognitive Science. Computational modeling of cognitive phenomena is relevant to understanding basic issues in cognition, to understanding breakdown and disorders (e.g. in language) and to understanding issues relevant to information technology, e.g. human-computer interaction. Therefore it would provide a broad and important interface across the different areas of strength already present in the program.

Finally, the question arose whether the Cognitive Science program could make more use of faculty in Philosophy. The Steering committee might explore what additional Philosophy courses could be part of the undergraduate curriculum, and there might be additional flexibility in allowing the rotating Special Topics course to include a Philosophy offering.

Recommendations
- Consider an added focus on human language processing, acquisition, and dissolution under brain damage, using resources in Linguistics and Psychology to build this bridge.
- Consider an added focus on computational modeling, filling an existing gap and building bridges across Computing Science, Cognitive Science, and Psychology.

7. Raising the program profile at SFU and attracting funding

Raising the program profile should be a natural part of the program's growth, especially if foci can be linked to areas of health (as in language in the mind/brain) and information technology (as in computational modeling). In addition, the creation of a niche graduate

program should attract attention across Canada and in the U.S.; there are very few graduate programs that offer degree programs in Cognitive Science, and even fewer that offer a terminal Masters degree as a path to industry or to further graduate education. Exploring connections with industry in Canada and the U.S. should enhance the possibility of funding from these organizations.

Another way to raise the profile is to expand collaborations with UBC in creating joint meetings on Cognitive Science, co-taught seminars, and research collaborations. One possibility is to establish a regular SFU-UBC meeting on Cognitive Science. If thematically based and successful, these could seed funding for cross-university funding initiatives.

Funding efforts of individual faculty have already been quite successful and should continue; but we do understand that these grants are relatively small. Larger grants should be achievable because funding mechanisms are increasingly oriented towards interdisciplinary research-- especially those that combine mind and brain. Several mechanisms for larger grants were brought to our attention, including the Community Trust Endowment Fund and the Canadian Institute for Health Research. The question is how to generate themes that unite faculty interests and create critical mass for seeking focused funding. One theme that seems a likely candidate is Language in the Mind and Brain. Such a theme is clearly health-related, which could attract funding; existing faculty already work in this area, and the possibility of funding would be enhanced if there were additional faculty working on brain-based aspects of language (e.g. the aphasias). It would also connect nicely with any development of Cognitive Neuroscience. Another theme might build on the First Nations project, perhaps seeking support for documenting in detail the linguistic structure of endangered languages. A third theme could be Computational Modeling, which could attract funding for its relevance to information technology development in Canada.

Other themes could be generated by establishing faculty working groups that support focused discussion of mutual research interests across units. If generating large-scale grants is of sufficient priority, the administration could provide some course release to the head of a working group, with the goal of identifying a fundable theme, and writing a grant proposal.

Finally, a somewhat different mechanism for raising the SFU profile and attracting funding is to develop some distance teaching components of the program. Cognitive Science is well-suited to distance teaching because of its interdisciplinary nature and appeal to both scientists and humanists. Improving the education of people who cannot attend classes on campus because of geographical or physical limitations is an overarching goal that would seem quite fundable, and would certainly enhance the public visibility of SFU.

Recommendations:
- Create a niche graduate program.
- Support and expand joint meetings with other Universities in Canada to identify natural collaborations.
- Create faculty working groups to identify themes that could cross-cut interests and serve as the basis for generating larger-scale grants, e.g. via CTEF and Canadian Institute for Health Research.
- Explore themes concerning Language in the Mind/Brain (in conjunction with development of Cognitive Neuroscience), Endangered Languages (in conjunction with the First Nations Project), and Computational Modeling.
- Explore distance learning for components of Cognitive Science curriculum

Answers to specific questions posed to the committee
in the Terms of Reference

a) What new programmatic directions should the Cognitive Science program consider, particularly at the graduate level, and how would these differ for Masters and Ph.D. students?

We have suggested that the program is ready to initiate a Masters degree program, but not a Ph.D. program. As the Masters program becomes successful, it could potentially grow into a Ph.D. program. The core strength in the program at present is in language and concepts, and so it makes sense to focus a graduate program on studies in these, including human processing, acquisition, and dissolution under brain damage, computational models of language and language processing, and experimental approaches to the classical problems in the philosophy of language. A focus on applications of linguistic theory to deficit populations would connect well with existing research within Psychology (e.g. Weeks; Ribary), with the existing instrumentation at SFU (EEG, fMRI) and with the effort to develop Cognitive Neuroscience at SFU. Another programmatic direction could be computational modeling, which would heavily engage people from Computing Science and (ideally) Psychology. A third possibility would be a focus on visual cognition, if the program can more effectively involve Fisher and his lab, and/or if there are additional hires in this area (e.g. in Psychology).

b) Suggest possible strategic directions and foci for the undergraduate program, with a view to including other related disciplines (other than Computing, Linguistics, Philosophy, and Psychology) in the program.

At present, we believe there is a pressing need to consolidate and deepen participation and relationships among the related disciplines that currently form the core. There is much progress to be made in doing this, as our review emphasizes. There should be special emphasis on increasing the participation of Psychology. However, other related disciplines/ units that should be more involved include Education and the School of Interactive Arts.

c) Evaluate the student experience in the program particularly in the light of the complexity around requirements for the program.

The students we interviewed were enthusiastic and excited, and seemed to be relatively undaunted by the program requirements. As we noted, the program would be enhanced by the addition of a Capstone COGS 400 course, possibly in combination with research (for credit). The administrative difficulty of getting into courses should be remediated by our suggestions for coordinating the Program Managers across participating units, and formal acknowledgement from Chairs of participating departments that the Cognitive Science program should be supported, e.g. by allocating class seats for the majors (without having to declare a "faux" major in the target department). The student survey revealed that the Cognitive Science program has been doing well for its graduates; continuing this survey will be an excellent way to monitor its trajectory.

d) Recommend strategies for developing linkages with other disciplines, with a view to raising the Program's profile at SFU, as well as attracting funding for cognitive science research.

The participating faculty have done well in terms of obtaining funding for their own research, but with the exception of several faculty, the grants remain small. One obvious way to increase the level of funding and to simultaneously raise the program's profile is to partner within the program and outside of it, possibly developing new initiatives. One possibility is to move in the direction of health-related funding by developing a focus on language processing in the normal and abnormal human brain, both in children (stemming from disease or genetic conditions) and adults (stemming from brain lesions). Approaching the problems of language learning and repair using theoretically and experimentally sophisticated approaches to the structure of language would be a natural extension to some of the work already being done in Linguistics and Cognitive Science. Labs and instrumentation are already in place; faculty who specialize in psycholinguistics and/or neurolinguistics (i.e. patient populations) would provide additional strength. A second initiative could build on the First Nations project, if work on endangered languages can be done in such a way as to strengthen the theoretical interests of current (or new) faculty. Our understanding is that, at present, work on these languages is very difficult, and not really at the level of being informative on theories of language evolution, acquisition, and the like. The third initiative we have mentioned is developing a focus on Computational Modeling of cognitive phenomena, including language, memory, and perception.

e) Evaluate whether the Program's secondment of teaching and administrative resources can sustain its growing level of activity and ensure a strong future in both research and teaching. Suggest how commitments made by collaborating units could be codified and formalized to ensure quality can be maintained?

At present, it is participating faculty — and not departments per se — who have formalized their commitments, e.g. by participating in the Steering committee and/or requesting designation as Associate Members. This is good, but probably not enough. There needs to be a clear commitment by the participating departments, and well as increased information exchange across these departments and units.

A simple fix is to put links to the Cognitive Science program on department websites (and vice versa). Another step would be to have administrative staff from the Cognitive Science program and member departments meet on a regular basis to discuss course scheduling, student issues, and other administrative issues. A third step is to request that participating departments provide student "seats" in the necessary classes, to avoid having Cognitive Science students denied enrollment. An important additional step would be to have the Chairs of the participating departments/ units attend regular meetings (perhaps twice a year) to discuss what is working and what needs improvement in fostering full commitment and participation by their faculty. These Chairs and the Program Director of Cognitive Science should meet with the Dean to work on facilitating teaching of Cognitive Science courses, and ensuring that both faculty and departments receive appropriate credit for doing this.

We have emphasized in the report that, while secondment may temporarily relieve some teaching needs, it is not a substitute for judiciously increasing the number of faculty specifically dedicated to Cognitive Science. A senior replacement for the CRC, and one further faculty member are well-justified at this point, and would be an excellent investment.

f) Suggest opportunities that would make the most sense with respect to the needs and interests of the Program, in the light of the proposed Faculty restructuring.

25

We do not have specific suggestions about how the Faculty restructuring might best serve the needs of the Program. We do think, however, that the occasion of restructuring presents a unique opportunity for administration to think creatively and flexibly about how they might enhance SFU's overall educational mission and profile. Our understanding is that interdisciplinary studies and programs are at the heart of SFU's mission. We believe that the administration's thoughtful consideration of how to move the Cognitive Science program ahead may well serve as the vehicle for considering the problems that all interdisciplinary programs face-- and therefore provide the opportunity to come up with thoughtful, long-term solutions.