S.03-48

SIMON FRASER UNIVERSITY

MEMORANDUM

To: Senate

From: Allan MacKinnon, Chair
Senate Committee on Undergraduate Studies

Subject: Faculty of Science
(SCUS reference 03-5b)

Date: March 19, 2003

Action undertaken by the Senate Committee on Undergraduate Studies at its meeting of March 18, 2003 gives rise to the following motion:

MOTION

"That Senate approve and recommend approval to the Board of Governors the Joint Major in Molecular Biology and Computing Science, as set forth in S. 03-48 , effective 2003-3."

Proposal for a B.Sc. Joint Major in Computing Science, Molecular Biology and Biochemistry

Fiona Brinkman, Molecular Biology and Biochemistry, Simon Fraser University

June 21, 2002 – revised July 29, 2002 – revised September 28, 2002 – revised October 4, 2002 – revised October 25, 2002 – revised (change of PHIL001 to PHIL 100) November 25, 2002.

Executive Summary

A joint major in Molecular Biology and Biochemistry (MBB) and Computing Science (CS) is proposed (B.Sc.) that would provide high quality education to students in B.C. who are interested in bioinformatics and related computational and biological disciplines. This undergraduate program has the capacity to attract very high calibre students, fill a void in undergraduate training in B.C., and capitalize on the high number of researchers at SFU who have an interest or experience in bioinformatics and related disciplines. The program should be relatively easy to initiate as it involves the development of only one new course in CS (that can be based on curricula already developed for an equivalent graduate course) and may capitalize on the previously successful development of a joint major in CS and Business and another joint major in MBB and Business. An anticipated maximum of 25 students in the program per year is proposed and students who would choose whether they wish to have their primary registration though the Faculty of Science or Faculty of Applied Science (similar to another joint-faculty program involving the Faculty of Applied Science). This program will provide a superior quality education to those students who are currently trying to develop such programs themselves using combined college and university courses, and will provide students with a base education in the CS and MBB fields that will be stronger than many currently existing bioinformatics programs in Canada. The joint major, with its focus on broad based education early in the program will give students added flexibility by making it easier for them to later enter more CS-oriented or MBB-oriented career paths if desired. The program will provide highly trained students suitable for entry into the SFU-UBC Graduate Bioinformatics Program that was recently funded, and it will also provide a source of much needed bioinformaticists for the biotech industry and government-funded genetic research initiatives. This program represents the first undergraduate program in B.C. that provides training suitable for a bioinformatics career.

Background

The biological sciences are generating enormous amounts of data, particularly with regard to the study of gene and protein data, the human genome, and other genome-based analyses. Gene databases have been increasing exponentially for more than a decade and are forecast to continue to do so as we gain more insight into the diversity of life on earth. Large projects involving the 3D modeling of protein structures are being performed and complex regulatory networks present in life are being uncovered. In such a climate, the field of bioinformatics was initiated, which is loosely defined as the intersection between the computer science and the study of biological macromolecules. This field endeavours to develop novel computational approaches/algorithms, or

perform computational analyses using existing methods, to study this biological data. Researchers in this field are in high demand, due to the large influx of data, the need to develop novel methods for visualization of the data, the need for new data mining approaches, and the need for other novel algorithms for analysis. This demand for bioinformaticists includes both those focusing on biological analysis using existing computational methods, as well as those focusing on development of new computational approaches.

As an indication of the demand for bioinformaticists and the need for newly trained bioinformaticians, a White Paper on Bioinformatics in Canada (2002; see http://bioinformatics.ca/docs/whitepaper.pdf) reports that the bioinformatician needs for Genome Canada projects alone is estimated to be 215 positions in the first two years (2001/2002). In a 2001/2002 bioinformatics survey (http://bioinformatics.ca/survey/indexbk.php) carried out by the Canadian Genetic Diseases Network (CGDN), 77 researchers with hiring responsibilities estimated their current demand for bioinformaticians to be already be greater than 487. The Canadian Bioinformatics Workshops, a national 2-week intensive training program for graduate students and researchers, had 130 applicants for 50 positions for its February 2002 Bioinformatics Workshop. At CDN$2500 per person, that represented a CDN$325,000 demand for bioinformatics training. The fall 2001 Cold Spring Harbor workshop "Bioinformatics: Writing Software for Genome Research" (http://nucleus.cshl.org/meetings/2002courses.htm) saw 200 applicants competing for 20 positions. Clearly there is a need for more training in bioinformatics.

Bioinformatics programs in Canada: The need for undergraduate training in B.C.

As a result of this demand for bioinformaticists, a number of bioinformatics undergraduate and graduate training programs have been initiated across Canada (see http://www.bioinformatics.ca/program_listings.php for a list of all programs in Canada, a list which was developed recently with funding obtained to write the White Paper on bioinformatics training in Canada). Alberta, Ontario and Quebec all have both undergraduate and graduate programs, however, notably absent, British Columbia does not currently have any undergraduate program and is only initiating a graduate program this year (subject to final approval). The one new graduate program in B.C., an SFU-UBC joint program in Bioinformatics, was recently funded this year, by the Canadian Institutes for Health Research, at 300,000/yr, with additional funding promised by the Michael Smith Foundation for Health Research. While this is promising, and this program has the potential to attract very high quality students to SFU computing science and biological departments, the lack of an undergraduate program in B.C. is still striking. This is particularly notable given that

- B.C., in particular SFU, is noted for informally training a number of bioinformaticists (for example, Francis Ouellette, Steven Jones, Marco Marra, and James Brown, all internationally known in the field, had some training at SFU)
- There is a significant critical mass of researchers in B.C. interested in bioinformatics (hence, the recent formation of a Vancouver Bioinformatics Users Group)
- The population size of B.C. should dictate that we should have programs equivalent to those of other provinces.

An additional indicator of the need for an undergraduate training program at SFU comes from the demand observed for access to the new 4th year Bioinformatics course offered through the MBB

department. Approximately double the number of students who could get into the course for the 2002-2 term signed up on a waiting list for entry. This course was then immediately offered in the following 2002-3 term, however the demand was still high and more than double the number of students accepted into the course signed up on a waiting list. Therefore, I propose that now is the time for an undergraduate program suitable for Bioinformatics training at SFU.

The strong and growing bioinformatics industry, coupled with our need for suitably trained students for the SFU-UBC Bioinformatics graduate program, makes a bioinformatics undergraduate program a must for B.C.. The need for such a program is further evident by the notable number of SFU MBB students who are currently taking courses at BCIT to supplement a degree in the biological sciences in order to get what (they hope) is bioinformatics training. This is not acceptable, as we should be providing our students with university-level training that provides them with a good education in the CS and MBB fields, coupled with bioinformatics-specific courses. Thankfully, there are courses already existing at SFU that are appropriate for such a program.

Why a joint major in CS and MBB, rather than a "Bioinformatics" degree?

A joint major in CS and MBB is proposed, since this will allow students to continue to "keep doors open" at the undergraduate level, should they decide later that they wish to pursue a career more directed toward either CS or MBB fields. It is felt that an undergraduate degree with the name "bioinformatics" is simply too narrow at this stage of their career – a time when they should be getting a base education in the basic and applied sciences and getting a better feel for what their interests are. Curriculum proposed in the Canadian Bioinformatics White Paper is very close to being a joint major, reflecting the large body of knowledge required by a bioinformaticist working in an interdisciplinary field. It therefore seems appropriate to give students credit for all this work, by requiring courses suitable to give them a joint major degree.

It is proposed that such a joint major program will be attractive to very high calibre students, because of its ability to keep their options open (verses programs more focused on bioinformatics, or just MBB or just CS), and because the field of bioinformatics, the biotech industry, and computing fields are currently very attractive to students in general. This program would be aimed at such high calibre students.

Career options for a student graduating with a joint major in CS and MBB

As indicated above, one attraction of such a program may be its ability make student eligible for a wide variety of career options. Career options include, but are definitely not limited to:

- Bioinformaticist or Computational Biologist* in a Medical, Agricultural or Aquacultural Biotech company
- Bioinformaticist or Computational Biologist in a Genome Sequencing Centre, Functional Genomics Centre, or equivalent (for example, the BC Genome Sciences Centre).
- Bioinformatics/Computational Biology technician in an academic research group
- Bioinformaticist or Computational Biologist in a government laboratory (clinical diagnostic, environmental, etc.) or government research group
- Medical Informaticist in a Government Laboratory
- Computer Scientist or Technician in a Biotech company, Government Laboratory, etc.
- Laboratory Research Technician in a Biotech company, Government Laboratory, Private Clinical Laboratory, Academic Research group, etc.

Subsequent graduate training in Bioinformatics, Computing Science, or a Biological discipline can, of course, lead to a number of further career options.

* "Computational Biologist" is a term increasingly used to describe bioinformaticians that focus more on development of new algorithms and other computional approaches relevant to the study of a biological problem. "Bioinformaticists" is a term being increasingly used to refer to Bioinformaticians as a group, or specifically those who are using existing bioinformatics approaches to perform and interpret new analyses relevant to a given biological problem. In other words, Computional Biologists often have a stronger computing science expertise, while Bioinformaticists may have a stronger biological knowledge. Of course, there are a number of bioinformaticians who are at a mid point for this spectrum, but many research and diagnostic groups find they need to hire people at either end of this multidisciplinary spectrum.

Some logistics regarding program development

In addition to proposing a program that would be of interest to very high calibre students, this proposal has the added benefit that it would be fairly easy to initiate and, based on an initial outline, involves the generation of only one undergraduate course from an existing graduate course (the CMPT 881 - Computational Molecular Biology course, offered by Arvind Gupta in CS). There is a wealth of researchers at SFU with an interest in bioinformatics that we can capitalize on, including myself, Frederic Pio, David Baillie and others of MBB, Arvind Gupta, Martin Ester, Ke Wang, and others of CS, Brad McNeney, Jinko Graham and others of Statistics, and researchers in other departments like Biological Sciences and Information Technology. Such researchers have already developed courses that would be suitable for inclusion into the program. This program may also capitalize on the previous development of joint majors between CS and Business, as well as another joint major between MBB and Business. As a result, the core courses required for a major in CS and MBB have already been determined (though some modification is necessary to reflect the discipline differences and the amount of course load). The program would also benefit from the fact that there are courses being generated, or already existing, for the SFU-UBC

graduate bioinformatics program who's curricula may be suitable as future upper level undergraduate courses (e.g. Problem-Based Learning in Bioinformatics, Statistics for Bioinformatics). Arvind Gupta and I have had a number of discussions about the program, the CS department set up a small committee for the development of this program, and I have been leading efforts for this undergraduate program development from the MBB department, as necessary.

Note that the course load for this program is high, but this reflects the significant amount of knowledge that students must gain if they wish to have a solid base of training in MBB and CS. Many students are already essentially trying to do the same program, by completing both a major in a biological science, and then completing another Bachelor's degree in the computational sciences. So it appears that there are students willing to take on such a course load. I propose that we can greatly aid such students by providing them with a program that will allow them to pursue such training over a much shorter time scale (versus subsequent Bachelor's degrees, or a double major). Again, we will also help provide students with a higher calibre education, for those who are supplementing their university degree with college courses.

The initiatives mentioned above, as well as other initiatives that are taking place in Bioinformatics in B.C. (for example, proposals for a new Bioinformatics NCE "CBIN", a B.C. node for the Canadian Bioinformatics Resource, to be centred at SFU, and a new Bioinformatics Centre at UBC), will hopefully enable us to attract the best students into this B.C. program, and provide a wealth of students for potential entry into the graduate program.

Program Administration

This program would be novel, in the sense that it must be administered in a truly collaborative manner between the Faculty of Science and Faculty of Applied Science. However there is some precedent for this as the Faculty of Applied Science is currently involved in other programs that involve more than one faculty. It is proposed that this joint CS-MBB program follow a similar model, in that the student decides whether they wish to register through the Faculty of Applied Science CS department, or register through the Faculty of Science MBB department. A committee comprising two representatives from both the MBB and CS departments would oversee the program and aspects of admissions, ensuring an appropriate maximum (and minimum, if necessary) allocation of students to the two faculties and ensuring that the same qualifications for admissions were adhered to for all admitted students. Admissions qualifications would always meet or exceed the minimum requirements for admission into both CS and MBB. This currently translates into particular course requirements (from MBB) and GPA requirements (from CS) that are above the minimal requirements for admission into either the MBB or CS program separately.

The maximum number of students entering the program each year is proposed to be 25, with a smaller number (12) proposed for the first year the program operates. Students in other programs (particularly CS and MBB) would have the option to transfer into this program after 1st year, as long as they meet very strict specified academic requirements. All students, regardless of whether their primary association is with the Faculty of Science, or with the Faculty of Applied Science, would all have the same course requirements and would all graduate with a B.Sc., Joint Major in Computing Science, Molecular Biology and Biochemistry. To my knowledge, this represents the first such joint major program of its kind in Canada.

Requirements to mount a Joint Major in CS and MBB at SFU

- Establishment of an undergraduate coordinating committee between Computing Science and the Department of Molecular Biology and Biochemistry, comprising two representatives from each department.
- Determination of entrance requirements for this program. It is proposed that students be accepted directly into the Joint Majors program from high school, meeting both MBB and CS admissions requirements, with an option for students already registered at SFU to transfer to the program, as long as they follow strict qualification criteria upon review by the Coordinating Committee. The Coordinating Committee will screen all applicants and set the level and number of admissions per year. Initially, the number of students admitted will be limited to 12, with an anticipated maximum number admitted of 25 per year in future years.
- Innovation of one new course CMPT 3XX (3-1-0). Introduction to Computational Biology. A graduate course already offered in CS, "CMPT 881 - Computational Molecular Biology" would be used as the platform for development of a very similar curricula for this course (http://www.cs.sfu.ca/gradpgm/Outlines/2002-3/CMPT-881-Gupta-02-3.txt).

Proposal for a Joint Major in Computing Science and Molecular Biology and Biochemistry: Proposed Course requirements

- An approximately equal number of credits are MBB and CS-associated (74 cr MBB vs. 73 cr CS)
- Recently introduced specifications for satisfying an Arts/Breadth Requirement are included, with the understanding that the requirement guidelines allow joint majors to opt out of the full 12 credit requirement, if there is little room. We propose we have a case for this and we propose that the number of credits indicated is acceptable for a such a "filled to capacity" joint major program.
- Note that if the student has former high school CS training, and so can take CMPT 104-2, the program is 120 total credits. If not, CMPT 101-4 must be taken, resulting in a total of 122 credits.
- Though the required course load for this program is high, note that there is considerable choice for what may be taken for 7 courses (21 credits) in the program

a) Proposed Lower Division Requirements (72 credits - or 74 credits if CMPT 101 is taken)
Note: Lower division courses will take a little over (by 3 courses) 2 years to complete.

For both majors:
MATH 151-3 - Calculus I
MATH 152-3 - Calculus II
STAT 270-3 Introduction to Probability and Statistics
Arts Requirement:
PHIL 100-3 - Knowledge and Reality
LIB ARTS - Liberal Arts course requirement
(plus proposed "Social Implications of a Computerized Society" course listed in upper division)

For MBB major:
Basic Science:
BISC 101-4 - Intro Biology I
BISC 102-4 - Intro Biology II
CHEM 121-4 - General Chem & Lab I
CHEM 122-2 - General Chem II & Lab II
CHEM 281-4 - Organic Chem
CHEM 282-2 - Organic Chem II (not required to take accompanying lab)
PHYS 101-3 - General Physics I OR 120-3 - Modern Physics and Mechanics
PHYS 102-3 - General Physics II OR 121-3 - Optics, Electricity and Magnetism
MBB:
BISC 202-3 – Genetics
MBB 221-3 - Cell Biology and Biochemistry
MBB 222-3 - Molecular Biology and Biochemistry

For CS major:
CMPT 104-2 - Computer Programming OR CMPT 101-4 - Intro to Computer Programming
CMPT 201-4 - Data and Program Abstraction
CMPT 275-4 - Software Engineering
CMPT 150-3 - Introduction to Computer Design
MACM 101-3 - Discrete Mathematics I
MACM 201-3 - Discrete Mathematics II
MATH 232-3 - Elementary Linear Algebra

b) Proposed Upper Division Requirements (48 credits)

For both majors:
STAT 302-3 - Analysis of Experimental and Observational Data

For MBB major:
BISC 331-3 - Molecular Biology
MBB 308-3 - Molecular Biology and Biochem Lab I
MBB 321-3 - Intermediary Metabolism ← *increased bioinformatics lab component for all students currently being created*
MBB 441-3 - Bioinformatics

plus at least two other fourth year-level courses, with a particular emphasis on suggesting that they consider taking:
MBB 435-3 - Genomic Analysis
MBB 423-3 - Protein Structure & Function
MBB 442-3 - Proteomics

For CS major:
CMPT 3xx-3: Introduction to computational biology (*course to be created – currently a graduate course only*)
CMPT 307-3 - Data Structures and Algorithms
CMPT 354-3 - Database Systems and Structures
MACM 316-3 - Numerical analysis
CMPT 320-3 - Social Implications of a Computerized Society (*It is proposed that this societal, essay-based course may fulfill 3 credits of an Arts requirement*)

plus two courses from:
CMPT 300-3 - Operating Systems
CMPT 305-3 - Computer Simulation and Modeling
CMPT 310-3 - Artificial Intelligence Survey
CMPT 340-3 - Computers in Biomedicine
CMPT 361-3 – Introduction to Computer Graphics
CMPT 363-3 – User Interface Design

plus at least two fourth year level courses, with two of the following suggested:
CMPT 405-3 - Design and Analysis of Computing Algorithms
CMPT 413-3 - Computational Linguistics
CMPT 419-3 - Special Topics in Artificial Intelligence
CMPT 454-3 - Database Systems II

39 courses – 120 credits total
(122 credits total if take CMPT101 instead of CMPT104)
Co-op is encouraged.

Proposed program – term by term breakdown – *an example*

According to all current information, there are no course time conflicts involving any of the courses as listed below and all course prerequisites and co-requisites are fulfilled. *Remember, this is only an example, and a number of other choices are possible, including involving summer terms.* Courses with square brackets around them reflect example choices for 7 of the courses, for which a number of options are possible. Of course, a student may slant their program slightly to reflect their interests when choosing such courses.

Term 1 – Fall of Year 1
- CMPT 104-2 - Computer Programming
- MATH 151-3 - Calculus I
- BISC 101-4 - Intro Biology I
- CHEM 121-4 - General Chem & Lab I
- PHYS 120-3 - Modern Physics and Mechanics

Term 2 – Spring of Year 1
- CMPT 150-3 - Introduction to Computer Design
- MACM 101-3 - Discrete Mathematics I
- BISC 102-4 - Intro Biology II
- CHEM 122-2 - General Chem II & Lab II
- PHYS 121-3 - Optics, Electricity and Magnetism

Term 3 – Fall of Year 2
- CMPT 201-4 - Data and Program Abstraction
- PHIL 100-3 - Knowledge and Reality
- MATH 152-3 - Calculus II
- MBB 221-3 - Cell Biology and Biochemistry
- CHEM 281-4 - Organic Chem

Term 4 – Spring of Year 2
- CMPT 275-4 - Software Engineering
- MACM 201-3 - Discrete Mathematics II
- MATH 232-3 - Elementary Linear Algebra
- MBB 222-3 - Molecular Biology and Biochemistry
- CHEM 282-2 - Organic Chem II (not required to take accompanying lab)

Term 5 – Fall of Year 3
- STAT 270-3 Introduction to Probability and Statistics
- BISC 202-3 – Genetics

End of lower division courses (except Liberal Arts course taken in later term)

- MBB 321-3 - Intermediary Metabolism
- CMPT 354-3 - Database Systems and Structures
- MACM 316-3 - Numerical analysis

Start of upper division courses

Term 6 – Spring of Year 3
CMPT 307-3 - Data Structures and Algorithms
CMPT 3xx-3 - Introduction to computational biology (*to be created – currently grad course*)
BISC 331-3 - Molecular Biology
[CMPT 310-3 - Artificial Intelligence Survey]
[LING 220-3 - Introduction to Linguistics (satisfies a Liberal Arts requirement)]

Term 7 – Fall of Year 4
MBB 308-3 - Molecular Biology and Biochem Lab I
MBB 441-3 - Bioinformatics
STAT 302-3 - Analysis of Experimental and Observational Data
[CMPT 405-3 - Design and Analysis of Computing Algorithms]
[CMPT 300-3 - Operating Systems]

Term 8 – Spring of Year 4
CMPT 320-3 - Social Implications of a Computerized Society
[MBB 435-3 - Genomic Analysis]
[MBB 423-3 - Proteomics]
[CMPT 454-3 – Database Systems II]

For this example: 120 credits

CA.SFU.FAS.UCC/Papers:2003-10

Calendar Language for a B.Sc. Joint Major in Computing Science, Molecular Biology and Biochemistry

Robert D. Cameron

February 11, 2003

The Proposal for a B.Sc. Joint Major in Computing Science, Molecular Biology and Biochemistry, published a FAS UCC Paper 2002-14 has been approved in principle by the FAS UCC, subject to agreement on revised administrative structure, minor curriculum revisions, and development of a complete and correct calendar description. This document provides proposed calendar text and revisions to resolve these issues. Specifically, the following items are included.

- The administrative structure is simplified to make the Faculty of Science the home faculty for the purposes of student admission, registration, appeals and graduation processing.
- A program director is appointed for alternating two-year terms from Computing Science and Molecular Biology and Biochemistry, respectively.
- The Liberal Arts Requirement is made concrete by using the list of first year Arts courses used by Computing Science for its social science requirement.
- The course CMPT 341 is introduced in place of CMPT 3xx in the upper division requirements.
- Wording referring to requirements for "both majors," the "MBB major" and the "CMPT major" is corrected.
- Correct course titles are used throughout.

Calendar Text - Faculty of Science Entry

The following text is proposed to be placed in the *Department of Molecular Biology and Biochemistry* section under *Faculty of Science*.

Joint Major in Computing Science and Molecular Biology and Biochemistry

The School of Computing Science and the Department of Molecular Biology and Biochemistry cooperate in offering this Joint Major program. The administrative home is within the Faculty of Science for purposes of student registration, appeals and graduation processing.

The program is administered by a coordinating committee consisting of two faculty members each from the School of Computing Science and the Department of Molecular Biology and Biochemistry. The chair of this committee serves as program director. Two-year appointments as chair are made on an alternating basis between representatives from the two units.

Program requirements below include sections labelled MBB Requirements and CMPT Requirements. The requirements under these sections are intended to track corresponding requirements within the MBB and CMPT Major programs, respectively.

11.

Lower Division Requirements

(72 credits - or 74 credits if CMPT 101 is taken)

- MATH 151-3 Calculus I
- MATH 152-3 Calculus II
- STAT 270-3 Introduction to Probability and Statistics
- PHIL 100-3 Knowledge and Reality
- One additional arts course chosen from ARCH 105, CMNS 110, 130, CNS 160, CRIM 101, ECON 103, 105, HIST 106, POL 100, PSYC 100, REM 100, SA 101, 150, WS 101.
- PHYS 101-3 General Physics I OR PHYS 120-3 Modern Physics and Mechanics
- PHYS 102-3 General Physics II OR PHYS 121-3 Optics, Electricity and Magnetism

MBB Requirements

- BISC 101-4 General Biology
- BISC 102-4 General Biology
- BISC 202-3 Genetics
- CHEM 121-4 General Chemistry and Laboratory I
- CHEM 122-2 General Chemistry and LaboratoryII
- CHEM 281-4 Organic Chemistry I
- CHEM 282-2 Organic Chemistry II
- MBB 221-3 Cell Biology and Biochemistry
- MBB 222-3 Molecular Biology and Biochemistry

CMPT Requirements

- CMPT 104-2 Computer Programming OR CMPT 101-4 Introduction to Computer Programming
- CMPT 150-3 Introduction to Computer Design
- CMPT 201-4 Data and Program Abstraction
- CMPT 275-4 Software Engineering
- MACM 101-3 Discrete Mathematics I
- MACM 201-3 Discrete Mathematics II
- MATH 232-3 Elementary Linear Algebra

Upper Division Requirements

(48 credits)

- STAT 302-3 - Analysis of Experimental and Observational Data

MBB Requirements

- BISC 331-3 Molecular Biology
- MBB 308-3 Molecular Biology and Biochemistry Laboratory I
- MBB 321-3 Intermediary Metabolism
- MBB 441-3 Bioinformatics

plus at least two additional 400-level MBB courses, with the following suggested:

- MBB 423-3 Protein Structure and Function
- MBB 435-3 Genomic Analysis
- MBB 442-3 Proteomics

CMPT Requirements

- CMPT 307-3 Data Structures and Algorithms
- CMPT 341-3 Introduction to Computational Biology
- CMPT 354-3 Database Systems and Structures
- MACM 316-3 Numerical analysis
- CMPT 320-3 Social Implications of a Computerized Society

plus two courses from:

- CMPT 300-3 Operating Systems
- CMPT 305-3 Computer Simulation and Modeling
- CMPT 310-3 Artificial Intelligence Survey
- CMPT 340-3 Computers in Biomedicine
- CMPT 361-3 Introduction to Computer Graphics
- CMPT 363-3 User Interface Design

plus at least two 400-level CMPT courses, with the following suggested:

- CMPT 405-3 Design and Analysis of Computing Algorithms
- CMPT 413-3 Computational Linguistics
- CMPT 419-3 Special Topics in Artificial Intelligence
- CMPT 454-3 Database Systems II

Students are encouraged to enrol in the Cooperative Education program.

Calendar Text - Faculty of Applied Sciences Entry

The following text is proposed to be placed in the *School of Computing Science* section under *Faculty of Applied Sciences*.

Joint Major in Computing Science and Molecular Biology and Biochemistry

The School of Computing Science and the Department of Molecular Biology and Biochemistry cooperate in offering this joint major. See the entry within the *Department of Molecular Biology and Biochemistry* section under the *Faculty of Science*.

TO: SCUS
FROM: Barry Honda, MBB DUCC
RE: The proposal for a joint major in MBB/CS
DATE: March 6, 2003.

Dear Colleagues,

First of all, on behalf of Arvind Gupta and Fiona Brinkman, I would like to thank you for the time and attention you have put into suggesting improvements to our proposal. I am also grateful to Rolf Mathewes and Rob Cameron, for their advice that we present you with a memorandum to attempt to address your comments and concerns, rather than change the original document. Their rationale for suggesting this is a practical one-- Dr. Brinkman, the principal author, is currently on maternity leave and not available.

1. The proposal was approved by both faculties, subject to "fine-tuning" if necessary to revise administrative structure, make minor curriculum revisions, and develop a complete and correct calendar description language. We thank SCUS and in particular Dr. Cameron for providing the details necessary to move the proposal along (available at http://fas.sfu.ca/ucc/Papers/2003/2003-10/2003-10.html).

2. Re: breadth requirements, it was never the intention of this proposal to preempt the university curriculum implementation process. Dr. Brinkman worked very hard to look at how we could achieve compliance, but felt it necessary to comment on the potential difficulties that such joint majors may face. Since the implementation phase of the Krebs report on undergrad curricula at SFU is just beginning, we felt that final details could be worked out in the process of reviews across departments and faculties. Drs. Mathewes and Cameron therefore suggested that SCUS might be willing to accept the current curriculum, with the implementation of university curriculum requirements as an area for future work. Both Science and Applied Sciences are committed to participation in the process, with the intention of satisfying the new policy guidelines, based on upcoming discussions with implementation committees.

3. Re: an honours program, our model for all of this was the MBB/Business joint major, which was approved by SCUS as an innovative and visionary program, without an initial honours program. I note that one is being developed now that the majors program is up and running, and should be in place in time for the first cohort should they choose to take this path. Thus we had hoped that this precedent would also be applied to this proposal. We have the same plan for this program, but will need to so some work to decide on curriculum details between the two departments, details which should certainly be in place well before the first set of students will desire access to an honours degree.

A final comment: as noted above in #3, we have tried to closely follow the model of the recently approved MBB/Business joint major, and we would hope that this

provides a useful precedent in getting this program approved e.g. details such as being sent to SCUP for information only, rather than consideration and approval.

Thank you again for your time and help with improving this curriculum and program, which I believe can effectively put SFU on the bioinformatics map as the premier institution in BC, and a leader in Canada.

Sincerely,

Barry Honda
Chair, MBB DUCC