

# SIMON FRASER UNIVERSITY

## OFFICE OF THE VICE-PRESIDENT, ACADEMIC

### MEMORANDUM

**To:** Senate

**From:** J. M. Munro, Chair  
Senate Committee on Academic Planning

**Subject:** Faculty of Science -  
Establishment of the Department Molecular Biology  
and Biochemistry  
(SCAP Reference: SCAP 99 - 27)

**Date:** September 14, 1999

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Action undertaken by the Senate Committee on Academic Planning gives rise to the following motion:

**Motion:**

“that Senate approve and recommend approval to the Board of Governors as set forth in S.99 - 56, the establishment of the Department of Molecular Biology and Biochemistry effective April 1, 2000”

**SIMON FRASER UNIVERSITY**  
**MEMORANDUM**

To: Alison Watt, Secretary  
SCAP

From: C.H.W. Jones, Dean,  
Faculty of Science

Subject: Formation of a New Department -  
Molecular Biology and Biochemistry

Date: August 11, 1999

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At its meeting of March 23, the Faculty of Science approved the proposal for the formation of a Department of Molecular Biology and Biochemistry as outlined in the attached paper.

Please include this item on the agenda of the next meeting of SCAP for consideration and approval.

C.H.W. Jones  
C.H.W. Jones

Enclosure

c. A.T. Beckenbach

# Proposal for the formation of a new Department

## Department of Molecular Biology and Biochemistry

We propose to consolidate the Undergraduate Program in Biochemistry with the Graduate Program in Molecular Biology and Biochemistry, to create a single administrative unit, the Department of Molecular Biology and Biochemistry.

We provide a brief history of the Biochemistry Program at Simon Fraser University, and of the Institute of Molecular Biology and Biochemistry (IMBB), as well as an overview of the current status of the undergraduate and graduate programs. An assessment of the potential budgetary implications and benefits of the proposed administrative changes is also included.

It should be emphasized that no new programs are proposed. Our proposal is for an administrative reorganization that will lead to increased efficiency in the operation of these programs and will result in clearer distinctions between our new Department and the Departments of Chemistry and Biological Sciences. No new faculty or administrative expenditure will be required to implement this proposal.

### **Brief History of the Biochemistry Program and the IMBB**

#### *The biochemistry program at SFU and establishment of the IMBB*

The Biochemistry B.Sc. program was established as an interdepartmental initiative involving faculty from Chemistry and Biological Sciences. In 1984 an external review committee assessed the program and concluded that it had many gaps. The committee recommended that the program be upgraded to provide a contemporary educational experience for its undergraduate and graduate students—one which would provide an appropriate breadth and depth of quality course work in cellular and molecular biology, as well as biochemistry. It proposed the formation of an Institute of Molecular Biology and Biochemistry to foster research and graduate training, and to provide a sufficient number of faculty and breadth of expertise for the Biochemistry program. The committee identified a core of six faculty members in Chemistry and Biosciences having appropriate expertise and research interests to be founding members of the IMBB and recommended that a comparable number of new faculty be hired by the IMBB. While not explicitly stated in its report, the committee anticipated that the IMBB would evolve into a fully independent department after the new faculty had arrived and the revamped B.Sc. and graduate programs had been implemented. This proposal thus represents the culmination of a process that began 15 years ago.

The IMBB was formally established in 1987 with the six charter members. Using an allocation of base budget funds from the Funds for Excellence in Education program, the IMBB initiated a faculty recruitment program which hired six new faculty,

including a Director. With the departure of one founding member, and addition of three new members from SFU departments, the IMBB now has 14 members. In addition, the IMBB has 13 associate and one affiliate members. As it was not feasible for the existing departments to provide laboratory and office space for a group of this size, a proposal for construction of a new building was submitted and approved. The South Sciences Building (SSB) was completed in 1993. The 14 full members of the IMBB now occupy contiguous laboratory and office space in the new building. The IMBB has an administrative office in the SSB, separate from the administrative offices of the Departments of Chemistry and Biological Sciences. It provides all of the clerical services required for its members and their graduate students, post-docs and research associates (approximately 100 people) and for the undergraduate biochemistry program and the graduate degree programs in molecular biology and biochemistry.

### *The MBB Graduate program*

In 1994, the IMBB proposed the establishment of M.Sc. and Ph.D. programs in molecular biology and biochemistry, including a set of MBB graduate courses and degree requirements. The program was initiated in 1995 as separate programs in the Departments of Chemistry and Biological Sciences. Administrative authority was transferred to the IMBB in September of 1998, unifying the two programs into a single MBB Graduate Program. This step eliminated the unnecessary duplication of effort that had resulted from dividing the program between the two departments and the IMBB. A majority of the students enrolled in the separate programs transferred to the new unified MBB Graduate Program. Our program now includes 32 students, 16 enrolled in the M.Sc. and 16 in the Ph.D. programs. An MBB Graduate Program Committee, selected by members of the IMBB, oversees the program and reports to the Director of the IMBB. The Director reports to the Dean of Graduate Studies on matters pertaining to the graduate program. The MBB Graduate Program is described in Appendix 1.

### *The Biochemistry B.Sc. Program*

For many years, the responsibility for financial and academic administration of the Biochemistry undergraduate degree program resided with the Department of Chemistry. In 1995, that authority was transferred to the IMBB, and in 1996 budgetary responsibility for the biochemistry faculty was also transferred. Since the original mandate of the IMBB was as an interdepartmental graduate teaching/research institute, these new responsibilities represented a significant expansion of that mandate. As a result, it was deemed necessary to create an independent Biochemistry Program to oversee the undergraduate teaching of biochemistry, and to serve as the "home department" for biochemistry faculty. This Program was established in September of 1997. All full members of the IMBB were offered an option of primary appointment in the new Program, or secondary appointment while retaining primary appointment in their home Department, or Associate status while retaining sole appointment in the home Department. In principle, faculty could choose their sole appointment in the Biochemistry Program, but for historical reasons, and since the Program was established largely as an undergraduate teaching program, no faculty considered this

option. The Director of the IMBB was appointed as the first Director of the Biochemistry Program.

Historically, the biochemistry undergraduate program has focused on physical biochemistry. In 1998, a proposal to introduce flexibility at the third and fourth year levels was approved, providing two streams: Biochemistry and Molecular Biology. The *Biochemistry Stream* is very similar to the existing Major program in biochemistry; the new *Molecular Biology Stream* allows emphasis in molecular and cellular biology and genetics. This expansion of the biochemistry undergraduate program will be reflected in the 1999-2000 Calendar, and will take effect in September of 1999. The Biochemistry Program, as presently approved, appears in Appendix 2.

### **The IMBB as a research institute**

The IMBB was originally established as a graduate teaching and research institute. All full members currently hold NSERC and/or MRC Research Grants. Most of the senior members of the IMBB have served on one or more NSERC or MRC grant selection panels: Baillie (NSERC GSC 33; MRC); Beckenbach (NSERC GSC 18; NSERC MFA); Brandhorst (NSERC GSC 32—Chair in 95/96); Cornell (MRC); Honda (NSERC GSC 33); Price (MRC); Smith (NSERC Genetics and Cell Biology). In 1994/95 the IMBB had members on three different NSERC Grant Selection Committees simultaneously (Beckenbach, Brandhorst and Honda). The IMBB has a well established national and international research reputation.

### **Current status of the Biochemistry Program and IMBB**

At present, we have two separate entities: the *Biochemistry Program*, which administers the undergraduate teaching program in biochemistry and molecular biology, and the *IMBB* which has authority over the graduate program in molecular biology and biochemistry. The faculty overlap between these programs is almost complete: of the 14 full members of the IMBB, 13 have either primary or secondary appointments in the Biochemistry Program. In addition, two of the 13 IMBB associate members have secondary appointments in the Biochemistry Program. All faculty holding primary appointments in the Biochemistry Program are full members of the IMBB.

Both the IMBB and Biochemistry Program have Directors, selected in separate nomination and election or ratification processes. To date, the same faculty member has served as Director of both, but there is no requirement that the Biochemistry Program and IMBB have the same Director. The Director of the Biochemistry Program and the Director of the IMBB report to the Dean of Science in relation to personnel, budgetary and administrative matters.

The Biochemistry Program and the IMBB share a single suite of administrative offices, and staff. The Biochemistry Program has its own Departmental Tenure Committee (DTC), elected by and from its members, as well as an undergraduate (Biochemistry) Curriculum Committee (BCC). The Biochemistry DTC assesses contract

renewal, tenure and merit for all faculty holding primary appointments in the Program and provides comments to the home Departments for all members holding secondary appointments. The BCC has authority over the biochemistry undergraduate curriculum. The Biochemistry Program also has the authority to recruit and hire faculty. The IMBB has a Graduate Studies Committee, elected by and from its members.

In summary, the Biochemistry Program and IMBB are, at present, completely complementary. They now have combined operating budgets, but could, in principle, have separate Directors. The committees required to administer the two programs are derived from overlapping, but not quite identical pools, and are elected by almost, but not quite, identical electorate. We regard the present situation as temporary, and extremely cumbersome. Together these two programs fulfill every requirement of a full department: complete undergraduate and graduate degree programs; operating budgets and administrative offices and office staff separate from any existing department; a complete set of committees, including tenure, undergraduate and graduate curriculum committees; the authority to recruit and fill faculty positions; and director(s) who report directly to the Dean of Science.

### **Implementation**

Since the teaching programs, administrative structures and facilities are already in place, the only steps required for implementation of this proposal are the establishment of founding faculty appointments and election of the first Chair of the DMBB. We propose that all faculty currently holding primary or secondary appointments in the Biochemistry Program, and any other full members of the IMBB, be offered the option of, (1) sole appointment in the DMBB; (2) primary appointment in the DMBB with a secondary appointment in another Department; (3) primary appointment in another Department with a secondary appointment in the DMBB; or (4) no appointment in the DMBB, but with the option of Associate status in DMBB. It is assumed that faculty choosing sole or primary appointment in the DMBB will have their primary teaching and service roles in the new Department. Faculty choosing secondary appointment in the DMBB should expect to regularly participate in teaching and service in the DMBB programs.

Faculty presently holding appointments in the Biochemistry Program or membership in the IMBB are listed in Appendix 3. We do not anticipate that this procedure will lead to major shifts in appointments of faculty and expect the charter faculty complement of sole or primary appointments to be 12 - 14 faculty.

Faculty with primary appointments in other Departments whose research interests extend to areas of molecular biology and biochemistry may supervise graduate students in the DMBB Graduate Program if they hold a secondary appointment.

The Chair of the DMBB shall be appointed by the standard procedure for the election of Department Chairs.

## **Relationship of DMBB to existing Departments**

### *Department of Chemistry*

The separation of the Biochemistry Program from the Department of Chemistry is virtually complete. Aside from shared responsibilities arising from faculty holding joint appointments in Chemistry and Biochemistry, administrative, budgetary and academic decisions in the Biochemistry Program reside entirely within the Program. There are no shared teaching responsibilities for either undergraduate or graduate courses.

There are, however, significant research collaborations between members of the Department of Chemistry and the IMBB. These collaborations should not only be maintained, but strengthened when the status of the Biochemistry Program/IMBB is finally resolved.

### *Department of Biological Sciences*

The relationship between the Department of Biological Sciences and the Biochemistry Program is complex. In addition to the joint appointments held by many faculty, there are shared teaching responsibilities and disciplines of mutual interest. Teaching responsibilities are currently shared between BioSciences and the Biochemistry Program in BICH 221 (Cellular Biology and Biochemistry), BICH 222 (Molecular Biology and Biochemistry), BISC 202 (Genetics), BISC 302 (Genetic Analysis), BISC 331 (Molecular Biology), BISC 333 (Developmental Biology), BISC 402 (Molecular Genetics), BISC 431 (Molecular Biotechnology) and BISC 453 (Advanced Developmental Biology). These courses are commonly taught by faculty holding joint appointments between the Biochemistry Program and BioSciences. Responsibility for teaching these courses is handled efficiently through the cooperation of our undergraduate curriculum committees. Any changes in these arrangements will have to be by mutual consent of the two Departments.

We anticipate that the close relations that currently exist between the Department of Biological Sciences and the Biochemistry Program/IMBB can, and should, continue indefinitely after our new Department is established.

### *Departments of Physics and Mathematics/Statistics*

Biochemical and molecular systems offer a level of complexity that is at once approachable and challenging to physicists and mathematicians. This fact has not been lost on either Department. One member of the Physics Department holds a primary appointment in the Biochemistry Program (Jenifer Thewalt) and both Departments have recently recruited faculty whose interests broadly overlap those of the DMBB. We believe it very likely that extensive interdisciplinary ties will develop between those departments and the DMBB.

## **Financial considerations**

This proposal can be implemented with little or no net cost to the University. The Biochemistry Program/IMBB already have sufficient administrative office space and facilities for our immediate needs. We employ an Administrative Assistant and 1.5 secretarial staff. We provide a full range of office and clerical services to our members, including word processing, preparation of course materials, course evaluations, postal and courier services, and telephones. The Biochemistry Program has a full time laboratory instructor and one teaching technician. The IMBB has a part time technical position to oversee and maintain shared equipment, including an imaging facility, with confocal and other microscope facilities. Although we will compete with other Departments in the Faculty of Science to maintain and expand our facilities and services, no additional resources are necessary to form our new Department.

The Biochemistry Program/IMBB already have operating and teaching assistant budgets. No new courses are proposed, nor are new faculty required, to implement this proposal. The cost of any increase in enrollment in the Biochemistry program should be managed through reallocation within the Faculty of Science, consistent with the teaching and research activity of the members of the DMBB. We expect that any reallocation will take into account the number of students enrolled in our courses, the cost of mounting the courses, and the size of our B.Sc. and graduate programs, together with the overall resources available to the Department at that time. Any reallocation would follow the normal criteria for reallocation of resources among Departments in the Faculty.

Since no new courses are planned, the resources of the library will continue to be adequate. The Biochemistry Program/IMBB currently have representation on the Faculty of Science Library Committee and the authority to advise the library on the acquisition and cancellation of holdings. Those responsibilities will be transferred to the DMBB.

## **Employment opportunities for DMBB graduands**

Students choose to enroll in biochemistry and molecular biology primarily for the employment opportunities it affords. Many of these students participate in Coop and there are many opportunities for employment in this field. A substantial proportion of our graduates go on to graduate or medical school. Students graduating with graduate degrees in the MBB program have nearly all found appropriate employment. The biotechnology, biomedical and pharmaceutical industries have been expanding at an astonishing rate, with no end in sight. The addition of a Department dedicated to the fields of molecular biology and biochemistry will place this Faculty, and our students, at the forefront of these developments.



## **Future prospects for the DMBB**

The IMBB and Biochemistry Program have made extraordinary progress since the 1984 external review. Not only have we carried out an extensive recruitment and hiring process, but our programs were the primary impetus for the construction of the South Sciences Building, and we are its principal occupants. The undergraduate degree program has been expanded to include molecular biology; the graduate program has been implemented and we now have administrative authority over those programs. When we assumed control of the undergraduate biochemistry teaching program in 1997, it accounted for about 90 FTE. That number has now increased to over 130. The Biochemistry Program graduated 33 students in 97/98, and has consistently been the third largest program in the Faculty of Science in numbers of Majors, Honors and graduands.

## Appendix 1

### **Graduate Program** **1998-1999 Calendar Entry**

#### **MOLECULAR BIOLOGY AND BIOCHEMISTRY PROGRAM**

8166 South Science Building, (604) 291-5630 Tel, (604) 291-5583 Fax, <http://darwin.mbb.sfu.ca>

##### *Director*

A.T. Beckenbach BSc (Florida Presbyterian), MSc (Flor), PhD (Calif)

##### *Faculty and Areas of Research*

D.L. Baillie - developmental genetics, genomics  
A.T. Beckenbach - population genetics, molecular evolution  
T.J. Borgford - protein structure and function  
B.P. Brandhorst - developmental biology and gene regulation  
R.B. Cornell - membrane bound enzymes  
R.J. Cushley - high field nuclear magnetic resonance  
N. Harden - developmental genetics, signal transduction  
B.M. Honda - molecular biology and gene regulation  
J.V. Price - developmental genetics; cellular signalling  
W.R. Richards - protein biochemistry; photosynthesis  
J.K. Scott - immunochemistry, immunology  
D. Sen - nucleic acid biochemistry, chromosome structure  
M.J. Smith - molecular evolution and development  
J.L. Thewalt - membrane biophysics; nuclear magnetic resonance

##### *Associate Members*

A.J. Bennet, Chemistry  
F. Breden, Biological Sciences  
A.H. Burr, Biological Sciences  
B.J. Crespi, Biological Sciences  
L.D. Druehl, Biological Sciences  
N.H. Haunerland, Biological Sciences  
E. Käfer, Biological Sciences  
A. Kermode, Biological Sciences  
M.M. Moore, Biological Sciences  
B.M. Pinto, Chemistry  
A. Plant, Biological Sciences  
G.F. Tibbits, Kinesiology  
A. Tracey, Chemistry

This graduate program is administered through the biochemistry program by a steering committee consisting of members of the Institute of Molecular Biology and Biochemistry (IMBB). Members of the

IMBB have appointments in the Biochemistry Program, and/or Departments of Biological Sciences, Chemistry and Physics. In addition, the IMBB has associate members who may also serve as senior supervisors for students in the MBB graduate program.

Information about the Molecular Biology and Biochemistry program, and the research activities of its faculty, can be obtained from the MBB graduate secretary, Institute of Molecular Biology and Biochemistry, Simon Fraser University, 8888 University Drive, Burnaby, BC, V5A 1S6. Telephone (604) 291-5630

### **Admission**

For admission requirements, refer to the *Graduate General Regulations*. Applicants should normally have completed some advanced course work in biology or biochemistry.

### **Degree Requirements**

All students will be assigned a graduate supervisory committee which has the authority to specify an appropriate program of course work meeting or exceeding the minimum requirements stated below. All students are expected to attend the IMBB research seminar series and to participate regularly in a journal club.

### **MSc Program**

#### **Course Work**

The minimum requirements consist of 12 credit hours of graduate course credits including MBB 801 and 802.

#### **Research**

A major part of the MSc program will be devoted to original research. A thesis describing the work must be submitted and defended in accordance with *Graduate General Regulations*.

### **PhD Program**

#### **Course Work**

For students entering the program with a BSc or equivalent, a minimum of 20 credit hours of credit is required, at least 15 of which must be at the graduate level, including MBB 801, 802 and 806. PhD students must normally enroll in MBB 806 at the earliest opportunity following four semesters of registration in the program. With the approval of their supervisory committee, students in the MSc program may apply to the MBB graduate program committee for transfer to the PhD program.

For students entering the program with an MSc degree, eight credit hours of credit is required, at least six of which must be at the graduate level, including MBB 802 and 806. The latter course must be taken at the first opportunity following two semesters of registration in the program.

#### **Research**

The major portion of the PhD program will be devoted to original research. An original thesis, which contributes to new knowledge, must be presented and defended at the end of the degree program, in accordance with the *Graduate General Regulations*. In addition, all MBB PhD candidates must present a public seminar on their research.

### **Courses Offered by Other Departments**

The following relevant courses are offered by other departments: CHEM 752, 754 and 811.

### **Graduate Course Work at Other Universities**

Upon the recommendation of the supervisory committee, and with the approval of the graduate program committee, up to six credits of course work taken elsewhere not resulting in a degree may be applied toward degree requirements, but not exceeding more than half of the credits required in addition to MBB 801, 802 and 806.

### **Graduate Courses**

#### **MBB 801-2 Student Seminar in Molecular Biology and Biochemistry I**

Discussion of recent literature through student seminars and written reports. Cannot be taken for credit in addition to CHEM 801

#### **MBB 802-2 Student Seminar in Molecular Biology and Biochemistry II**

Discussion of recent literature through student seminars and written reports. Prerequisite: MBB 801 or an MSc degree. Cannot be taken for credit in addition to CHEM 802.

#### **MBB 806-3 Ph.D. Graduate Research Seminar**

Oral presentation and defense of a written Ph.D. research proposal. Students will be examined on their progress and grasp of knowledge relevant to the proposed research and their capacity to complete the proposed thesis research. Open only to students in the molecular biology and biochemistry graduate program. Cannot be taken for credit in addition to CHEM 806.

#### **MBB 811-1, MBB 812-2, MBB 813-3 Techniques in Molecular Biology and Biochemistry**

Consideration of methods applied to research in molecular, cellular, and developmental biology; genetics; and biochemistry. Can be repeated with permission of the instructor.

#### **MBB 821-3 Nucleic Acids**

An examination of recent literature for revelations about the structure and function of DNA and RNA.

#### **MBB 822-3 Biological Membranes**

A review of recent literature on the structure, dynamics, function, and biosynthesis of membrane lipids and proteins.

#### **MBB 823-3 Protein Structure and Function**

Transition state theory; specificity in enzyme catalyzed reactions; use of recombinant DNA techniques to describe and modify enzyme catalysis, catalytic activities through monoclonal antibody techniques.

**MBB 824-3 Physical Biochemistry**

The physical properties of biomacromolecules; modern physical methods applied to biomolecules; properties and analysis of membrane systems.

**MBB 825-3 Bioenergetics**

Consideration of important processes for biological energy transduction. Structure/function relationships of membrane components and other interacting macromolecular systems. Cannot be taken for credit in addition to CHEM 825.

**MBB 826-3 Molecular Immunology**

An overview of cellular and humoral immunology with emphasis on the molecular basis of immune recognition and response.

**MBB 827-3 Mechanisms in Enzyme Catalysis**

The study of enzyme mechanisms by a variety of techniques including spectroscopic, kinetic, radioisotopic exchange, site-directed mutagenesis.

**MBB 828-3 Spectroscopic Methods in Biochemistry**

Application of spectroscopic methods including multidimensional NMR, fluorescence, circular dichroism, and FTIR for determination of biomacromolecular structure. Includes elements of protein conformation. Cannot be taken for credit in addition to CHEM 828.

**MBB 829-3 Special Topics in Biochemistry**

Consideration of recent literature concerning selected contemporary research topics. Can be taken more than once with permission of the instructor.

**MBB 831-3 Molecular Evolution of Eukaryote Genomes**

Examination of the dynamics of change in eukaryotic nuclear, mitochondrial, and chloroplast genome structure and organization.

**MBB 832-3 Molecular Phylogeny and Evolution**

Examination of the basic methods applicable to analyses of molecular phylogeny and evolution.

**MBB 833-3 Developmental Genetics**

Selected topics on the developmental genetics of drosophila.

**MBB 834-3 Topics in Developmental Biology**

Selected topics including pattern formation, morphogenetic determinants, inductive interactions, and differential gene expression in embryos.

**MBB 835-3 Genomic Analysis**

Consideration of topics related to the structure and function of the genome with emphasis on genome mapping and sequencing projects, and computational methods for genomic sequence analysis.

**MBB 836-3 Gene Expression**

A consideration of the mechanisms and regulation of gene expression in eukaryotes and prokaryotes.

**MBB 837-3 Molecular Genetics of Signal Transduction**

Consideration of mechanisms of signal transduction using molecular genetic approaches with emphasis on the yeast *Saccharomyces cerevisiae*. Cannot be taken in addition to BISC 861.

**MBB 839-3 Special Topics in Molecular Biology**

Consideration of recent literature concerning selected contemporary research topics. Can be taken more than once with permission of the instructor.

**MBB 871-1 Directed Readings in Molecular Biology and Biochemistry.**

Programs of directed reading and critical discussions offered by staff members to individual students according to their needs. Study programs must be approved by the molecular biology and biochemistry program committee.

**MBB 872-2 Directed Readings in Molecular Biology and Biochemistry.**

Programs of directed reading and critical discussions offered by staff members to individual students according to their needs. Study programs must be approved by the molecular biology and biochemistry program committee.

**MBB 873-3 Directed Readings in Molecular Biology and Biochemistry.**

Programs of directed reading and critical discussions offered by staff members to individual students according to their needs. Study programs must be approved by the molecular biology and biochemistry program committee.

**MBB 898 M.Sc. Thesis**

**MBB 899 Ph.D. Thesis**

## Appendix 2

### **Present Undergraduate Program** **1999-2000 Calendar Entry**

#### **Biochemistry Program**

Students who have already declared majors or honors in the Biochemistry Program may follow the program requirements in effect when they were accepted into the program, or the program requirements as set out below, whichever is to their advantage.

#### **Major Program**

(120 semester hours)

All students must complete the lower and upper division cores plus additional courses as specified in either the Molecular Biology or Biochemistry Stream as indicated below.

#### **Lower Division Core**

(52-53 semester hours)

BICH 221-3 Cell Biology and Biochemistry

BICH 222-3 Molecular Biology and Biochemistry

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 II

CHEM 126-2 General Chemistry Laboratory II

CHEM 215-4 Introduction to Analytical Chemistry

CHEM 281-4 Organic Chemistry and Laboratory I

CHEM 282-2 Organic Chemistry II

CHEM 286-2 Organic Chemistry Laboratory II

one of

CMPT 101-4 Introduction to Computer Programming

CMPT 102-3 Introduction to Scientific Computer Programming

CMPT 110-3 Event-Driven Programming in Visual Basic

one of

MATH 151-3 Calculus I

MATH 154-3 Calculus I for the Biological Sciences\*

one of

MATH 152-3 Calculus II

MATH 155-3 Calculus II for the Biological Sciences\*

one of

PHYS 120-3 Modern Physics and Mechanics

PHYS 101-3 General Physics I

one of

PHYS 121-3 Optics, Electricity and Magnetism

PHYS 102-3 General Physics II

**Recommended Course**  
**MATH 251-3 Calculus III**

\*Note: Course alternatives marked with an asterisk are possible only for students who have transferred to Biochemistry from another program. Students who have declared (or intend to declare) a major or honors program in Biochemistry should not register for these alternative courses.

**Upper Division Core**

(22-23 semester hours)

BICH 311-2 Analytical Biochemistry Laboratory

BICH 312-2 Metabolism Laboratory

BICH 321-3 Intermediary Metabolism

BICH 322-3 Molecular Physiology

BISC 331-3 Molecular Biology

CHEM 360-3 Chemical Kinetics and Thermodynamics

one of

BISC 431-4 Molecular Biotechnology

BISC 457-3 Plant Molecular Biology and Biotechnology

one of

MATH 310-3 Introduction to Ordinary Differential Equations

STAT 302-3 Analysis of Experimental and Observational Data

**Upper Division Streams**

In addition to the lower and upper division cores, students must complete all of the requirements in one of the two streams listed below:

**Molecular Biology Stream**

(15-18 semester hours)

two courses from

BICH 403-3 Physical Biochemistry

BICH 412-4 Enzymology

BICH 421-3 Nucleic Acids

BICH 422-3 Biomembranes

BICH 423-3 Protein Structure and Function

BICH 426-3 Immunology

plus one course from

BISC 302-3 Genetic Analysis

BISC 303-3 Microbiology

BISC 405-3 Cell Physiology

plus one course from

BISC 333-3 Developmental Biology

BISC 402-3 Molecular Genetics

BICH 435-3 Genomic Analysis

plus one course from

BISC 305-3 Animal Physiology

BISC 400-3 Evolution



BISC 453-3 Advanced Developmental Biology  
 BISC 439-3 Industrial Microbiology  
 BICH 491-5 Undergraduate Research

or with permission of the undergraduate advisor  
 another 400-level BICH course  
 BISC 471-3 Special Topics in Biology  
 BISC 472-3 Special Topics in Biology  
 BISC 473-3 Special Topics in Biology

#### **Biochemistry Stream**

(15-17 semester hours)

BICH 403-3 Physical Biochemistry  
 BICH 412-4 Enzymology  
 BICH 413-2 Physical Biochemistry Laboratory

plus two courses from

BICH 420-3 Selected Topics in Contemporary Biochemistry  
 BICH 421-3 Nucleic Acids  
 BICH 422-3 Biomembranes  
 BICH 423-3 Protein Structure and Function  
 BICH 426-3 Immunology  
 BICH 491-5 Undergraduate Research  
 CHEM 333-3 Inorganic Chemistry of Biological Processes

In addition to the above requirements, students majoring in Biochemistry must complete 26-31 semester hours of electives, with enough upper division credits to bring the total of the latter to 44 semester hours. Students must have a total of 12 semester hours taken in subjects outside the Faculty of Science (excluding EDUC 401 to 407), including a minimum of 6 hours from the Faculty of Arts. Further BSc general degree regulations are given in the Faculty of Science section.

Although many variations are possible, a student entering with BC High School Chemistry 12, Mathematics 12 and Physics 12 (or equivalents) might take the following typical program.

#### Levels 1 and 2

BISC 101-4 & 102-4  
 CHEM 121-4, 122-2 & 281-4  
 MATH 151-3 & 152-3  
 PHYS 120-3 & 121-3

Total 30 semester hours

#### Levels 3 and 4

BICH 221-3 & 222-3  
 BISC 202-3  
 CHEM 126-2, 282-2, 286-2 & 215-4  
 CMPT 101-4, 102-3, or 110-3  
 6 hours of electives  
 hours

Total 28-29 semester

#### Levels 5 and 6

BICH 311-2, 312-2, 321-3 & 322-3  
 BISC 331-3 & 431-4 or 457-3

CHEM 360-3

MATH 310-3 or STAT 302-3

9 hours of electives  
hours

Total 31-32 semester

Levels 7 and 8

Requirements of one of the streams (15-18 hours)

11-16 hours of electives

Total 29-31 semester hours

### **Honors Program**

(132 semester hours)

In addition to the requirements shown above for the major program, students taking honors in Biochemistry must complete one of the following Individual Study Semester Options:

either BICH 493-15 Individual Study Semester (Option B)

or BICH 491-5 Undergraduate Research plus BICH 492-10 Individual Study Semester (Option A)\*

\*This may be accomplished by breaking the individual study semester project into two consecutive semesters (cf. criteria for approval of individual study semesters on p. \_\_\_ of the Calendar). If BICH 491-5 has already been taken to satisfy the major program requirements, then the student must complete one other course selected from the appropriate list in either the Molecular Biology or Biochemistry Stream in addition to BICH 492-10 in order to satisfy the honors requirements. Students must have a total of 12 semester hours taken in subjects outside the Faculty of Science (including 6 hours in the Faculty of Arts but excluding EDUC 401 to 407); and sufficient upper division courses to bring the total number of upper division credits to at least 60 semester hours. Further BSc Honors requirements are given in the Faculty of Science section.

### **Minor Program**

(56-60 semester hours minimum)

### **Lower Division Requirements**

(42 semester hours minimum)

BICH 221-3 Cell Biology and Biochemistry

BICH 222-3 Molecular Biology and Biochemistry

BISC 101-4 General Biology

BISC 102-4 General Biology

CHEM 121-4 General Chemistry and Laboratory I

CHEM 122-2 General Chemistry II

CHEM 126-2 General Chemistry Laboratory II

CHEM 281-4 Organic Chemistry and Laboratory I

CHEM 282-2 Organic Chemistry II

CHEM 286-2 Organic Chemistry Laboratory II

one of

MATH 151-3 Calculus I

MATH 154-3 Calculus I for the Biological Sciences

one of

MATH 152-3 Calculus II

MATH 155-3 Calculus II for the Biological Sciences

one of

**PHYS 120-3 Modern Physics and Mechanics**  
**PHYS 101-3 General Physics I**

one of

**PHYS 121-3 Optics, Electricity and Magnetism**  
**PHYS 102-3 General Physics II**

**Upper Division Courses**

(14-18 semester hours)

Students must complete five upper division courses (plus any lower division prerequisites) with a minimum of 14 semester hours selected from:

Any upper division BICH course (excluding BICH 492-10 and 493-15)

**BISC 331-3 Molecular Biology**

one of

**BISC 431-4 Molecular Biotechnology**

**BISC 457-3 Plant Molecular Biology and Biotechnology**

Appendix 3

**Potential Pool of Faculty for the DMBB**

Faculty Member	Rank	<u>Current Appointments</u>		IMBB Status
		Primary	Secondary	
Baillie, D.L.	Professor	Biochemistry	Biosciences	Full
Beckenbach, A.T	Assoc. Professor	Biosciences	Biochemistry	Full
Borgford, T.J.	Assoc. Professor	Biochemistry	Chemistry	Full
Brandhorst, B.P.	Professor	Biochemistry	Biosciences	Full
Cornell, R.B.	Professor	Biochemistry	Chemistry	Full
Cushley, R.J.	Professor	Biochemistry	Chemistry	Full
Davidson, W.	Professor	Biochemistry	--	
Harden, N.	Asst. Professor	Biochemistry	Biosciences	Full
Honda, B.M.	Assoc. Professor	Biosciences	Biochemistry	Full
Price, J.V.	Assoc. Professor	Biochemistry	Biosciences	Full
Richards, W.R.	Professor	Biochemistry	Chemistry	Full
Scott, J.K.	Assoc. Professor	Biochemistry	Biosciences	Full
Sen, D.	Assoc. Professor	Biochemistry	Chemistry	Full
Smith, M.J.	Professor	Biosciences	--	Full
Thewalt, J.L.	Asst. Professor	Biochemistry	Physics	Full
Bennet, A.J.	Assoc. Professor	Chemistry	--	Associate
Breden, F.	Assoc. Professor	Biosciences	--	Associate
Burr, A.H.	Assoc. Professor	Biosciences	--	Associate
Crespi, B.J.	Assoc. Professor	Biosciences	--	Associate
Druehl, L.D.	Professor	Biosciences	--	Associate
Hauerland, N.H.	Assoc. Professor	Biosciences	--	Associate
Kafer, E.	Adjunct Prof.	Biochemistry	--	Associate
Kermode, A.R.	Assoc. Professor	Biosciences	--	Associate
Moore, M.M.	Assoc. Professor	Biosciences	--	Associate
Pinto, B.M.	Professor	Chemistry	--	Associate
Plant, A.L.	Asst. Professor	Biosciences	--	Associate
Tibbits, G.F.	Professor	Kinesiology	Biochemistry*	Associate
Tracey, A.S.	Adjunct Prof.	Chemistry		Associate

\* Approved for Secondary Appointment in the Biochemistry Program.