

History and Administration of the Interdepartmental Graduate Program in Biochemistry

Departments of Biochemistry and Biomolecular Chemistry
University of Wisconsin-Madison

Overview and Rationale

Biochemistry is the study of biological molecules and the chemistry of their reactions in living systems. UW-Madison has historically been a leader in biochemical research, in the state, the nation, and indeed the world. The Biochemistry Department in the College of Agricultural and Life Sciences and the Biomolecular Chemistry Department in the School of Medicine and Public Health first established doctoral graduate programs in the 1880's and 1920's, respectively. At that time, the formation of independent graduate programs in the two schools/colleges satisfied the need for specialized training in plant and animal biochemistry in CALS and human biochemistry in the Medical School. However, in the ensuing decades, an understanding of the fundamental similarities of biochemical processes in cells of all life forms has blurred the boundaries between the research carried out by students in the two graduate programs.

Thus, the Departments of Biomolecular Chemistry and Biochemistry have crafted a plan for a new joint graduate program in Biochemistry, capitalizing on the strong history of graduate training in both departments. This new program represents the best features of each of our departmental programs and highlights an exciting and unprecedented step for cooperation and collaboration in the biochemical sciences at the University of Wisconsin-Madison.

The goals of the Integrated Graduate Program in Biochemistry are to:

- θ Create a preeminent doctoral program in biochemistry with broad opportunities for research training
- θ Offer a coordinated and high quality program of coursework in biochemistry
- θ Promote cross-fertilization across departmental and college/school boundaries amongst faculty and students
- θ Vigorously recruit outstanding graduate students nationally and internationally

I. Name of Program and Implementation

A. Name

The Program will be called the Integrated Program in Biochemistry (IPiB). Degrees (PhD or MS) awarded by the program will be in "Biochemistry".

B. Implementation

IPiB will replace existing graduate programs in the Department of Biochemistry (College of Agricultural and Life Sciences) and the Department of Biomolecular Chemistry (School of Medicine and Public Health).

II. Administrative Structure of the IPiB

A. Governance

Significant policy changes in the program will require majority vote of both Biochemistry and Biomolecular faculties separately. Proposals for policy changes will initially be considered by the Steering Committee and will require majority vote of the Steering Committee before further action is taken by the department faculties.

B. Program Director and Committee Chairs

The Program Director will be a faculty member of either the Biochemistry Department or Biomolecular Chemistry Department, and will be appointed by agreement of the chairs of the two departments. The Program Director will be chair of the Steering Committee. The chairs of the other IPiB committees will be appointed by agreement of the department chairs.

C. Financial Responsibility for Support of IPiB Trainees

Financial responsibility for support of IPiB trainees will reside with the thesis adviser once a thesis lab has been chosen.

D. Role of Trainers

A trainer in the IPiB program is defined as any faculty member in the program who does not have an appointment in either Biochemistry or Biomolecular Chemistry. Applications to be a trainer in the program will be evaluated by the faculty of both departments and will require a two thirds vote by the combined Biochemistry/Biomolecular Chemistry faculty for approval. Trainers appointed to the program ~~will~~ be reviewed for reappointment every four years.

^{will} Trainers are full members of the graduate program. In addition to being eligible to serve as thesis advisors, trainers are expected to assist in recruiting, help teach courses pertinent to IPiB graduate students, and serve on the IPiB committees listed below. The total number of trainers serving on the IPiB committees will reflect the number of trainers in the program as a whole - approximately 1 committee assignment for every 2 faculty trainers in the program, approximating the same representation as for faculty from the core departments of Biochemistry and Biomolecular Chemistry.

E. Faculty Committees

Departmental representatives will be selected by their respective departments. Trainer and student representatives will be selected by the Steering Committee with the advice of departmental faculty and chairs.

1. Steering Committee

a. Composition

4-5 Biochemistry faculty

2-3 Biomolecular Chemistry faculty

(these will include the chairs of the Admissions/Recruiting, New Student Orientation, Examination/Certification and Student/Faculty Liaison Committees; the Program Director will serve as the chair of the committee)

1 trainer, according to guidelines above

2 students (nonvoting members; one from each department).

b. Responsibilities

- i. oversight of program and policy recommendations for approval by two departmental faculties.
- ii. confirmation of thesis laboratory assignments
- iii. oversee development of programmatic initiatives that will foster interaction among faculty and students in the program. These could include faculty lunches to hear about each other's research, joint faculty meetings, etc.
- iv. all other issues related to the program that are not dealt with by other committees.

2. Admissions and Recruiting Committee

a. Composition

5-6 Biochemistry faculty

3-4 Biomolecular Chemistry faculty

Co-chairs from among the core faculty members listed above (1 or 2 from each department); 1 of the co-chairs from each department will be appointed to the Steering Committee.

1-2 trainers, according to guidelines above.

b. Responsibilities

- i. review files for admissions/make admissions decisions.
- ii. contact students to make offers and urge acceptance.
- iii. development and implementation of recruitment strategies
- iv. supervision of recruits' visits to campus during Feb-Apr.
- v. delegation of recruiting functions to faculty and students in the program.

3. New Student Orientation Committee

a. Composition

2-3 Biochemistry faculty

1-2 Biomolecular Chemistry faculty

(chair from among these core faculty)

1 trainer, according to guidelines above

2 students

b. Responsibilities

- i. supervise orientation activities and advise students prior to assignment to thesis laboratory
- ii. organize rotations and assignment of students to laboratories

4. Examination and Certification Committee

a. Composition

- 2 Biochemistry faculty
- 1 Biomolecular Chemistry faculty
(chair from among these core faculty)
- 1 trainer, according to guidelines above
- 2 students

b. Responsibilities

- i. ensure students are effectively tracked through the program for timely completion of the requirements.
- ii. in advising students on course selection, the advising and thesis committees should ensure that each student has adequate instruction in the core disciplines of biochemistry. In addition, to the extent consistent with optimal research training for each student, the advising and thesis committees should encourage cross-disciplinary training of students.

5. Student-Faculty Liaison Committee (SFLC)

a. Composition

- 2-3 Biochemistry faculty
- 1-2 Biomolecular Chemistry faculty
(chair from among these)
- 1 trainer, according to guidelines above
- 8-12 students
(co-chair and vice-co-chair from among these)
should include student representatives on other IPiB committees and be distributed among members of laboratories of Biochemistry, Biomolecular Chemistry and trainers.

b. Responsibilities

- i. serve as a liaison between faculty and students, communicating the wishes, concerns and problems of the graduate student population to the faculty.
- ii. promote educational and social interaction amongst students in the program (i.e. organization of student seminar series)
- iii. development of programmatic initiatives that will foster interaction among faculty and students in the program; these might include retreats, student-hosted seminars, and student-run journal clubs.

III. Staffing for the IPiB Program

The greatest challenge in making an interdepartmental program run smoothly will be to coordinate staff activities in ways that optimize faculty and staff time, maximize coordination between staff in two offices that will be physically distant until Biochemistry Phase II is completed, and ensure that all necessary work is accomplished in a timely manner.

One staff person will be responsible for ensuring that necessary work gets done. This person would attend all meetings of program committees and coordinate work done by staff in both departmental offices.

IV. Course Requirements for the IPiB Ph.D. degree

A. Background course and undergraduate degree requirements.

Candidates should have an undergraduate degree in biochemistry, chemistry, physics, or one of the biological or medical sciences. A minimum GPA of 3.0 (on a 4.0 scale) is required. In addition to meeting the general requirements of the UW-Madison Graduate School, coursework in biology, chemistry, biochemistry, genetics, physics, organic chemistry, and physical chemistry is required. Any course deficiencies should be made up during the first year of graduate study.

B. Program course requirements

1. Graduate School Regulations.

The general regulations of the Graduate School will be satisfied.

2. Minimum program requirements

a. Major course requirements.

Course No.	Course Title
Biochem/BMC 701	Professional Development in Biochemistry (1 credit)
BMC/Biochem 710	Biochemical Function of Macromolecules (2 credits)
Biochem 660	Biochemical Techniques (2 credits)
BMC/Biochem 711	Cellular Functions of Macromolecules (2 credits)

i. Professional Development course- required: new course, see attached syllabus draft

ii. 2-semester Macromolecules course-required. BMC 710 and 711 will be merged with Biochem 875 into a new two-semester course (2 credits per semester) that will be taught in the spring of the first year and fall of the second year (New course numbers have not been obtained at present). The class will meet 2 hours, once a week, have co-chairs (one from each department) and be taught by faculty from both departments.

iii. Biochemical Techniques-required. Biochem 660 "Biochemical Techniques" is focused on understanding biochemical methods. This course will be offered in the fall.

b. *Minor Course Requirements*. 10 credit hours distributed among courses from any department related to the individual training emphasis area fulfill the minor requirement. These can include courses from Biochemistry or Biomolecular Chemistry. In fulfilling the minor requirement, students should take a total of six credits from a list of physical and biological science courses (See attachment). A minimum of two credits each must belong to the physical and biological lists respectively. Whenever possible, students should take these courses in the first and second semester. This minor arrangement is "Option B" as defined by the Graduate School.

c. *Grade Requirement*. A student must maintain a B average in all courses taken to meet degree requirements. Grades of P and S are considered to be satisfactory.

d. *Seminar Requirement*. After completing one semester of graduate work, students will register for an advanced Biochemistry, Biomolecular Chemistry, or other approved seminar course each fall and spring semester of each academic year. Letter grades are assigned in semesters when students

present a seminar, and grades of S or U are assigned in semesters when students attend, but do not give a seminar.

Required Seminar Presentations. During their graduate careers, students are required to present a minimum of 3 seminars in advanced seminar courses (a list of currently available seminars is given below) and receive a grade of B or better in each seminar.

- One literature seminar will be in the general area of their research interests
- One literature seminar will be in an area outside their specific research interests.
- One seminar will be presented on their research progress in an interdepartmental graduate seminar (described below)*. This will generally occur in the fourth or fifth year of graduate study. Students will be required to enroll for two semesters in this seminar series, even though they will be expected to present a seminar only once.

Seminar Waiver. A student may petition to substitute enrollment in an equivalent UW advanced seminar course in lieu of those currently approved by the Departments of Biochemistry or Biomolecular Chemistry if participation in that course seems especially appropriate to his/her course of study.

*New research seminar course.

Each student is required to present a departmental research seminar describing his/her research progress. It is expected that this seminar will last 40-50 minutes during which ~half of the time will be devoted to background and the remaining time will be devoted to research experimental protocols, results and future directions. Students will be required to enroll in this course for two semesters in their fourth or fifth years (once when they are presenting); attendance will be obligatory. The departmental chairs will arrange a rotating committee of five faculty who will attend all of the presentations for that semester. However, all students and faculty will be encouraged to regularly attend this seminar series.

V. Initiation of Graduate Study

A. Graduate Study Prior to Choosing a Thesis Adviser

During registration week of the first semester of residence, each student will attend orientation activities and meet with the New Student Orientation Committee (NSOC). The committee will review background course requirements, consider training emphasis area (if known) and devise a course of study for the first year. The advising committee will also monitor rotations and be available for advice until a thesis adviser is identified. If a student is funded by a training program grant, the student may also be assigned a specific adviser who is representing that program until a thesis adviser is identified.

Before the end of the first semester of graduate study, students will complete at least 3 research rotations with 3 different faculty or trainers in the program. Students will submit their top three choices for each rotation and the NSOC will make assignments to a rotation laboratory, making every effort to place students in the laboratory that is their first or second choice. Thesis advisors will generally be selected at the end of the first semester of residence. A uniform and equitable selection procedure for doing this will be devised and monitored by NSOC. Deviation from the minimal number of rotations or dates for selection of a thesis adviser will require approval of the advising committee.

B. Graduate Study After Choosing a Thesis Adviser

1. Thesis Committee selection. The thesis committee will include the major professor and four other faculty members. In consultation with their major professors, students will select three faculty members they would like to have on their committee. The graduate school requires that at least one of

these committee members to be from outside the Department. One member will be assigned by the Examination and Certification Committee. It will be the student's responsibility to seek and obtain the verbal approval of the faculty members to serve on this committee, other than the one assigned by the ECC. The ECC will designate a committee member who shall serve as Chair for the preliminary examination. All other committee meetings will be chaired by the major professor.

2. First Committee Meeting. The thesis committee will be convened prior to the start of the second year to evaluate the student's performance in course work and discuss the student's research program.

3. Yearly Review Procedures. An annual meeting that includes a brief written report of progress is required after passing the preliminary exam.

VI. Completion of Graduate Studies

A. Teaching Requirement

As part of their training, students are required to perform two semesters of teaching. Waivers of one semester may be granted for special circumstances by the Steering Committee in consultation with the appropriate departmental administrator.

B. Preliminary Exam

1. Preliminary Examination

a. *Exam Timing.* Students must complete the preliminary exam process by the end of the Spring semester of their second year.

b. *Written Proposal.* Each student will prepare a written research proposal and present it to his/her graduate committee for evaluation as is currently done in both departmental programs. The student may consult with his/her major professor in planning the proposed research, and have limited consultation with the major professor during proposal writing. However, the major professor should not proofread the proposal. The proposal will be prepared in a format similar to that for proposals to the NIH. The proposal will be completed and distributed to the committee two weeks before the date of the oral prelim examination. The committee will have the option to postpone the upcoming oral exam if the written research proposal has significant deficiencies.

c. *Oral Preliminary Examination.* At the beginning of the oral examination, the thesis committee Chair (as designated by the ECC) will reiterate procedures and distribute exam rating/evaluation sheets. The student will give a 20-minute, uninterrupted oral presentation of the research proposal to the committee and then respond to committee questions. The major professor will not participate in the question period, except to provide brief points of clarification. The oral examination will not exceed two hours.

After the exam is completed, the student will be excused, and the committee will discuss the student's exam and each committee member *except* the major professor will complete a rating form that scores eight performance criteria such as quality of the written proposal and experimental design. Each committee member except the major professor will provide a final, summarizing overall evaluation of the written and oral parts of the exam. The summary score, or overall rating scale, will be excellent (4 pts); satisfactory (3 pts); marginal (2 pts); and inadequate (1 pt). The summary scores from each committee member will be tallied by the Chair and a total of 11 pts will be required to pass the oral examination. A student who fails the Preliminary Examination may be offered a second opportunity to pass the exam or may be dismissed from the program. If a student fails the exam and is given a

second opportunity, he/she will have until the end of June of the following year to repeat the exam. If a student fails the Preliminary Exam twice, he/she cannot continue in the PhD program.

2. Candidacy.

After the student has passed the Preliminary Exam and all other degree requirements have been met, the Graduate School warrant certifying candidacy for the Ph.D. will be signed by the Thesis Committee and returned to the Graduate School.

3. Procedure for Appeal.

Appeals of a decision by the Preliminary Examination Committee must be made to the Steering Committee within two weeks or the decision will be final. The Steering Committee will make the final decision on an appeal.

A student who has not satisfied the Preliminary Examination requirement within 36 months of entering the Ph.D. program will be dropped from the program, except by appeal in writing to the Steering Committee

C. Thesis and Final Defense

Students are expected to carry out significant, original research during the entire period of their PhD training and to write a thesis based on this research. The thesis must be formatted according to the guidelines of the Graduate School, present evidence of a substantial experimental effort by the student, and reflect a strong intellectual contribution that meets all standards set by the student's thesis committee. If the work is the result of collaborative enterprises, the writing must clearly define those portions representing the student's own contribution. The thesis must also include a substantive review of literature relevant to the project. The thesis must be completed and distributed to the members of a student's graduate committee not less than one week before the date of the final oral examination.

Publication of a PhD thesis is required, since it constitutes a permanent record of research and literary achievement. After successful completion of the final exam, an unbound, fully corrected, and complete copy must be deposited with the UW Memorial Library. The UW uses Bell and Howell Information Learning in Ann Arbor, MI, to publish dissertations on microfilm and to publish abstracts in *Dissertation Abstracts*. Students must pay the cost of microfilming the thesis and publishing the abstract. They are also responsible for knowing and meeting all thesis filing deadlines for degree completion. The Grad School web site provides clear instructions for these procedures.

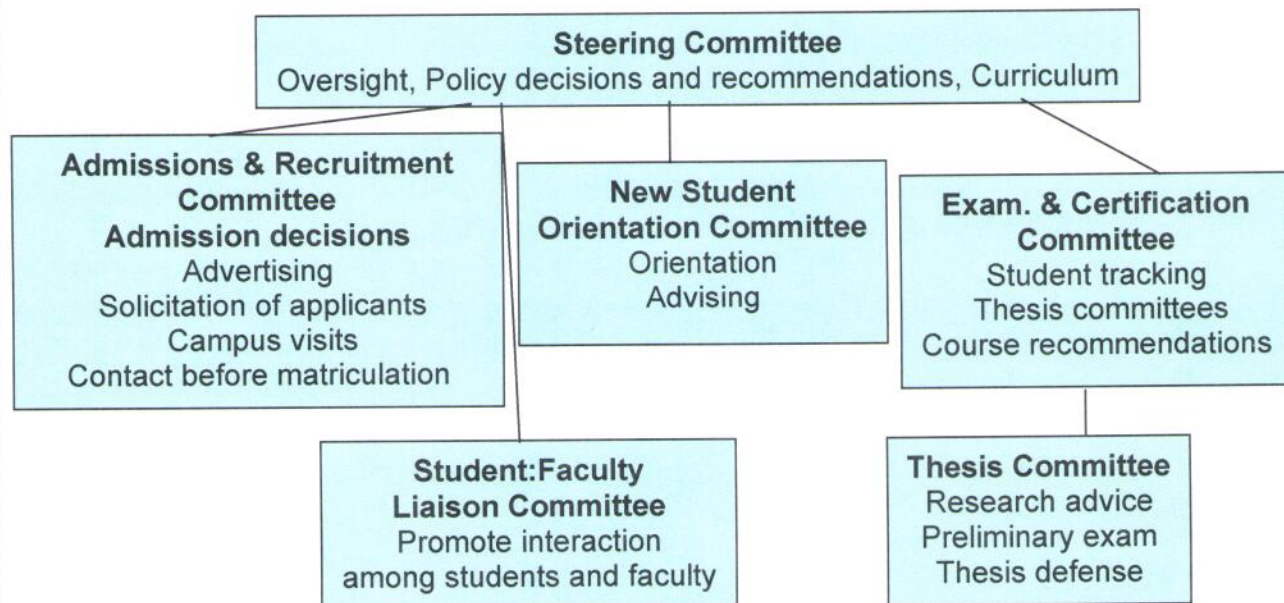
The final oral examination deals primarily with the thesis content. Students will begin their oral exam with a public seminar summarizing their research accomplishments and highlighting the significance to the field. Afterwards, the student meets with his/her graduate committee and responds to questions. The major professor can take part in the questioning, but should not actively steer the discussion or defend the research. The oral examination usually lasts up to 2 hrs, or until the committee is satisfied with their individual evaluations. The student is then excused, and after deliberation, the members decide whether or not to endorse the degree completion by signing the PhD Warrant. At the discretion of the student's thesis committee, a student may repeat a failed final exam (once), be dropped from the Program, or leave the Program with an MS degree.

Overview of Educational Aspects of the IPiB

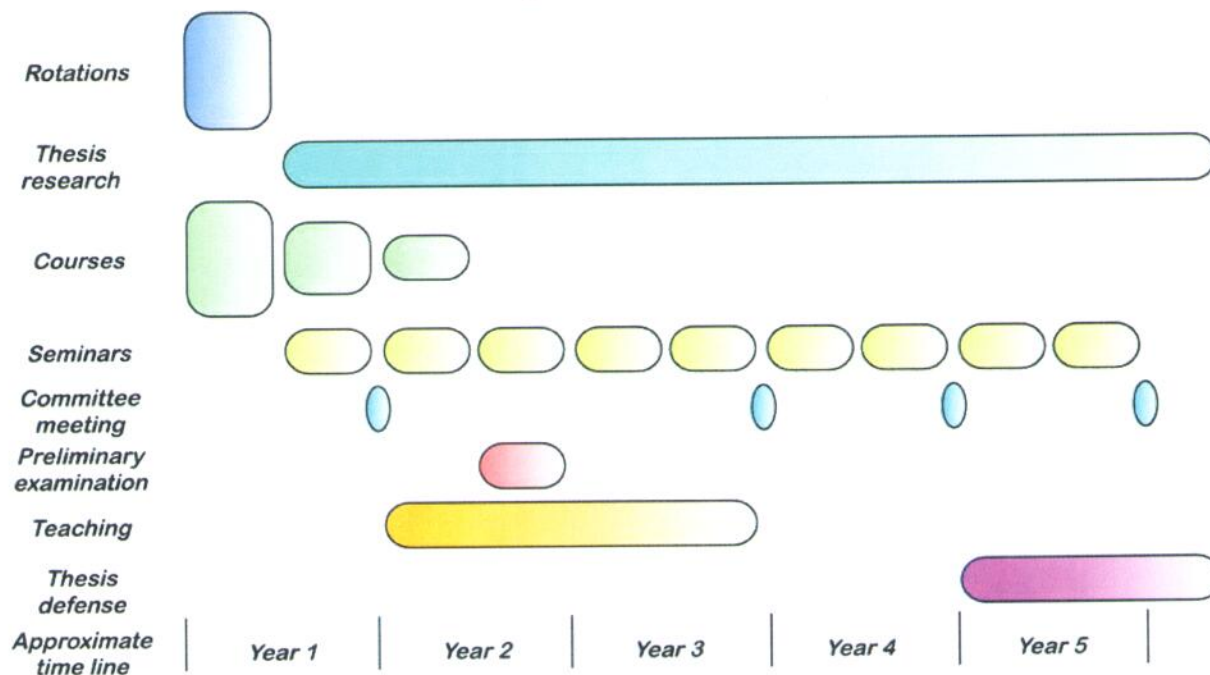
Coursework: The new coursework plan consists of four semesters of formal instruction. The first semester includes a new Professional Development course that will aid in the "student to scientist" transition by defining the broad questions and challenges that we face in our field. Students will select additional course work in the biological and physical sciences to ensure well-rounded training. In the first, second and third semesters, our students will take three courses that will develop their understanding of biochemical methodologies as well as their critical reading skills and comprehension of seminal advances in biochemical science. Together, these course requirements present a bedrock of graduate education that will have the flexibility to evolve in parallel with the field of biochemistry. We view this as a great attraction to prospective graduate students who will be applying to our program.

Preliminary Exam and Thesis: The plan for thesis committees and preliminary examinations has been constructed to ensure that students receive high quality guidance from faculty in the joint program throughout their graduate years. A student's committee will meet prior to his/her third semester to solicit input for any additional coursework that might be required before the qualifying examination. This first meeting will also serve as an introduction to the student's planned thesis research. The second committee meeting will be the student's qualifying exam, which will take place prior to the end of the student's fourth semester. As has been the policy in both Biochemistry and Biomolecular Chemistry, students will prepare an NIH-style proposal based around their area of research and defend the proposal in an oral examination. Subsequent to passing this exam, students will continue to meet annually with his/her committee. These policies allow consistent input into our graduate student's development and set clear expectations for high quality research.

Overview of Administrative Structure of IPiB



IPiB - Integrated Program in Biochemistry at the University of Wisconsin, Madison



- **Rotations:** IPiB students carry out three rotations in any of the ~50 program labs in the first semester.
- **Thesis research:** Upon completion of rotations, thesis labs are chosen and thesis research begins.
- **Courses:** Coursework includes formal classes in biochemical techniques, professional scientific development, and the physical and biological sciences. Dozens of courses allow curricula to be tailored to each student's interests and needs. A typical schedule is:

First semester <ul style="list-style-type: none"> •Biochemical Techniques •Professional Development •Biological or Physical Science Elective 	Second semester <ul style="list-style-type: none"> •Biochemical Functions of Macromolecules •Biological or Physical Science Elective 	Third semester <ul style="list-style-type: none"> •Coursework recommended by committee
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- **Seminars:** IPiB students enroll in a seminar each semester once thesis research begins. Presentations in three seminars are given during a student's graduate training.
- **Committee meetings:** Committee meetings occur annually.
- **Preliminary examination:** The preliminary examination occurs prior to the end of the second year. The student writes an NIH-style grant proposal based on his/her research and defends it before a panel of faculty.
- **Teaching:** Each IPiB student will serve as a student teacher in two courses during the second and third year.
- **Thesis defense:** IPiB students write a formal thesis and defend it at the end of their graduate study. The timeline for defense will depend upon many factors but the defense typically occurs after 4-5.5 years.

Procedures for the Consideration of Trainers

Criteria

Inclusion of a trainer in IPiB is expected to elevate the national stature of the program, and have definitive benefits to the program as a whole, especially with regard to the competitive recruitment of outstanding, highly qualified students. Trainers must commit to being actively involved in IPiB program functions, including student recruiting, orientation, advising and instruction.

Procedure

1. Submission to the Steering Committee of a one page letter of intent and a NIH style biosketch. The letter should state the reasons the person wishes to join the IPiB program and how her/his inclusion will strengthen the program.

2. The Steering Committee will review the preliminary applications, and will decide whether to request a full application. The IPiB faculty will be informed of these decisions. In the event that ten IPiB faculty should wish to include an applicant who was declined, that individual will be requested to provide a full application. A full application will consist of:

- A) A full curriculum vitae
- B) Description of research interests and research activities (meetings attended, journals reviewed, etc.)
- C) Description of current funding
- D) Summary of prior training experience
- E) Description of current training environment
- F) IPiB program activities in which the trainer is willing to participate

3. The Steering Committee will review the full applications, and will decide whether to invite the applicant to present a seminar. The IPiB faculty will be informed of these decisions. In the event that ten IPiB faculty should wish to include an applicant who was declined, that individual will be invited to present a seminar to the IPiB faculty. The candidate's application materials will be made available for review to the IPiB faculty.

4. After the seminar, the IPiB faculty will vote on whether to accept the applicant as a trainer. Acceptance will require a 2/3 vote.

5. Applications to be considered as a trainer should be addressed to:

Chair of the IPiB Steering Committee
c/o Flavia Arana
Department of Biochemistry
433 Babcock Drive
111F Biochem Addition

Final Version (approved by Biochem 04-20-07; by BMC 05-11-07)

Annual Timetable for Trainer Applications

It is proposed to review applications from those who wish to become a trainer in the IPiB once a year according to following timetable.

October 1. Preliminary Applications Due.

December 1. Full Applications Due

Spring Seminars for selected applicants.

Final vote on selected applicants to be taken at an IPiB faculty meeting to be held during the last two weeks of April.