Interdisciplinary Program in Chemical Biology at the University of Houston

LIST OF THE MATERIALS INCLUDED IN THIS DOCUMENT

INTERDISCIPLINARY PROGRAM IN CHEMICAL BIOLOGY
UNIVERSITY OF HOUSTON
EXECUTIVE SUMMARY

The nature of research in the natural and physical science disciplines has become highly interdisciplinary and collaborative. Consequently, there is an urgent need to provide interdisciplinary education and training so that students will be prepared for modern careers in academics, research, and/or industry. The *Chemical Biology Interdisciplinary Program (CBIP)* was established to fulfill this mission by providing a pathway to M.S. and Ph.D. degrees in existing academic Departments with training that crosses traditional disciplines of Chemistry, Biochemistry, Biology, Physics, and Computer Science. Faculty members of CBIP will design curricula that reflect the advances of modern science and technology and benefit student education and training by allowing student participation in classes and research in more than one department.

CBIP provides mentoring, a curriculum that is interdisciplinary in nature and flexible in design, and a state-of-the-art training environment. The students admitted to the program are encouraged to pursue studies in the interdisciplinary fields represented in Chemical Biology via personally customized curricula derived from their chosen major field of study. The CBIP students and faculty will benefit from seminar series, meetings and conferences, social and academic functions and interactions, and an annual retreat.

The goal of the program is to facilitate the production of high-quality and highly-competitive M.S. and Ph.D. scientists with knowledge, training, and experience in interdisciplinary research.

Sample Areas of Focused Study Enabled by this Program:

Chemical Biology, Biomaterials, Bio-organic Chemistry, Computational Chemistry/Biochemistry, Genomics, Membrane Biophysics, Molecular Biophysics, Nano-Biotechnology, Proteomics, Structural Biology, Structure-Aided Drug Design, Synthetic Chemistry, Biological and Chemical Sensing

Current Faculty Participants in this Program are listed in the following websites:

Chemical Biology Interdisciplinary Program: http://chembiol.nsm.uh.edu
Department of Biology and Biochemistry: http://www.bchs.uh.edu
Department of Chemistry: http://www.chem.uh.edu

To obtain additional information, please contact the Chemical Biology administrators at cbip-admin@uh.edu.

INTERDISCIPLINARY PROGRAM IN CHEMICAL BIOLOGY

A. Description of the Program

The nature of research in the natural and physical science disciplines has become highly interdisciplinary and collaborative. Consequently, there is an urgent need to provide interdisciplinary education and training so that students will be prepared for modern careers in academics, research, and/or industry. The *Chemical Biology Interdisciplinary Program (CBIP)* was established to fulfill this mission by providing a pathway to M.S. and Ph.D. degrees in existing academic Departments with training that crosses traditional disciplines of Chemistry, Biochemistry, Biology, Physics, and Computer Science. Faculty members of CBIP will design curricula that reflect the advances of modern science and technology and benefit student education and training by allowing student participation in classes and research in more than one department.

CBIP provides mentoring, a curriculum that is interdisciplinary in nature and flexible in design, and a state-of-the-art training environment. The students admitted to the program are encouraged to pursue studies in the interdisciplinary fields represented in Chemical Biology via personally customized curricula derived from their chosen major field of study. The CBIP students and faculty will benefit from seminar series, meetings and conferences, social and academic functions and interactions, and an annual retreat.

The goal of the program is to facilitate the production of high-quality and highly-competitive M.S. and Ph.D. scientists with knowledge, training, and experience in interdisciplinary research.

A1. Sample Research Areas of Focused Study Enabled by this Program

Biomaterials, Bio-organic Chemistry, Chemical Biology, Computational Chemistry/Biochemistry, Genomics, Membrane Biophysics, Molecular Biophysics, Nano-Biotechnology, Proteomics, Structural Biology, Structure-Aided Drug Design, Synthetic Chemistry, Biological and Chemical Sensing.

A2. Student Body

Students applying to the program must have undergraduate or graduate degrees in Biochemistry, Bioengineering, Biology, Chemistry, Computer Science, Physics or a related area and be interested in graduate training in a combination of these areas. The Admissions/Advisory Committee will ensure that the student body will be diverse in both educational and research interests.

A3. Benefits of the Program

Students will benefit from a highly flexible, custom-designed interdisciplinary curriculum that offers the following opportunities:

◆ Choice of Major Advisor and Thesis Committee from professors in Chemistry, Biochemistry, and Biology who are engaged in interdisciplinary research (see the list of faculty members of CBIP).

◆ Custom-designed curriculum (in consultation with the Admissions/Advisory Committee and Major

Advisor) centered on a small core of courses in the major area of study, complemented by a selection of courses from the full array of those offered by the participating Departments.

- Courses offered at area institutions (e.g., Rice University, Baylor College of Medicine, and University of Texas Health Science Center) may be taken for credit at UH with prior approval from the Admissions/Advisory Committee.
- A seminar series dedicated to interdisciplinary topics.
- Close relationship of the CBIP Program with local technology and biotechnology industries.
- An annual retreat and colloquium where Program participants will present their research.
- Students admitted to the Program can apply for a CBIP Fellowship and receive support for one semester, usually the second Spring semester, allowing them to focus on research.

B. Governance of the Program

A Chemical Biology Governing Committee (CBIP Committee) composed of faculty members participating in the program will have the responsibility of coordinating all aspects of the Chemical Biology Program. The CBIP Committee shall consist of two Co-Directors, and one Program faculty member from each participating Department. In the case of a tied vote, the Chairs of the participating Departments will resolve the dispute. The Co-Directors shall be appointed independently by the Departmental Chairs of Chemistry and Biology and Biochemistry. One Co-Director shall have their primary faculty appointment in the Chemistry Department and the other will have their primary appointment in the Biology and Biochemistry Department. The other members will be nominated by the Co-Directors and, upon mutual approval by both Departmental Chairs, will serve for a period of two years each, also staggered so as to maintain continuity. The CBIP Committee is responsible for creating all CBIP Subcommittees and appointing members thereto by majority consent of the CBIP Committee.

Upon admission to the CBIP Program, the student will consult with the Admissions/Advisory Committee, which will assist the student in the initial selection of courses and in choosing a Major Advisor, if desired. Once the student selects a Major Advisor, the Major Advisor, in conjunction with the Thesis Committee of the student, will assist the student in selecting all remaining courses.

C. Faculty Participants in Program

Current Faculty Participants in this Program are listed in the following websites:

Chemical Biology Interdisciplinary Program: http://chembiol.nsm.uh.edu
Department of Biology and Biochemistry: http://www.bchs.uh.edu
Department of Chemistry: http://www.chem.uh.edu

D1. Admissions Requirements and Procedures

- Students may be able to enter the Chemical Biology through two mechanisms depending on the Home Department and the time when they express interest in the Program. The Departments may consider new graduate applicants for direct admission into the Program and/or may consider them near the end of the Fall semester.

D2. CBIP Fellowship Application and Evaluation

- CBIP students may apply for CBIP Fellowships. Pending availability of funding, CBIP Fellows may be supported for one semester, typically the Spring semester in their second year.
- CBIP Fellowship applicants are required to select a Major Advisor from the list of Chemical Biology Faculty and a Co-Advisor or Thesis Committee member from the other department, and obtain their signatures on the Committee Appointment form to confirm their acceptance. The form should be returned to your Departmental Graduate Advisor before your application.
- Submit the following materials: 1) the resume showing educational and research experience, 2) a project description (no more than 500 words, approved by the Major Advisor), 3) one letter of recommendation in a sealed envelope from the Major Advisor. **The deadline for application is November 30.**
- The applications will be evaluated by the Fellowship Selection Committee based on the performance in coursework and research. The award decision will be announced by December 30.

D3. Residency Requirements

Starting with the first semester, a minimum of 12 months of continuous full-time residence at the University of Houston is required for all M.S. and Ph.D. candidates until all degree requirements are met. Any off-campus research that will become part of a dissertation or thesis must have prior written approval of both the CBIP Committee and the collaborating company or institution.

D4. Degree Requirements

The minimum semester hour requirements, per University policy, are:

- M.S. Plan I (Research) - 30 semester hours
    - 21 hours of core and elective coursework plus at least 9 hours of research credits
- Ph.D. - 24 semester hours beyond the M.S. Plan I requirement (54 hours)
    - 21 hours of core and elective coursework plus at least 33 hours of research credits

The State of Texas stipulates that graduate students having more than 99 graduate hours are no longer eligible for in-state tuition nor are they eligible for a tuition fellowship. Therefore, all students are strongly encouraged to complete their degree requirements as soon as possible.

Students are also encouraged to read the University Graduate Catalog, wherein they can find additional details regarding the rules and regulations of graduate study at UH. If there is a discrepancy between this document and the Universities Graduate Catalog, the Graduate Catalog will prevail.

http://www.uh.edu/grad_catalog/garr/index.html

D5. Course Requirements

All students must fulfill the coursework requirements for the intended degree within the first four long semesters. Under unusual circumstances, the student may petition for one additional semester in which to complete the coursework. For the purpose of fulfilling the coursework requirements, only the courses in the Appendix are considered to be acceptable. These requirements are:

(a). Ph.D. coursework requirement (21 hours)

i. Home Department: Biology and Biochemistry

1. Graduate Core Courses: Ten hours of core course hours must be taken. Four of the hours must be selected from the list of Biology and Biochemistry core courses in the Appendix. The remaining six hours of core courses must be selected from the list of Chemistry courses in the Appendix.
2. Eleven hours of graduate electives must be taken. The courses can be selected from the available list of graduate elective courses in the Departments of Biology and Biochemistry, Chemistry, or from another Department or an area institution upon approval by the Major Advisor.

ii. Home Department: Chemistry

1. Fifteen hours of courses must be taken, except for students who did exceptionally well in the diagnostic exams who are allowed to exempt from one course. Twelve hours of courses must be selected from the list in the Appendix according to the home division of the student. Specifically, the Organic Division requires at least two courses in Group A, one in Group B and one in Group C; the Inorganic Division and Physical Chemistry Division require at least one course in Group A, one in Group B and one in Group C. The remaining three hours of course may be selected based on the result of the diagnostic exam and recommendation of the Graduate Advisor.
2. Two courses (total of 4 credit hours) must be selected from the list of Biology and Biochemistry courses in the Appendix. The remaining two hours of courses may be selected from the list of Chemistry, and Biology and Biochemistry courses in the Appendix, or from another Department at UH or from an area institution upon approval by the Major Advisor.

(b). M.S. core requirement (21 hours)

The core coursework requirements for the M.S. degrees are the same as those for the Ph.D. listed above.

(c). Seminar and presentation requirements

CBIP students are required to attend monthly CBIP seminars throughout their entire graduate studies, and present their work in an annual retreat. The students must also satisfy all seminar requirements in their Home Department.

D6. Additional Degree Requirements (advancement to degree candidacy)

CBIP program participants are required to satisfy the additional degree requirements from their respective Home Departments. For example, if the student is admitted through the Department of Biology and Biochemistry, and is a member of the Biochemistry Division, they must pass a written comprehensive exam as well as an oral exam, which is comprised of the oral defense of a written research proposal in an area in which the student is not directly working. It is the responsibility of the student to learn about and work with the Major Advisor to satisfy these requirements.

D7. Admissions/Advisory Committee/CBIP Fellowship Selection Committee

The Admissions/Advisory Committee will consist of the Co-Directors, one additional CBIP faculty representative from each participating department, as appointed by the respective Chairs of the participating Departments and the Graduate Admission Chairs from each Department. Admission to the CBIP Program will be coordinated with the respective Departmental Graduate Admissions Committees through the appointed Departmental representatives to maintain consistency in the admissions process with the participating Departments. Applicants must meet the approval of both the CBIP Admissions/Advisory Committee and the Admissions Committee of their chosen Home Department. The CBIP Fellowship Selection Committee will consist of the Co-Directors and one faculty member from each Department nominated by the Co-Director and approved by the Department Chair.

D8. Research Advisors

A Major Advisor from the list of CBIP faculty must be chosen before the respective deadlines for each Department. A Co-Advisor or Thesis Committee Member must also appointed. The Major Advisor, in conjunction with the co-Advisor and/or the student's Thesis Committee, will direct the plan of study, including coursework and research for the student.

D9. Thesis Committee

The student's Thesis Committee will be formed after selection of a Major Advisor according to the appropriate Program and Departmental guidelines but no later than the end of the second semester in residence. For M.S. and Ph.D. candidates, the Committee will consist of five faculty. This Committee will assume the role of the initial Admissions/Advisory Committee in helping the student and Major Advisor select and implement a plan of study and research. At least three members of the thesis Committee, including the Advisor and the optional co-Advisor from the other Department, must be faculty participants in the CBIP Program. The Thesis Committee will administer the oral/qualifying and final exams and meet once a year to evaluate the student's performance and progress after the student achieves degree candidacy. At each meeting, the student is expected to provide a brief written document summarizing their performance in coursework and research. The student will also be expected to make a brief oral presentation of research progress, allowing ample time for questions from the Committee. The first meeting of the Committee must occur before the end of the second semester in residence. In the event that a member of the Thesis Committee leaves the

University or is not available for an examination or thesis/dissertation defense, the Committee and student can recommend a suitable substitute to the Home Department's Graduate Chair. The appointment to Committees of faculty members from other institutions is encouraged.

D10. Program Continuation Requirement

The GPA in coursework (exclusive of dissertation or thesis research credits) must not fall below 3.0. A student achieving a GPA below 3.0 will be placed on probation. The student will remain on probation while their GPA is below 3.0. A student remaining on probation for three consecutive semesters will be ineligible to continue in the CBIP Program.

For Chemistry graduate students participating in the Program, GPA below 3.0 at the end of the second semester will result in being terminated from the Graduate Studies Program, therefore terminated from this Program.

Any student who makes four or more grades of C+ or less in coursework (all courses taken are counted, including coursework at the graduate and undergraduate level) is ineligible to continue in the CBIP Program.

D11. Program Completion Certificate

All students successfully completing the Chemical Biology Interdisciplinary Program will receive a certificate indicating their completion of the Program.

APPENDIX

A. List of Participating Departments

Biology and Biochemistry
Chemistry

B. List of Participating Faculty

Current Faculty Participants in this Program are listed in the following websites:

Chemical Biology Interdisciplinary Program: http://chembiol.nsm.uh.edu
Department of Biology and Biochemistry: http://www.bchs.uh.edu
Department of Chemistry: http://www.chem.uh.edu

C. List of Chemistry Courses

Group A) Organic chemistry courses:

CHEM 6311: Mechanisms of Reactions
CHEM 6351: Organic Structural Determination
CHEM 6352: Organic Reactions and Synthesis
CHEM 6353: Physical Organic Chemistry
CHEM 6376: Organometallic Chemistry

Group B) Physical chemistry courses:

CHEM 6313: Thermodynamics and Kinetics
CHEM 6314: Spectroscopy
CHEM 6321: Quantum Chemistry
CHEM 6311: Mechanisms of Reactions

Group C) Inorganic chemistry courses:

CHEM 6374: Physical Inorganic Chemistry I
CHEM 6376: Organometallic Chemistry
CHEM 6332: Instrumental Characterization of Materials

D. List of Biochemistry and Biology Courses*

BCHS 6226: Enzyme Catalysis and Kinetics
BCHS 6227: Membranes and Signal Transduction
BCHS 6228: Advanced Nucleic Acids
BCHS 6229: Protein Structure and Function
BIOL 6371: Molecular Genetics
BIOL 6307: Advanced Cell Biology

*Note that the second number in the course id reflects the number of credit hours. For example, 6226 is worth 2 credit hours and 6371 is worth 3.