

# University of North Carolina at Chapel Hill

## Certificate Program Application Form

*Please use this application form as a guide for your Certificate Program proposal.*

**Name of Proposed Certificate Program:** Chemical Biology Training Program

**Sponsoring Academic Unit:** Medicinal Chemistry & Natural Products (Pharmacy) and Chemistry (Arts & Sciences)

**Administering Unit, if different:** \_\_\_\_\_

**Primary Contact Name:** David Lawrence

**Address and CB #:** C540 Kenan, Department of Chemistry, CB#3290

**Phone Number:** 2-8907      **Email:** lawrencd@email.unc.edu

**First Term the Certificate Would be Offered:** 2010-2011

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### **1. Describe the Certificate Program and provide a statement of educational objectives.**

The field of Chemical Biology seeks to create and apply novel chemical tools to address problems in biology. However, an umbrella program is lacking that unites chemists with biologists, which would serve to introduce chemists to outstanding biological problems and biologists to existing chemical solutions. As part of a newly developed Chemical Biology Training Program, we seek to offer a Certificate in the field of Chemical Biology, which will provide a cross-disciplinary course- and research-based education for entering graduate students.

### **2. Include a statement about the need for such a Certificate Program, and specifically why there is a need to offer this Certificate at UNC-Chapel Hill. Is the Certificate offered at other universities or community colleges?**

A modern biomedical research institution requires research groups that are capable of constructing, manipulating, and characterizing molecules. However, the creation and application of biologically useful reagents cannot be achieved in the absence of well-defined biological and biomedical goals. Unfortunately, chemists and biologists are often geographically and linguistically isolated from one another. The University of North Carolina at Chapel Hill is one of less than a handful of institutions that has world class strength in four key areas: Biomedicine, Pharmacy, Cancer, and Chemistry. Scientists in these disciplines are all physically located within a 10 minute walk of each other. A Chemical Biology Certificate Program will provide course and research training for graduate students, during the initial phase of their graduate career, who wish to work at the nexus of chemistry and the biological sciences. Unlike a graduate student in chemistry, who may or may not be exposed to the intricacies of biology, or a graduate student in biology, who may or may not be exposed to the diverse tools of chemistry, students in the Certificate Program will have a formal education in both disciplines.

***Completed and approved applications should be submitted to:***  
Stephanie Schmitt, Associate Dean for Academics, [sschmitt@email.unc.edu](mailto:sschmitt@email.unc.edu)

*Updated: Spring 2010*

To the best of our knowledge, the Certificate Program in Chemical Biology at UNC would be unique. We are not aware of any organization that offers a certificate in this field. We do note that a number of institutions have Chemical Biology Centers, such as Harvard and MIT (the Broad), Duke, and Vanderbilt to name a few. However, these are exclusively research-based enterprises that typically offer a fee-for-service (i.e. synthesis of a molecule or high throughput screening of a large collection of potential drugs). Indeed, UNC has a world-class center that offers such a capability (the Center for Integrative Chemical Biology and Drug Design).

**3. Describe the demographics of the target student population for the Certificate Program. Double click each box that applies and describe the intended audience.**

- Undergraduate Students
- Graduate Students
- Degree-seeking, Matriculated Students
- Non-Degree-Seeking Students

**4. Why is the Certificate Program necessary beyond offering the program as a minor, supporting area, or specialization/concentration/track?**

In addition to the comments noted above (see 2), the general area of Chemical Biology is quickly becoming a major scientific discipline. For example, in the last decade several new journals have been established in this area: Nature Chemical Biology, ACS Chemical Biology, Chemistry & Biology, Current Opinion in Chemical Biology, BMC Chemical Biology, ChemBioChem, and the Journal of Chemical Biology. The absence of a cohesive training program in this area places UNC at a major disadvantage in terms of recruiting exceptional graduate students who are interested in pursuing research at the interface of chemistry and biology. A number of Chemistry Departments have changed their name to the Department of Chemistry and Chemical Biology (e.g. Harvard, Cornell, Rutgers, etc) as a recruiting tool. However, an umbrella training program involving the array of chemical and biological educational units at UNC should be significantly more effective as a recruiting tool. The Certificate Program will establish UNC with the credentials to offer cohesive training to entering graduate students in this emerging area of scientific endeavor.

**5. Provide specific courses and other requirements for the Certificate Program. Separate listings of courses may be included with the proposal.**

A Chemical Biology Certificate Program will provide training for graduate students who wish to work at the nexus of chemistry and the biological sciences. In order to achieve this primary goal, the Certificate Program is comprised of the following four trans-disciplinary educational requirements:

(1) A Course Curriculum that is uniquely designed to educate biologically-inclined students in chemistry and chemically-inclined students in biology. In short, the curriculum has been constructed to ensure that students achieve a “linguistic fluency” in both fields. In addition, the curriculum contains both core courses and electives so that that Certificate Program can be easily integrated with the course requirements of the home departments of the students, which we anticipate will include Chemistry, Biology, Cell & Developmental Biology in the School of Arts & Sciences, the Divisions of Medicinal Chemistry & Natural Products and Molecular

Pharmaceutics in the School of Pharmacy, and the Departments of Biochemistry and Pharmacology in the School of Medicine:

#### REQUIRED CORE COURSES:

- A. MEDC 807 (Fall): Molecular Foundations of Chemical Biology: Organic and Medicinal Chemistry.
- B. CBIO 643 (Fall): Cell Structure, Function, and Growth Control (SuperCell).
- C. CHEM 730 (Spring): Chemical Biology.

#### ELECTIVES:

Given the anticipated diversity (i.e. from various UNC graduate programs) of students participating in the Certificate Program, we expect that the “Electives” will constitute required courses in the Students’ home departments (Biochemistry, Biology, Cell & Developmental Biology, Chemistry, Medicinal Chemistry & Natural Products and Molecular Pharmaceutics, and Pharmacology).

(2) A Seminar Series that includes leading Chemical Biologists from around the world. This seminar series arose from the merging of two pre-existing seminar programs (Pharmacy’s Division of Medicinal Chemistry & Natural Products and Chemistry’s Division of Biochemistry & Chemical Biology).

(3) An Annual Scientific Retreat in which students will be exposed to the wide variety of research programs in the field of Chemical Biology at UNC. Students in the Certificate Program will be required to present a poster (or a short talk) at the annual retreat in their second year.

(4) Research. All graduate students in Chemistry, Pharmacy, and Medicine are required to successfully complete an oral defense in order to advance to Ph.D. candidacy. Students in the Certificate Program, as part of their defense, will be required to demonstrate a working knowledge of the disciplines of chemistry and biology. Advancement to candidacy will serve as successful completion of the Certificate Program.

**6. Provide a statement on the relationship of the Certificate Program to degree programs within the unit(s). To what extent will requirements for the Certificate overlap with requirements for bachelor’s, master’s or doctoral degrees? Confirm how course credit transfer policies will be applied to students.**

Two of the requirements overlap to some extent with that of existing degree programs: (1) Curriculum. As noted in 5, the Certificate Programs requires a specific set of unique core courses in the Chemical and Biological Sciences. The course electives that constitute the remainder of the curriculum allow the student to focus in their area of interest and fulfill the requirements of their home departments. Since these requirements differ significantly amongst the various graduate programs, the elective requirement does not include a specific number of elective courses. (2) Advancement to Candidacy Oral Defense. All graduate programs in the chemical and biological sciences require an oral defense for advancement to candidacy. However, students in the Certificate Program will be required to demonstrate a working proficiency of chemistry and biology during the defense as it relates to their research focus.

**7. Will the Certificate Program be offered jointly with another university? If yes, describe the relationship with the joint unit.**

Not Applicable.

**8. Will the Certificate Program be offered on campus, as a distance education program, or a combination? Describe any distance education components in detail.**

On campus only.

**9. Describe the admissions criteria and process in detail. Differentiate between processes for degree-seeking students and non-degree-seeking students, where applicable. Include information about residency for tuition purposes as needed.**

Upon application to a Ph.D. program at UNC (Chemistry, Pharmacy, or BBSP), interested students will have the opportunity to request admission to the Chemical Biology Certificate Program. Their application for admission to the Certificate Program will include a statement of interest (explanation of relevant background and reason for pursuing the Certificate). Admission to the Certificate Program will be based on (1) offer of admission to a Ph.D. program at UNC, (2) Statement of Interest, and (3) educational and scientific background. The offer of admission will be determined by an executive committee (currently: David Lawrence, Alex Tropsha, Marcey Waters, and Kevin Weeks). Since the students have home departments, issues regarding tuition are not relevant.

**10. Provide a three-year, semester-by-semester projection of enrollments and course offerings.**

As noted above (5), the Certificate Program requires the successful completion of three core courses:

MEDC 807: A new course in advanced organic chemistry that will be offered during the fall semester. Anticipated enrollment is approximately 10 – 15 students. As the Certificate Program gains in national stature, we anticipate that that course enrollment could increase by 50% or more during the 3 year period.

CBIO 643: An existing course in cell biology (SuperCell) that is offered during the fall semester. This course is required for many of the graduate students in the biological programs at UNC (e.g. BBSP and Medicinal Chemistry & Natural Products). Given the large size of the course, we do not anticipate that the Certificate Program will have a significant impact on the course size during the 3 year period.

CHEM 730: An existing course in chemical biology offered during the spring semester. Enrollment is approximately 10 – 15 students. As the Certificate Program gains in national stature, we anticipate that that course enrollment could increase by 50% or more during the 3 year period.

**11. Provide a three-year projection of the Certificate Program's financial plan. Include the impact on campus resources, such as classrooms and instructional faculty/personnel.**

The proposed certificate will not require creation of additional courses. The courses that will comprise the certificate are offered at UNC. Teaching of the courses will be within usual academic activity of the associated faculty. Advising will constitute an addition to faculty academic activities and is recognized as such by the administrations of their respective academic units (see letters of support for details). The program will be jointly administered by Chemistry and Pharmacy and will require a part time program coordinator. The initial three-year funding for this position has already been allocated by the Associate Dean of the School of Pharmacy. Additional funding has been furnished by the Department of Chemistry for release time to create MEDC 807, the Certificate Program, the Chemical Biology Training Program, as well as the creation of a Chemical Biology website.

**12. List all faculty members who will be responsible for planning and participating in the Certificate Program. Programs are encouraged to provide advising for students through the identification of one faculty member as the director of the Certificate.**

Director of the Certificate: David Lawrence

Executive Committee: David Lawrence, Alex Tropsha, Marcey Waters, and Kevin Weeks

**13. Describe the evaluation plans for the Certificate Program.**

The program coordinator will be responsible for monitoring the success of the Certificate Program. Specifically, the coordinator will keep track of student/faculty advisor matching and the level of faculty involvement. Students who have completed the program (successful completion of the advancement to candidacy exam) will be asked to fill out an exit survey and to complete an in-person interview with the program coordinator about their experience in the program. At the end of every semester starting with the spring of inaugural year, the program coordinator will hold meetings with associated faculty to discuss the ability of the program to meet student needs and necessity of any changes to the program. These discussions will be based on results of exit survey and interviews as well as other indicators of program success, such as student retention and distribution of student interest in the program (i.e. is the program mostly attracting students who were already planning to apply to UNC or applicants who decided to apply to UNC because of the Certificate Program).

**14. Appropriate letters of support should be included with the proposal. All units sponsoring and participating in a Certificate Program should approve the proposal and provide support letters, including letters from units supporting the Certificate through resources (e.g., faculty time, course slots). Approval letters from the home school should accompany the proposal submitted to the Graduate School for final approval.**



UNC  
ESHELMAN  
SCHOOL OF PHARMACY

THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL

OFFICE OF RESEARCH AND GRADUATE EDUCATION  
BEARD HALL F 919.966.3525  
CAMPUS BOX 7360 www.pharmacy.unc.edu  
CHAPEL HILL, NC 27599-7360

July 27, 2010

Dr. David Lawrence  
Fred N. Eshelman Distinguished Professor  
Departments of Chemistry, Medicinal Chemistry & Natural Products, and  
Pharmacology

Dear David,

I am delighted with the progress that you and your colleagues have made in advancing training in Chemical Biology at UNC-CH. As we have discussed, this is a priority area for the UNC Eshelman School of Pharmacy. The proposed Certificate program will be an important step forward in itself and will also contribute to the eventual development of an NIH-funded training program in this area.

As you indicated in your proposal, the courses to support the Chemical Biology Certificate are already in place. Thus the needs of the training faculty will primarily involve administrative support. My office is fully prepared to address this issue by committing staff resources to the development of graduate training in Chemical Biology including support for the Certificate program.

I look forward to your future progress.

Best regards,

*Rudy Juliano*

R.L. Juliano Ph.D.  
Boshamer Distinguished Professor of Pharmacology  
Assoc. Dean for Research & Graduate Education  
UNC Eshelman School of Pharmacy



UNC  
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THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL

DEPARTMENT OF CHEMISTRY

CAMPUS BOX 3290 T 919.843.8910  
CHAPEL HILL, NC 27599-3290 O 919.962.4358  
www.chem.unc.edu F 919.962.2388  
redinbo@unc.edu

MATTHEW R. REDINBO  
*Professor and Chair*

August 7, 2010

Dr. David Lawrence  
Fred N. Eshelman Distinguished Professor  
Departments of Chemistry, Medicinal Chemistry & Natural Products, and Pharmacology  
University of North Carolina at Chapel Hill

Dear David,

I am writing to indicate my enthusiasm for the new Chemical Biology Training Program and to state that the Department of Chemistry will support this new program with faculty time, cross-listed courses, and the other resources required to make this effort a success.

As you know, the Department of Chemistry contains a vibrant Biochemistry Division that offers a range of courses both at the undergraduate and graduate level. This Division works closely with those in the Organic, Analytical, Materials, Inorganic, and Physical Divisions to develop courses that are team-taught by our faculty. As part of the on-going process of updating our curriculum, we have already developed several Chemical Biology courses that are taught by faculty from Chemistry, as well as the Schools of Pharmacy and Medicine. These courses will be a central part of the new Chemical Biology Training Program; they are already in place and our faculty will be committed going forward to offering them, and indeed improving them annually.

We will also highlight this new Certificate on our website and to our incoming and prospective graduate students. I am sure this will be a significant recruiting tool, one that will bring in young scientists interested in working on the most cutting-edge research at the interfaces between Biology, Chemistry, Pharmacy, and Medicine.

With best regards,

Matthew R. Redinbo, Ph.D.  
Professor and Chair  
Department of Chemistry  
College of Arts and Sciences  
Professor  
Department of Biochemistry and Biophysics  
Department of Microbiology and Immunology  
School of Medicine  
University of North Carolina at Chapel Hill



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DEPARTMENT OF MICROBIOLOGY  
AND IMMUNOLOGY

804 MARY ELLEN JONES T 919.966.1191  
CAMPUS BOX 7290 F 919.962.8103  
CHAPEL HILL, NC 27599-7290  
<http://www.med.unc.edu/microimm>

July 28, 2010

To Whom It May Concern,

I am writing to indicate my support for the new Chemical Biology Training Program and its interactions with the Biological and Biomedical Science Program (BBSP). The BBSP is the new, unified mechanism by which prospective students apply for graduate study in the biological or biomedical sciences at UNC-Chapel Hill. The BBSP encourages and receives applications from students with diverse prior experiences, including those interested in the interface between chemistry and biology. The Chemical Biology Training Program is consistent with the requirements of BBSP admissions and the first year graduate student program. Chemical Biology is one of the areas of research interest of BBSP faculty and a training program in this area will enhance the ability of BBSP to attract the very best graduate students to UNC.

BBSP will coordinate with the Chemical Biology Training Program with respect to the application process. This coordination will include highlighting the presence of the Certificate Program on the BBSP website, providing the Chemical Biology Training Program with a list of students who are interested in being accepted into the Certificate Program, and facilitating productive interactions between BBSP students and the training program.

Sincerely,

Virginia L. Miller, Ph.D.  
Assistant Dean of Graduate Education  
Office of Graduate Education  
Director of Biological and Biomedical Sciences Program  
University of North Carolina  
Chapel Hill, NC 27599



August 14, 2010

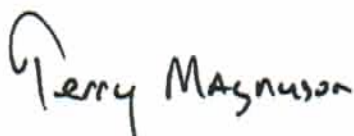
Dr. David Lawrence  
Fred N. Eshelman Distinguished Professor  
Departments of Chemistry, Medicinal Chemistry & Natural Products, and Pharmacology  
University of North Carolina at Chapel Hill

Dear David:

I am writing to you to confirm the support of the School of Medicine in your endeavor to create a Graduate Training Program in Chemical Biology. As you are aware, our faculty, Departments, and the School of Medicine have worked vigorously to establish scientific and educational bridges to our counterparts in the physical sciences. This has led to the creation of enterprises such as the Biological and Biomedical Science Program, the Carolina Center of Cancer Nanotechnology, the Program in Molecular Biology and Biotechnology, the Carolina Center for Genome Sciences, and the recently established UNC-Olympus Research Imaging Center (to name just a few). In short, we have long recognized the increasingly vital role that the physical sciences play in biomedical research. The proposed Graduate Training Program in Chemical Biology will serve as an ideal cross-training platform for young scientists by exposing chemists to the unanswered questions of biology and medicine and biologists to the chemical tools that can address these questions.

The School of Medicine will be happy to work with you and your colleagues to ensure that the Training Program is successfully implemented and available to our students and faculty.

Sincerely,



Terry Magnuson, Ph.D.  
Sarah Graham Kenan Professor  
Vice Dean for Research  
UNC School of Medicine



**THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL**

**OFFICE OF THE DEAN    T 919.962.1165  
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CAMPUS BOX 3100    college.unc.edu  
CHAPEL HILL, NC 27599-3100**

August 18, 2010

Professor Steven Matson  
Dean, Graduate School  
UNC-Chapel Hill  
Chapel Hill, NC

Dear Steve:

I am writing to indicate my strong support for the establishment of a Certificate Program in Chemical Biology. Chemical Biology is a rapidly developing area of interdisciplinary science and the presence of strong programs in Chemistry, Pharmacy, Biomedicine and Cancer research at UNC-Chapel Hill make this a unique location for the development of a program in chemical biology. This certificate program will provide an exceptional educational opportunity for our graduate students in the biological and chemical sciences. I fully support this initiative.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael T. Crimmins".

Michael T. Crimmins  
Mary Ann Smith Professor of Chemistry  
Senior Associate Dean for Natural Sciences