

NIH T32 in the Chemistry of Life

Program Executive Committee: Joshua Pierce (COS, PI); Gavin Williams (COS, Co-I); Yevgeny Brudno (COE); Melanie Simpson (CALs); Casey Theriot (CVM)

Program Internal Advisory Committee: Robert Kelly (BIT/COE); David Muddiman (METRIC/COS); Sid Thakur (Global Health/CVM); Fred Gould (GGI/CALs); Jorge Piedrahita (CMI/CVM); Hernan Navarro (BRITE/NC Central)

Program Overview: The NIH Chemistry of Life Training Program (CLTP) aims to propel research at the Chemistry-Life Science interface through a focused graduate student training program that bridges Chemistry and Biochemistry with Life Science researchers across NC State's campus. Building on the team science training model of the CMI, the program provides for an interdisciplinary training and research program that is not able to be accomplished in a traditional PhD program. The students trained in this program emerge with a unique training experience underpinned with chemical knowledge but focused on translational problems in the life sciences.

Specific Training Goals:

- To provide trainees with a solid curriculum in chemical biology and the life sciences, creating an integrated and unique look at fundamental chemistry in biological systems and translational science.
- To provide trainees with outstanding research training and mentoring experiences.
- To provide trainees with hands on mentoring of an undergraduate in a team-science project.
- To provide trainees with access and instruction in the use of cutting-edge research tools.
- To provide trainees with exposure to the international research community at the chemistry:biology interface through seminars and workshops.
- To provide professional development opportunities through travel support, fellowship development support and teaching experience.

Recruitment/Selection: Broad advertisement of the program will be conducted, with interested students directed to apply to the respective graduate program. Prospective students are selected by the CLTP executive committee after review of direct applicants or after consideration of applications forwarded by CLTP training faculty. Unfilled slots (due to lack of acceptance of offers or lack of identified students) will be filled from the accepted student pool before the start of the fall semester. In this way, it is available as a recruiting tool, but also will be filled each year with appropriate students before year 1 begins.

Year 1: Selected students will enter a participating graduate program and will enroll in the core "Chemistry of Life" course (CLP501) in the Fall and a Chemical Biology course (CLP701) and "Chemistry of Life" laboratory course in the Spring (BIT510-CLP). Students will select other courses from a menu of CLTP-selected courses or other graduate program courses in consultation with CLTP leadership and home graduate programs (this will vary based on the students interest areas in the life sciences). In the fall semester the students will rotate in 3 research labs and will select a primary research mentor (open to all mentors in all participating departments) by December 1st in consultation with the program director and faculty. In the spring semester the students will work with a chosen primary mentor to select a secondary mentor and to develop a research proposal that is a collaborative project between these labs with a requirement of a bridge between chemistry and the life sciences. These proposals will be reviewed by the executive committee and adjustments made as necessary in consultation with faculty - this project will serve as the initial thesis project for the trainee. Note that these projects do not require 50:50 involvement, but only the clear involvement of a complementary research partner working on problems in the life sciences or chemistry as appropriate.

NIH T32 in the Chemistry of Life

Year 2: Students begin funded positions in the CLTP, working in their primary lab and taking any coursework required for their degree program. Ethics training will be conducted in the fall semester of this year and the students will meet bi-monthly with the program leadership to discuss their progress. As part of this year CLTP scholars will undertake one on one hands-on mentoring of an undergraduate in the laboratory through the CMI SIRI program. In the Fall, CLTP scholars will be required to develop an interdisciplinary proposal related to their thesis topic but targeted at training an undergraduate student (competitively selected though an existing CMI program). These proposals will be vetted by the executive committee to make sure they meet the goals of the training grant. In the Spring, a Special Topics course focused on mentoring will be required so that all participants, both undergraduate and graduate students, can meet to develop professional skills including mentoring and communication skills, poster preparation, preparing slides for presentation and best methods of interdisciplinary science communication. It will also serve as a way for the program leadership to monitor the progress of the students to ensure that both graduate and undergraduate students are benefitting from the experience. In addition, the undergraduate students will be expected to start training in the laboratory under the direction of the CLTP scholar. This will allow the undergraduate to develop the skills required to fully contribute to the research during the summer months. At the end of this year students will participate in the annual symposium by presenting a poster.

Year 3: Students transition to RA, TA or fellowship positions and complete their preliminary examinations in the Fall of this year. At the end of this year CLTP trainees will participate in the CLTP annual symposium by presenting an oral talk and will be supported to travel to a major scientific conference to present their first 2 years of work.

Year 4 and 5: Students will continue in funded RA positions in the mentors lab and continue to participate in seminars and professional development activities through the CLTP program. Over these 2 years, the students will meet with their advisory committee every 6 months to provide the committee an opportunity to evaluate the research accomplished and to get the committee's input on further experimentation and approval to schedule his/her dissertation defense.

Broader Benefit to Other Students: students not directly participating in this program will benefit through the new courses developed, the seminars and workshops held as part of the program and the increased support for research at the chemistry-life science interface. All aspects of this program will be open to other graduate students in the participating programs.

Expected Student Outcomes:

- Increased technical proficiency and understanding of the molecular underpinnings of biology.
- Increased research rigor and reproducibility through training and mentorship.
- Improved PhD outcomes, research productivity and educational/professional experiences in line with modern student expectations.
- Increased community engagement and networking, leading to improved job placement.
- Improved mentoring and teaching skills translatable to their future careers.

Expected Institutional Outcomes:

- Substantially increased number of collaborative research proposals and long-term collaborations.
- Improved quality of incoming graduate students and increased attraction/retention of top faculty.
- Strong bridges between colleges and departments, tied together through the molecular sciences.