EXECUTIVE SUMMARY

A new undergraduate program in Biological Data Sciences (BDS)

We propose a new undergraduate major and minor that combines education and practical training in biological data sciences (BDS), a new paradigm in the life sciences that couples large-scale data collection with advanced computational and analytical methods for data analyses. Data are currently being collected at speeds and scales that were previously unimaginable and modern research programs addressing issues of human health, energy, the environment, and food security are heavily dependent on scientists with the skills to work large and complex datasets. As expected of an explosion of data richness, there has been a corresponding increase in demand for transdisciplinary trained scientists, and a variety of career opportunities. However, the training of undergraduate students in the life sciences has not been contemporized to meet these needs.

In response to the need for improved training of 21st century biologists, in July 2013, a Task Force was commissioned by Deans Dan Arp and Mark Zabriskie to develop a strategic plan for coordinated graduate and undergraduate curricula in bioinformatics and computational biology. The task force, chaired by CGRB Director Brett Tyler, included 20 faculty from the Colleges of Science, Agricultural Sciences, Pharmacy, Veterinary Medicine, Forestry, Engineering, Public Health and Human Sciences, and Earth, Ocean and Atmospheric Sciences. A report was released recommending the establishment of a new major to deliver undergraduate transdisciplinary training in the quantitative and life sciences. Detailed feedback was collected from the community through small group discussions, email, and three town hall meetings. A BDS committee was assembled to represent expertise necessary for developing an undergraduate transdisciplinary program. The BDS committee used recommendations of the undergraduate sub-task force and community feedback as a foundation for the BDS program. The committee also conducted a thorough analysis of pre-existing and related programs to understand the curricular landscape.

The BDS undergraduate program outlined here provides transdisciplinary education that intersects the life sciences, computer science, statistics, and mathematics. BDS will be based in the College of Agricultural Sciences (CAS) and administered by Department of Botany and Plant Pathology (BPP), but the program is designed to be collaborative and to integrate courses and faculty across units representing multiple disciplines, including all of the life sciences departments, Chemistry, the School of Life Sciences, School of Electrical Engineering and Computer Science, the departments of Statistics and Mathematics, and the College of Earth, Ocean, and Atmospheric Sciences. In addition, to provide students a transformative educational experience, the BDS program will offer six new classes that are structured for cohort learning, promoting the integration of domain knowledge from multiple disciplines, and learning skills necessary for effectiveness in teams. As part of the learning experience, students will be required to participate in an experiential learning activity and a senior capstone course. The proposed BDS program will foster undergraduate engagement and provide foundational knowledge and skills in biological data sciences that are needed for success in graduate or professional school, and the workplace.