

SPATIAL ECOLOGY AND EVOLUTION: INTEGRATIVE QUANTITATIVE TRAINING IN BIOLOGY, STATISTICS AND MATHEMATICS

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Intellectual merit:

Understanding, forecasting, and managing the **spatial dynamics of ecosystems** is a challenge that forces us to combine biological knowledge with new mathematical and statistical tools. To address current ecological/evolutionary problems with an inherently spatial nature, such as emerging pathogens, changes in species ranges, and population dynamics in patchy habitats, students need training in an arsenal of quantitative tools and in cross-disciplinary **collaboration and communication**. We will train students in mathematics, statistics and ecology; at the same time, they will learn how to **tackle applied problems** and **communicate with managers and other stakeholders**. Our program links a broad range of faculty whose collective expertise spans mathematics, statistics, and the biology of spatial systems to train students to handle such challenges in **interdisciplinary, client-focused research teams**, as well as engaging students in teaching mathematical/statistical biology at many levels. Students will reside in a home discipline but will be exposed to training in the other research areas rarely experienced in traditional graduate programs.

We will bring an interdisciplinary group of these students together under collaborative mentorship of energetic, creative faculty with collaborative experience who will work together to train them; present them with real-world research challenges that require them to learn a wide variety of tools; and engage them in teaching their new-found skills to others. Students will start with “gateway” courses outside of their home discipline to acquire a common set of basic concepts and terminology. After other appropriate disciplinary coursework, **year-long classes will undertake research on applied problems framed by outside Clients**. We will first train students in the necessary tools; they will then work in interdisciplinary research teams supervised by faculty mentors to explore the problems and communicate results to clients. This client interaction provides a forum for interacting with stakeholders and non-scientists. A weekly colloquium presented by faculty, outside speakers, and senior students will provide cohesion, expose students to a broad range of topics, and cover both research and communication; an annual symposium will provide further avenues for presentation and learning. Students will also be given the opportunity to share their knowledge and perspective by teaching interdisciplinary material in a range of undergraduate and graduate courses.

Broader impacts:

Students leaving the program will be uniquely well equipped for interdisciplinary research collaboration and communication, all of which they will need to tackle pressing scientific and societal problems. As with our previous research and training efforts, we will emphasize the recruitment and retention of women and minorities. Spillover benefits will include increased interdisciplinary faculty collaboration, participation of non-IGERT students in courses, seminars, and workshops, participation of IGERT students in teaching novel interdisciplinary content at the undergraduate and graduate levels, and breakdown of institutional barriers with increased appreciation throughout the institution for interdisciplinary work, especially in quantitative biology.