



Biology

COMPETENCIES AND RESEARCH

The biology department at Tufts is home to “a very broad yet integrated group of scientists,” according to Associate Professor Juliet A. Fuhrman, department chair. With programs that focus on molecular aspects of biology as well as programs that conduct population- and ecosystem-level research, “the members of our department all talk and work in interdisciplinary teams,” said Fuhrman, and “our students benefit from seeing all of those different scales coming together.” In building its ranks, the department is concentrating on finding new members that strengthen and also bridge existing core groups. “We have an eclectic mix of research disciplines, so when people get together, oftentimes it’s quite serendipitous,” said Fuhrman.

As the department adds strength to its focus areas, it is creating working groups that can then apply for larger funding vehicles. The goal, said Fuhrman, is to create synergistic combinations “as a way to nucleate interdisciplinary work within the department.” Some of the significant areas in which Tufts biologists are involved include:

- **Development and Regeneration:** Tufts biology researchers have made significant breakthroughs in describing events that determine left/right symmetry during early development. This work, concentrated in the Tufts Center for Regenerative and Developmental Biology, has profound implications not only for our basic understanding of how complex organisms develop from the single cell of a fertilized egg, but also for applied medicine. Areas in which this work is of special interest include healing and tissue regeneration as well as the treatment of congenital heart disease. A better appreciation of the molecular mechanisms that cells use to communicate with one another in early development can lead to therapies that harness our growing understanding of adult stem cells.
- **Soft-Bodied Robots:** By studying insect physiology, researchers are contributing to a

large-scale interdisciplinary effort to develop robots that, like caterpillars, combine strength and durability with a highly specialized form of locomotion in a flexible shell. This departure from the hard steely carcasses with articulating arms and legs often associated with robotics can potentially lead to a wide variety of applications. These include medical diagnostics, industrial processes such as navigating through pipelines, and many more.

- **DNA Stability, Replication, and Repair:** Better understanding of what happens when chromosomes break or DNA does not replicate properly can have broad implications for the study of neurodegenerative diseases such as Huntington’s, as well as cancer. Several labs in the biology department are looking at different aspects of the repair mechanisms chromosomes employ and why they sometimes go wrong. Researchers are also studying naturally occurring instability in areas of DNA that are highly repetitive. Besides the immediate applicability of this research, it also contributes significantly to scientific understanding of biological processes.
- **Social Insects:** Behavior is the observable outcome of all evolutionary history. An intriguing subfield of animal behavior research has to do with how groups coordinate responses to environmental factors. Work in the department has included the study of honeybees, describing how they beat their wings to create physiological heat to regulate the temperature in the hive, thereby controlling heat-sensitive pathogens as a way to protect developing juveniles from fungal infections. This kind of inquiry allows scientists to ask very basic questions about insect behavior as well as holistic evolutionary questions about things like the functions and workings of cooperation on a population level.

Biology CONTINUED

SELECTED PRINCIPAL INVESTIGATORS

Catherine Freudenreich, Ph.D.

Associate Professor of Biology

Michael Levin, Ph.D.

Professor of Biology and Director of Tufts Center for Regenerative and Developmental Biology

Mitch McVey, Ph.D.

Assistant Professor of Biology

Sergei Mirkin, Ph.D.

White Family Chair in Biology

Philip T.B. Starks, Ph.D.

Associate Professor of Biology

Barry A. Trimmer, Ph.D.

Henry Bromfield Pearson Professor of Natural Sciences and Director of the Tufts Biomimetic Devices Laboratory

PARTIAL LIST OF FUNDERS

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