Six NYU Professors Win NSF Career Awards

By James Devitt

Six NYU faculty have received National Science Foundation (NSF) Career Awards. They are: Kent Kirshenbaum, an assistant professor in the Department of Chemistry; Matthew Kleban, an assistant professor in the Department of Physics; Scott Sheffield, an assistant professor at the Courant Institute of Mathematical Sciences; Mark Siegal, an assistant professor in the Department of Biology; and Anindya Ghose and Panagiotis Ipeirotis, both assistant professors of information, operations, and management sciences at the Stern School of Business. Their work combines scholarship and pedagogy.

Kirshenbaum will use experimental approaches that span the disciplines of bioorganic chemistry, physical chemistry, and macromolecular engineering to establish new approaches for studying folding in synthetic polymers. These new methods will have applications for the design of new therapeutic and diagnostic agents. This is because the ability to control chemical structures can provide molecules with sophisticated properties. The project will explore the design, synthesis, characterization, and applications of a versatile family of protein mimics. Kirshenbaum will also work in partnership with NYU’s Steinhardt School of Culture, Education, and Human Development to develop curricula in “molecular gastronomy,” in which preparations of food polymers will allow students to learn that chemistry has an influence in every aspect of what we breathe, drink, and eat.

Siegal will explore how organisms develop and function reliably, despite experiencing a range of environmental conditions and genetic differences caused by mutations. Central to this endeavor is understanding how the robustness of living organisms affects evolution, so Siegal will seek to identify genes that buffer environmental and genetic variation, which may influence how novel traits evolve. The project will also include a complementary experiment, in which Siegal and his colleagues will analyze physical variation in progeny from a cross between laboratory and wild yeast. This will allow for the identification of genes that determine robustness in nature. In addition, Siegal will develop two new NYU courses — one for advanced biology students and the other for non-science majors — that use computers to enhance learning of difficult quantitative concepts. His intent is to prepare the next generation of biologists to tackle problems and to enable non-scientists to evaluate technological advances. He is also working with colleagues in the Steinhardt School to develop multimedia learning tools for non-majors course.

Ghose’s research will identify and measure the economic value of online information and contribute to an understanding of the economic impact of new kinds of information content on the Internet. His research will lead to actionable recommendations for practitioners to improve the design of electronic markets and social networks. Ghose will also integrate his findings into his teaching through a combination of new course materials, datasets, and interactive learning modules. His work straddles several disciplinary boundaries and seems likely to generate research of significant importance.

Ipeirotis will examine Internet searches, specifically how to provide Internet users the power and tools to quickly process the vast amount of available data and receive answers to complex questions. When dealing with complex queries, users currently have to search through a large number of returned documents to identify and construct the required answer. Ipeirotis’ research will enable users and business to answer these complex questions and show not only the answers, but also the economic impact of the available information.

Sheffield will examine spatial problems of probability theory, with a particular focus on random surfaces and two-dimensional random objects with “conformal symmetries.” The longitude and latitude lines on the surface of the earth have the property that when they intersect one another, they meet at right angles. One can use these coordinates to map a piece of the earth’s surface onto a flat piece of paper in such a way that right angles on the earth get mapped onto right angles on the paper. A map with this property is called a “conformal map.” In addition to their intrinsic beauty, these objects have applications in quantum field theory, statistical physics, and the theory of random surfaces. Sheffield’s work will include efforts to bring new graduate students into this emerging field and to assist them in their studies and careers.

Kleban will undertake a program of research in high energy theory in which he focuses on the aspects of string theory most relevant to cosmology. Specifically, he will research the physics of black hole and cosmological horizons and singularities. In addition, Kleban will develop a pilot program at NYU to help promote the success of undergraduates belonging to groups traditionally underrepresented in physics and the physical sciences. The program will attempt to overcome the isolation such students often experience by facilitating the formation of a peer group and by providing additional support.