Fall 2019 events

This semester we will host six day-long symposia, on topics ranging from quantum field theory to animal behavior (with many stops in between), as well as a three day workshop on fluid phases of matter. We also will have less formal seminars, and presentations of works in progress by ITS fellows and visitors.

All events are held at The Graduate Center, 365 Fifth Ave, in Manhattan. For details, see https://itscuny.org.

Oct 11 **Toward the physics of complex behaviors**
In the past decade there has been considerable progress toward a “physics of behavior,” taming the complexity of animal movements in their natural contexts. Here we explore the next layers of complexity in songbirds, dolphins, and the general problem of animal navigation.

Oct 25 **Recent advances in electron and proton transfer theories**
Electron and proton transfers are among the simplest possible chemical reactions. We explore recent progress on the theory of these reactions, especially the subtle interplay of classical and quantum dynamics, as well as implications for fundamental processes in biological systems.

Oct 31 **Recent advances in nonlinear problems**
Nonlinear partial differential equations arise in the description of many systems, and motivate deep mathematical questions. We explore recent progress, connecting to variational problems, Morse theory, and topological methods.

Nov 15 **Searching for simpler models**
There has been remarkable progress in turning our qualitative preference for simple models of the natural world into quantitative, mathematical principles. We explore these developments, both as general principles and in examples from biological systems and deep neural networks.

Nov 22 **Conformal bootstrap and related ideas**
The bootstrap program aims to map the space of possible quantum field theories, constrained only by symmetries and the basic principles of quantum mechanics. We explore exciting new developments, including non-perturbative results, field theories at finite temperature, and more.

Dec 6 **Adaptation**
Living systems achieve their extraordinary functions in part by adapting their strategies to the structure of their environment. We explore examples of this phenomenon in systems from bacteria to brains, searching for a unifying theoretical framework.

Dec 11-13 **Fluid phases of matter: From electron liquids to active matter**
Topics will include the experimental discovery of hydrodynamic electron flow in graphene and other materials, the prediction and observation of odd elasticity and viscosity in active matter, and new transport coefficients from the Schwinger-Keldysh framework.