

# ITS @ The Graduate Center

Initiative for the Theoretical Sciences



## Bits & Biology

Much of the business of life is about the transmission and processing of information. Less clear is what the full mathematical structure of information theory teaches us about the mechanisms at work in living systems. We use the 70th anniversary of Shannon's foundational papers as an opportunity to address this question, across all scales; from the folding of individual protein molecules to the dynamics of learning. We will explore the amount of information that is conveyed in these different processes, and the nature of its representation, using information theory as a tool for the characterization of biological systems. More deeply, we will explore examples where optimization of information transmission has been used as a principle from which aspects of biological function can be derived. Presentations will start with pedagogical background, and there will be ample opportunity for discussion.

### Topics Include:

- Science of information meets the life sciences: Overview and results
- Coded string reconstruction: From substrings to traces
- Persistent copying in biological systems
- Optimal cellular information transmission
- Mathematical techniques for analyses of single cell transcriptomic data
- Three principles of data Science: Predictability, computability, and stability (PCS)
- Relating theories of neural coding using the information bottleneck
- Decoding the brain's Enigma
- Geometry of the natural olfactory space
- Outlook: Information theoretic principles for biological networks

Sept. 12th - 15th, 2018

Science Center (Room 4102)

The Graduate Center, CUNY  
365 Fifth Avenue  
New York, NY



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# Center for the Physics of Biological Function

Sponsored by the Initiative for the Theoretical Sciences, and by the CUNY doctoral programs in Physics and Biology.  
Supported in part by the Center for the Science of Information, an NSF Science and Technology Center,  
and by the Center for the Physics of Biological Function, a joint effort of The Graduate Center and Princeton University.