

## Princeton Center for Theoretical Science

The Princeton Center for Theoretical Science is dedicated to exploring the frontiers of theory in the natural sciences. Its purpose is to promote interaction among theorists and seed new directions in research, especially in areas cutting across traditional disciplinary boundaries.

The Center is home to a corps of Center Postdoctoral Fellows, chosen from nominations made by senior theoretical scientists around the world. A group of senior Faculty Fellows, chosen from science and engineering departments across the campus, are responsible for guiding the Center. Center activities include focused topical programs chosen from proposals by Princeton faculty across the natural sciences. The Center is located on the fourth floor of Jadwin Hall, in the heart of the campus "science neighborhood". The Center hopes to become the focus for innovation and cross-fertilization in theoretical natural science at Princeton.

### Faculty Fellows:

Paul Steinhardt, Director  
Igor Klebanov, Associate Director  
Ravindra Bhatt  
William Bialek  
Curtis Callan  
Roberto Car  
David Spergel  
Salvatore Torquato

### Center Postdoctoral Fellows:

Dmitry Abanin 2008-2011  
Bogdan Andrei Bernevig 2006-2009  
Thomas Klose 2007-2010  
Jean-Luc Lehnars 2007-2010  
M. Lisa Manning 2008-2011  
Meera Parish 2006-2009  
Matthew Reece 2008-2011  
Branson Stephens 2007-2010  
Aleksandra Walczak 2007-2010

To find out more about Center Postdoctoral Fellowships and Programs see:

<http://pcts.princeton.edu/pcts>



## Physical Principles in Biological Networks Program

### Robustness vs. Fine Tuning

**Tuesday, 24 March 2009**

**PCTS Seminar Room 407, Jadwin Hall**

### Organizers

William Bialek  
Curtis Callan  
Aleksandra Walczak  
Ned Wingreen

# Physical Principles in Biological Networks Program

## Robustness vs fine tuning.

Biological networks have many parameters, most of which can be adjusted (by evolution, by learning, by changing levels of gene expression, by covalent modifications of proteins ...). Are there mechanisms that tune these parameters to their "correct" values? Or do real biological networks have specific architectures that render their function invariant to large variations in some of these parameters? Is maximizing the functional volume in parameter space a quantitative version of this intuition about robustness? How can such invariance against parameter changes coexist with exquisite sensitivity to meaningful signals?

## **Theory days**

### Tuesday 24 March: Robustness vs fine tuning.

Provocateurs: Larry Abbott (Columbia), Chao Tang (UCSF)

Dinner Talk by John Hopfield, Princeton University

### Tuesday 31 March: Modularity.

Provocateurs: Chris Wiggins (Columbia), Eduardo Sontag (Rutgers)

### Thursday 9 April: Finding the right operating point.

Provocateurs: Daniel Fisher (Stanford), Paul Francois (Rockefeller), Eric Siggia (Rockefeller),

### Thursday 16 April: Signals, noise and information.

Provocateurs: Anirvan Sengupta (Rutgers)

## **Experiment days**

### Tuesday 21 April: Collective behavior in networks of real neurons.

Speakers: Michael J. Berry II (Princeton), Carlos Brody (Princeton), Gasper Tkacik (U.Penn), Samuel S-H Wang (Princeton)

### Thursday 30 April: Early events in the Drosophila embryo

Speakers: Thomas Gregor (Princeton), Eric F. Wieschaus (Princeton)

# Robustness vs. Fine Tuning

**Tuesday, 24 March 2009**

9:45 am	Welcome William Bialek, Curtis Callan
10:00 -11:30	"Tuning Neurons and Networks To Do What They Should" <b>Larry Abbott</b> , Columbia University
11:30 – 11:45	Coffee Break
11:45 – 1:00	Discussion
1:00 - 2:30 pm	Lunch
2:30 - 4:00	"Robust states, patterns, and cycles in biochemical and genetic networks" <b>Chao Tang</b> , UCSF
4:00 – 4:15	Coffee Break
4:15 – 5:30	Discussion
6:30 pm	Dinner at Prospect House, Presidential Dining Room  Dinner Talk <i>Error detection and 'implicit check bits'</i> <b>John Hopfield</b> , Princeton University

Check <http://pcts.princeton.edu/pcts/calendar.html>  
for program updates and other Center activities