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 and celebrated its tenth anniversary in 2016.

Faculty Fellows
Paul Steinhardt, Director
Igor Klebanov, Associate Director
Andrei Bernevig
Curtis Callan
Pablo Debenedetti
Eve Ostriker
Howard Stone
Herman Verlinde
Ned Wingreen

Center Postdoctoral Fellows
Barry Bradlyn 2015-2018
Jennifer Cano 2015-2018
Anna Frishman 2016-2019
Bruno Le Floch 2015-2018
Daniel Lecoanet 2016-2019
Zhiyuan Li 2015-2018
Biao Lian 2017-2020
Pierre Ronceray 2016-2019
Yizhi You 2017-2020
Yaojun Zhang 2015-2018

To find out more about Center Postdoctoral Fellowships and Programs see: http://pcts.princeton.edu/pcts

“How to get from A to B: Transitions in Biology”

13-15 December 2017

Jadwin Hall, Room 407

Workshop Organizers
Zemer Gitai
Hsin-Jung (Sophia) Li
Zhiyuan Li
Eric Wieschaus
Ned Wingreen

This workshop is supported in part by the Department of Ecology and Evolutionary Biology; Lewis-Sigler Institute; Department of Molecular Biology; and the Department of Physics
“How to get from A to B: Transitions in Biology”

**Wednesday, December 13, 2017**

9:00  Coffee & Light Breakfast

9:25-9:30  Welcome/Introduction

9:30-10:00  Asynchrony and the transition to aggregative multicellularity: insights from the social amoeba *D. discoideum*
*Corina Tarnita, Princeton University*

10:00-10:30  An experimental test of hybrid speciation
*Daniel Matute, University of North Carolina*

10:30-11:00  Break

11:00-11:30  Exploring the origin of multicellularity through experimental evolution
*Will Ratcliff, Georgia Tech*

11:30-11:45  Origin of multicellularity: evolution of increased size via reduced cellular volume fraction
*Peter Yunker, Georgia Tech*

11:45-12:00  Transitions between adaptive strategies in fluctuating environments
*Andreas Mayer, Princeton University*

12:00-1:30  Lunch at PCTS or take lunch to MolBio Seminar
12:00-1:00  MolBio Seminar, Lewis Thomas Lab (LTL), Room 003
*David Pellman, Harvard University*

1:30-2:00  Controlling the migratory mode of cells by altering the set point of an excitable network
*Pablo Iglesias, Johns Hopkins University*

2:00-2:30  Ribosome dynamics and resource allocation strategy of E.coli across different nutrient limitation
*Zhiyuan Li, Princeton University*

2:30-3:00  Coffee break

3:00-3:30  A global resource allocation strategy governs growth transition kinetics of *E. coli*
*Severin Schink, Harvard University*

3:30-4:00  Reconstruction of developmental landscapes by optimal-transport
*Geoffrey Schiebinger, Broad Institute*

4:00-4:30  LIGHTNING TALKS

4:30-6:30  Poster Session and Welcome Reception

**Thursday, December 14, 2017**

8:30 AM  Coffee & Light Breakfast

9:00-9:30  Temperature Extremes and Cell Biological Transitions during Embryonic Development
*Eric Wieschaus, Princeton University*

9:30-10:00  The transition between homeostasis and regeneration
*Peter Reddien, MIT Whitehead Institute*

10:00-10:30  Coffee break

10:30-11:00  Signals, forces, and cells: Decoding tissue morphogenesis
*Jennifer Zallen, Memorial Sloan Kettering Cancer Center*

11:00-11:15  Depletion of maternal Cyclin B3 enables the Ciona maternal to zygotic transition
*Nicholas Treen, Princeton University*

11:15-11:30  Mapping EMT landscape with single cell imaging and machine learning methods
*Weikang Wang, University of Pittsburgh*

11:30-2:00  Lunch at PCTS, Jadwin Hall, Fourth Floor

2:00-2:30  Microbiome transitions in patients receiving bone-marrow transplant
*Joao Xavier, Memorial Sloan Kettering*

2:30-3:00  Insulin resistance and colon cancer: pathogenic mechanisms and therapeutic strategies
*Rachel Perry, Yale University*

3:00-3:30  tRNA codon landscape transitions during metastatic progression
*Sohail Tavazoie, The Rockefeller University*
“How to get from A to B: Transitions in Biology”

Thursday, December 14, 2017 (cont.)
3:30-4:00  Coffee break

4:00-5:00  Physics Colloquium, Room A-10 Jadwin
  Exploring embryonic patterning with colonies of human embryonic stem cells.
  Eric Siggia, The Rockefeller University

Friday, December 15, 2017
8:30  Coffee & Light Breakfast

9:00-9:30  Moving through intracellular phase space
  Cliff Brangwynne, Princeton University

9:30-9:45  Robust nonequilibrium pathways to bacterial microcompartment assembly
  Grant Rotskoff, Courant Institute of NYU

9:45-10:00  Coarse-grained models coupling cell cycle and gene expression
  Jie Lin, Harvard University

10:00-10:15  Spatiotemporal self-organization of fluctuating bacterial colonies
  Eric Vanden-Eijnden, Courant Institute of NYU

10:15-10:30  Leading the Pack: Leader and follower in collective cancer invasion
  Yi Jiang, Georgia State University

10:30-11:00  Coffee Break

11:00-11:15  Mechanomorphogenesis of V. cholerae biofilms
  Yan Jing, Princeton University

11:15-11:30  Verticalization transition in Vibrio cholerae biofilms.
  Farzan Beroz, Princeton University

11:30-12:00  How rats flexibly go from sensing to acting
  Carlos Brody, Princeton University

12:00-12:15  Closing Remarks followed by lunch.