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
Oren Slone 2018-2020
Yizhi You 2017-2020
Yaojun Zhang 2015-2018

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

“Regular Patterns In Biology: Causes and Consequences”

April 18-20, 2018
Jadwin Hall, Room 407

Workshop Organizers
Corina Tarnita
Robert Pringle
Simon Levin

This program is supported in part by the NSF and the Department of Ecology and Evolutionary Biology (EEB).
**Regular Patterns In Biology: Causes and Consequences**

**Wednesday, April 18, 2018**

8:30  Coffee & Light Breakfast
9:00-9:40  Welcome/Introduction: Tarnita/Levin/Pringle
9:45-11:00  Breakout groups

11:00-11:30  Coffee break
11:30-12:30  Status update: Patterns in morphogenesis
12:30-1:30  Lunch at PCTS

1:30-2:30  Status update: Patterns in terrestrial ecosystems
2:30-3:30  Status update: Patterns in aquatic ecosystems

3:30-4:15  Coffee break
4:30-5:30  PEI Seminar: Ruben Juanes (Guyot 10) – Hydro-mechanical instabilities and pattern formation in geoscience

**Thursday, April 19, 2018**

8:30 AM  Coffee & Light Breakfast

**Short talks I: Terrestrial patterns in drylands**

9:00-9:20  Ehud Meron – Universal mechanisms of pattern formation and their realizations in dryland landscapes
9:20-9:40  Mary Silber – Exploiting topographic heterogeneity to probe models of dryland vegetation patterns
9:40-10:00  Kelly Caylor – Better together: vegetation organization, water use, and water stress across dryland climate gradients
10:00-10:20  Efrat Sheffer – The patterns are there but we don’t see them: on other forms of organization

10:20-10:50  Coffee break

**Short talks II: Terrestrial patterns across ecosystems**

10:50-11:10  Carla Staver – Patterns in spatial heterogeneity in tree cover are consistent across diverse savannas in Kruger
11:10-11:30  Ignacio Rodriguez-Iiturbe – Tree clusters in savannas: Rainfall, islands of soil moisture, and fire
11:30-11:50  Doyle McKee – Spatially regular earth-mound landscapes in seasonal tropical wetlands: Empirical results in search of theory
11:50-12:10  Maarten Eppinga – Studying peatland patterns with Appropriate Complexity Landscape Modeling

12:10  Grab lunch bags at PCTS and head to EEB seminar

12:30-1:30  EEB Seminar: Max Rietkerk (Guyot 10) – Critical transitions and self-organization in nature

**Short talks III: Terrestrial patterns across scales**

2:00-2:20  Eitan Tadmor – The emergence of higher-order structures from short-range interactions
2:20-2:40  Juan Bonachela – Emergent patterns and ecological transitions
2:40-3:00  Brice Ménard – Mapping patterns on the Earth’s surface
3:00-3:20  Sal Torquato – Hidden Large-Scale Order in Biological Patterns and Collective Behavior
3:20-3:40  Lars Hedin – The hidden traits that have built the biosphere

3:40-4:10  Coffee break

**Short talks IV: Pattern formation in morphogenesis**

4:10-4:30  Andrej Kosmrlj – Branching morphogenesis in developing lungs
4:30-4:50  Stas Shvartsman – Collective growth in a simple cell network
4:50-5:10  Andy Aman – Scales and proportion: Fish squamation as a new model for developmental patterning
5:10-5:30  Ricardo Mallarino – Developmental mechanisms of pigment patterns in rodents
5:30-5:50  Rick Prum – Self assembly mechanisms in bio-optical nanostructures

6:00  Workshop dinner for INVITED PARTICIPANTS only.

**Friday, April 20, 2018**

8:30  Coffee & Light Breakfast

**Short talks V: Aquatic patterns**

9:00-9:20  Nigel Goldenfeld – Stochastic Turing patterns in oceans, brains and biofilms
9:20-9:40  Johan van de Koppel – Self-organization bridging spatial scales in marine ecosystems
9:40-10:00  Silvia de Monte – Ubiquitous abundance decay in the rare biosphere of marine plankton
10:00-10:20  Mick Follows – On the organization of individual and community metabolism

10:20-10:50  Coffee Break
10:50-12:30  Discussion: Synthesis and Where Next?

12:30-1:30  Conclusion and Lunch at PCTS