

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

Igor Klebanov, Director
Ned Wingreen, Associate Director
Jeremy Goodman
Duncan Haldane
Andrej Košmrlj
Mariangela Lisanti
Frans Pretorius
Silviu Pufu
Eliot Quataret
Shinsei Ryu

Center Postdoctoral Fellows

Vir Bulchandani 2020-2023	Minjae Cho 2021-2024
Giorgio Cipolloni 2021-2024	Scott Collier 2020-2023
Trevor GrandPre 2022-2024	David Hosking 2022-2025
Brooke Husic 2020-2023	Jonah Kudler-Flam 2022-2025
Yves Kwan 2022-2025	Alejandro Martinez-Calvo 2021-2024
Elias Most 2020-2023	Anirudh Prabhu 2022-2025
Carolyn Raithel 2020-2023	Samajdar Rhine 2022-2025
Frank Schindler 2020-2023	Nicole Shibley 2021-2024

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



Biophysics of Organoids

February 15-17, 2023

Organizers

Celeste M. Nelson
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Jared Toettcher
Samhita Banavar

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Biophysics of Organoids

Wednesday, February 15, 2023

- 8:30 Coffee and Light Breakfast
- 9:15-9:20 Welcome/Introduction
- 9:20-10:00 *Synthetic embryology for building human embryo and organ models*
Jianping Fu, University of Michigan
- 10:00-10:40 *Precise and scalable self-organization in mammalian pseudo-embryos*
Thomas Gregor, Princeton
- 10:40-11:10 Coffee Break
- 11:10-11:50 *Hydrodynamic models for morphogenetic flows: gastrulation, elongation and segmentation*
L Mahadevan, Harvard University
- 11:50-1:30 Lunch at PCTS
- 1:30-2:30 **Selected from abstracts (10 min each)**
- 1:30-1:40 *Gulf War veteran derived cerebral organoids display multifaceted pathological defects in Gulf War Illness*
Kendra Case, Drexel University College of Medicine
- 1:42-1:52 *Vascularized human kidney organoids with enhanced cell lineage specification*
Titilola Kalejaiye, Duke University
- 1:54-2:04 *Understanding the Mechanics of Human Somatogenesis through In Vitro and Theoretical Models*
Yue Liu, University of Michigan
- 2:06-2:16 *Profiling structure-function relationship of cardiac organoids using artificial intelligence*
Zhen Ma, Syracuse University
- 2:18-2:28 *Human skinoid cultures recapitulate wound healing in a dish*
Yvon Woappi, Columbia University
- 2:30-3:00 Coffee Break

Biophysics of Organoids

Wednesday, February 15, 2023 (cont.)

- 3:00-3:40 *The stem cell zoo reveals mechanisms for species-specific developmental time*
Miki Ebisuya, European Molecular Biology Laboratory
- 3:40-4:20 *Towards building brains using synthetic biology across scales*
Jennifer Schwarz, Syracuse University
- 4:20-6:30 **Poster Session and Welcome Reception**

Thursday, February 16, 2023

- 8:30 Coffee and Light Breakfast
- 9:00-9:40 *Scaling up organoid production for therapeutic-scale vascularized tissue engineering*
Mark A. Skylar-Scott, Stanford University
- 9:40-10:20 *Novel Methods for Manipulating Lung Tissue and Lung Organoids to Understand Mechanobiology*
Brian Varisco, Cincinnati Children's Hospital
- 10:20-11:00 Coffee Break
- 11:00-11:40 *4D customization of engineered cellular niches*
Cole DeForest, University of Washington
- 11:40-12:20 *Morpho-elasticity of living systems by examples: leaves and embryonic C-elegans*
Martine Ben Amar, Ecole Normale Supérieure
- 12:20-2:00 Lunch at PCTS
- 2:00-2:40 *Emerging technologies to translate organoids into artificial kidneys*
Samira Musah, Duke University
- 2:40-3:20 *Interpreting geometric rules of early kidney formation for synthetic morphogenesis*
Alex Hughes, University of Pennsylvania
- 3:20-4:00 Coffee Break

Biophysics of Organoids

Thursday, February 16, 2023 (cont.)

4:00-5:00 **Physics Colloquium**
Linking force, form and function in intestinal organoids
Xavier Trepap, Institute for Bioengineering of Catalonia

Friday, February 17, 2023

8:30 **Coffee and Light Breakfast**

9:00-9:40 *Upgrading the physiological relevance of human brain organoids*
Georgia Quadrato, University of Southern California

9:40-10:20 *Biomechanical modeling of cortical folding: hypotheses, predictions, and testing*
Maria Holland, University of Notre Dame

10:20-11:00 **Coffee Break**

11:00-11:40 *Pushing the boundaries of intestinal organoids, with topological data analysis and morphoelasticity*
Helen Byrne, Oxford University

11:40-12:20 *Integrated single-cell sequencing reveals principles of epigenetic regulation of human gastrulation and germ cell development in 3D gastruloid model*
Sid Dey, University of California Santa Barbara

12:20-2:00 **Lunch at PCTS**