

# Dresden - Oxford

math meets biology  
4 - 6 December 2023



# Welcome

Welcome to the Max Planck Institute of Molecular Cell Biology (MPI-CBG) and the Center for Systems Biology Dresden (CSBD). Our center is a cooperation between the Max Planck Institute of Molecular Cell Biology and Genetics, the Max Planck Institute for the Physics of Complex Systems, and the Technische Universität Dresden.

Many of the Dresden researchers will speak about their work and the Oxford maths early career researchers will give short talks to share our research interests with the Dresden community. We would be delighted if you could spend some time at MPI-CBG 4 December and/or 6 December to learn about current research in Dresden and Oxford.

We are organising two theory meets biology “speed dating” events and invite you to SIGN UP! These are 30 minute sessions after lunch on Monday at 2pm and Wednesday at 2pm.

On Tuesday 5 December, we have a day event as part of the collaborative workshop “Mathematical Biology in Saxony” organized jointly by the University of Oxford, the Algebraic Systems Biology group in the Center for Systems Biology in Dresden (CSBD) and the Nonlinear Algebra group of Bernd Sturmfels at MPI-MiS in Leipzig.

This three day workshop offers a unique opportunity for researchers from these different institutions to explore current research where maths meets biology. Attendees will have the opportunity to learn about exciting research topics and establish valuable collaborations.

**To sign up** for the Dresden component of the event please register [here](#):

<https://show.forms.app/hatimbentahar/workshop-registration-form>

**To sign up** for the Leipzig component of this event please register [here](#):

<https://www.mis.mpg.de/events/series/mathematics-in-biology-day>

# Contents

## SCHEDULE

**-6 Monday -**  
*MPI-CBG / CSBD Day*

**-8 Tuesday**  
*MPI-MiS Leipzig Day*

**-10 Wednesday**  
*MPI-CBG / TU-Dresden Day*

## WHO'S WHO

**14 MPI-CBG-CSBD**

**16 MPI-MiS**

**18 Oxford**

## BIOS

**20 A-Z of speakers**

## Monday 4 December

*Heather Harrington (MPI-CBG & CSBD)*

8.45

Welcome



*Stephan Grill (MPI-CBG)*

9.00

Activating active matter

*Pierre Haas (MPI-PKS)*

9.30

Cut it out: The mathematics of cutting biological tissues

*Ximena Fernandez (Oxford)*

9.45

Density-based persistent homology and applications to time series analysis.

*Rita Mateus (MPI-CBG)*

10.00

Growth control across scales

*Coffee break*

10.15 - 10.30



## MPI-CBG / CSBD Day

*Meritxell Huch (MPI-CBG)*

10.30

Stem cells, regeneration and organoids

*Christoph Zechner (MPI-CBG & CSBD)*

11.00

Stochastic processes in cells and tissues

*Carl Modes (MPI-CBG & CSBD)*

11.15

Ensnarled networks

*Gillian Grindstaff (Oxford)*

11.30

Metric spaces of phylogenetic trees

*Frank Jülicher (MPI-PKS)*

11.45

Active matter

*Lunch*

12.15 - 14.00



*Speed Dating - Theory meets Biology*

14.00 - 14.45

This event will take place in the MPI-CBG Grotto. Please sign up [here](#)

*Tour of CSBD, CBG*

14.45 - 15.30

Meet in the MPI-CBG ground floor atrium.

*Team Building*

15.30 - 18.00



Meet in the MPI-CBG ground floor atrium.

*Dinner*

19.00



Dinner at Lila Soße  
Alaunstraße 70, 01099 Dresden

## Contacts

### Scientific Organisers

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## Tuesday 5 December

*Bus to MPI-MIS Leipzig*

**8.30**

*Please meet in fron of the MPI-CBG*

*Michael Joswig (TU-Berlin)*

**10.00**

Master regulators of biological systems in higher dimensions

*Coffee break*

**11.00 - 11.30**



*Angelica Torres (MPI-MiS)*

**11.30**

Phylogenetic invariants for time-reversible models

*David Beers (Oxford)*

**12.00**

Stability of a shape transform for Curves

*Celia Hacker (EPFL)*

**12.30**

Simplicial representation Learning with neural k-forms

## Leipzig Day

*Lunch*

**13.00 - 14.00**



*Vadim Lebovici (Oxford)*

**14.00**

Euler characteristic in topological persistence

*Anachiara Korchmaros (Leipzig Uni)*

**14.30**

A tree-free method to estimate gene family historiese

*Katherine Benjamin (Oxford)*

**15.00**

Multiscale topology classifies and quantifies cell types in subcellular spatial transcriptomics

*Coffee Break*

**15.30 - 16.00**



*Sayan Mukherjee (Uni of Leipzig)*

**16.00 - 17.00**

Form and time

*Dinner and Team building*

**18.00**



## Contacts

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### Scientific Organisers

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# Schedule

## Wednesday 6 December

*Welcome & Coffee*

10.00 - 10.15



*Axel Voigt (TU Dresden)*

10.15 - 10.45

Nonequilibrium hyperuniform states in active turbulence

*Markus Schmidtchen (TU Dresden)*

10.45 - 11.00

Interacting particle systems across Scales

*Uzu Lim (Oxford)*

11.00 - 11.15

Singularity detection from a data "manifold"

*Alex Tanaka (Oxford)*

11.15 - 11.30

Morse theory for drug discovery

*Ivo Sbalzarini (TU Dresden & CSBD)*

11.30 - 12.00

Scientific computing for systems biology

## MPI-CBG / TU-Dresden Day

*Lunch & discussion*

12.00 - 14.00



*Speed dating CBG/CSBD*

14.00 - 14.30

This event will take place in the MPI-CBG Grotto. Sign up [here](#)

*Discussion*

14.30 - 14.45



*Andreas Thom (TU Dresden)*

14.45 - 15.15

Infinite networks and property testing

*Mario Kummer (TU Dresden)*

15.15 - 15.30

Applications of real algebraic geometry

*Marc Fersztand and Luis Scoccola (Oxford)*

15.30 - 15.45

(Luis) Algebraic persistence  
(Marc) Harder-Narasimhan filtrations of persistence modules

*Coffee & discussion*

15.45 - 16.00



*Thomas Chaplin and Otto Sumray (Oxford)*

16.00 - 16.15

(Otto) A harmonic approach to feature selection and single cell chromatin accessibility  
(Tom) Directed topology for biology

*Anita Behme (TU Dresden)*

16.15 - 16.45

Queueing networks: From theory to (some) applications

*Closing Remarks*

17.00

