Mathematics of Cancer: Open Mathematical Problems

Monday February 23, 2026

8:00–8:55 *Check-in/Breakfast (hosted by IPAM)*

8:55–9:00 *Welcome and Opening Remarks*

9:00 *MODERATOR: Jackson*

9:00–9:30 **Renee Brady-Nicholls** (Moffitt Cancer Center & Research Institute)
Developing Predictive Models Using Minimally-Invasive Biomarkers Part 1

9:40–9:50 *Break*

9:50–10:20 **Renee Brady-Nicholls** (Moffitt Cancer Center & Research Institute)
Developing Predictive Models Using Minimally-Invasive Biomarkers Part 2

10:30–10:40 *Break*

10:40–11:10 **Dominik Wodarz** (University of California, San Diego (UCSD))
Evolution in Spatially Structured Tumors Part 1

11:20–11:30 *Break*

11:30–12:00 **Dominik Wodarz** (University of California, San Diego (UCSD))
Evolution in Spatially Structured Tumors Part 2

12:10–1:40 *Lunch (on your own)*

1:40 *MODERATOR: Weinberger*

1:40–2:20 **Herbert Levine** (Northeastern University)
Cancer Drug Persistence; Modeling a Continuum of Phenotypic States

2:30–2:45 *Break*

2:45–3:25 **Eduardo Sontag** (Northeastern University)
A Mathematical Model of Evolution of Drug-Induced Resistance

3:35–3:50 *Break*

3:50–4:30 **Reinhard Laubenbacher** (University of Florida)
Mathematical Technology for Agent-Based Digital Twins

4:40–5:00 *Lightning Poster Round*

5:00–6:30 *Poster Session & Reception (Hosted by IPAM)*

Tuesday February 24, 2026

8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*

9:00 *MODERATOR: Levine*

9:00–9:30 **Ben Raphael** (Princeton University)
Models and Algorithms for Cancer Evolution Part 1

9:40–9:50 *Break*

9:50–10:20 **Ben Raphael** (Princeton University)
Models and Algorithms for Cancer Evolution Part 2

10:30–10:45 *Break*

10:45–11:25 **Charles Epstein** (University of Pennsylvania)
The Kimura Diffusion Equation in Population Genetics, Theory and Numerics

11:35–11:50 *Break*

11:50–12:30 **Heather Harrington** (Max Planck Institute for Molecular Cell Biology and Genetics)
Topological Data Analysis for Analysing Cancer Organisation

12:40–2:40 *Lunch (on your own)*

2:40 *MODERATOR: Komarova*

2:40–3:20 **Luis Aparicio** (Columbia University)
Random Matrix Theory Applications to Biology

3:30–4:00 *Break*

4:00–4:40 **Ingmar Glauche** (Technische Universität Dresden)
From Binary Switches to Continuous Landscapes: Challenges in Modeling Hematopoietic Stem Cell Dynamics and Clonal Progression

Wednesday February 25, 2026

8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*

9:00 *MODERATOR: Sontag*

9:00–9:30 **Smita Krishnaswamy** (Yale University)
Virtual Talk: Inferring Dynamic Cellular Trajectories and Underlying Cellular Regulatory Networks with Neural and Graph ODE Models Part 1

9:40–9:50 *Break*

9:50–10:20 **Smita Krishnaswamy** (Yale University)
Virtual Talk: Inferring Dynamic Cellular Trajectories and Underlying Cellular Regulatory Networks with Neural and Graph ODE Models Part 2

10:30–10:45 *Break*

(Wednesday schedule continued on next page)

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10:45–11:25 **Tuca Auffinger** (Northwestern University)
Open Mathematical Problems in Manifold Learning for Single-Cell Data

11:35–11:50 *Break*

11:50–12:30 **Andrea Bertozzi** (University of California, Los Angeles (UCLA))
Virtual Talk: Machine Learning for High Throughput DNA-Aptamer Screening and Selection

12:40–12:45 *Group Photo*

12:45–2:40 *Lunch (on your own)*

2:40 *MODERATOR: Wodarz*

2:40–3:20 **Ruth Williams** (University of California, San Diego (UCSD))
Fragility of Stochastic Dynamics in Autocatalytic Reaction Networks (of Togashi-Kaneko Type)

3:30–4:00 *Break*

4:00–4:40 **Konstantin Mischaikow** (Rutgers University New Brunswick/Piscataway)
Dynamics of Regulatory Networks

Thursday February 26, 2026

8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*

9:00 *MODERATOR: Wilkie*

9:00–9:30 **Andrew Blumberg** (Columbia University)
Manifold Learning and Optimal Transport in Genomics Part 1

9:40–9:50 *Break*

9:50–10:20 **Andrew Blumberg** (Columbia University)
Manifold Learning and Optimal Transport in Genomics Part 2

10:30–10:45 *Break*

10:45–11:25 **Samantha Riesenfeld** (University of Chicago)
Insights from Developing Hybrid Quantum-Classical Algorithms for Biomarker Discovery in Multimodal Cancer Data

11:35–11:50 *Break*

(Thursday schedule continued on next page)

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11:50–12:30 **Michael Perlmutter** (Boise State University)
The Geometric Scattering Transform for High-dimensional Data Analysis

12:40–2:40 *Lunch (on your own)*

2:40 *MODERATOR: Laubenbacher*

2:40–3:20 **Arne Traulsen** (MPI for Evolutionary Biology)
Evolutionary dynamics in Small Network Structured Populations

3:30–4:00 *Break*

4:00–4:40 **Andrea Bild** (City Of Hope)
A Predictive, Biology-Driven Framework to Guide Cancer Therapy

Friday February 27, 2026

8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*

9:00 *MODERATOR: Banuelos*

9:00–9:40 **Tibor Antal** (University of Edinburgh)
Modelling Metastasis Formation

9:50–10:05 *Break*

10:05–10:45 **Hongkai Zhao** (Duke University)
Simple and Efficient Fictitious Play for Mean-Field Games

10:55–11:10 *Break*

11:10–11:50 **Jasmine Foo** (University of Minnesota, Twin Cities)
Virtual Talk: Role of Growth and Selection in Site Frequency Spectra of Evolving Populations

12:00–2:00 *Lunch (on your own)*

2:00 *MODERATOR: Komarova*

2:00–2:40 **Paul Newton** (University of Southern California (USC))
Gaming the Cancer-Immunity Cycle by Synchronizing the Dose Schedules

2:50–3:20 *Break*

3:20–4:00 **Lorin Crawford** (Microsoft Research New England)
When more isn't better: A Lesson from Rethinking Scale in Single-cell Foundation Models

4:10–5:00 *Future Directions Discussion*

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