

MONDAY, AUGUST 3

09:15	Welcome Philip Tinnefeld, LMU Munich
09:30	Measuring Life at the Quantum Limit: Quantum Sensing for Biology and Health Lincoln Carr, Colorado School of Mines
10:10	Session 1 • Lukas Milles: Reconstructing biological function with de novo protein design • Adrian Schnell: <i>How Immune Sensors Read RNA Stress Signals: Integrating Experiment, Simulation and AI to Understand OAS2 Activation</i> • Andrey Sysoev: <i>Engineering Entropy-Driven FtsZ Contractility with De Novo Proteins</i>
11:00	Coffee
11:30	Session 2 • Wolfgang Losert: Astrocyte Biocomputing: Reimagining information flow in the brain • Eden Zhu: <i>Semantic Compression in Narrative Memory</i> • Mao Yasueda: <i>From Structure to Function: Cortical Structural Constraints Shape Dynamical Regimes in Decision Making</i> • Allison Cairns: <i>Molecular Topology of the Postsynaptic Density in Shank2 Knockout Circuits</i>
12:35	Lunch
14:00	From diamond defects to protein-based qubit sensors Peter Maurer, The University of Chicago
14:40	Session 3 • Armine Dingilian: <i>Quantifying classical and quantum bounds for resolving closely spaced, non-interacting, simultaneously emitting dipole sources in optical microscopy</i> • Anna Emenheiser: <i>Network-Level Characterization of Spontaneous Calcium Activity in an In-Vitro Alzheimer's Disease Model</i> • Steffen Rulands: Non-equilibrium physics of the epigenome
15:30	Coffee
16:00	Session 4 • Zan Luthey-Schulten: 4D simulations of a growing and dividing minimal cell • Ariana-Dalia Vlad: <i>Can Synthetic Cryo-EM Maps Replace Experimental Training Data for Atomic Model Building?</i> • Andreas Riedlberger: <i>Covalent, yet reversible: De novo design of autocatalytic ester-bond-forming enzymes</i> • Jonathan Levine: <i>Ensembles of predicted structures enable T cell peptide-MHC binding prediction</i>
17:05	Poster Flash Talks A1 – A29 (each presenter 1 min & 1 slide)
17:35 - 19:45	Poster Session and Welcome Reception

TUESDAY, AUGUST 4

- 09:00** **From Single Molecules to Self-Organizing Tissues: Engineering and Quantifying Human Brain Development in Organoids**
Barbara Treutlein, ETH Zürich
- 09:40** **Session 5**
- **Ralf Jungmann: *Molecular Physics of Life: Towards Single-Molecule Spatial Proteomics***
 - Iris Seitz: *Functionalization of DNA origami with monotypic RNA libraries for multivalent display*
 - Leon Kaub: *Nitrogen-vacancy magnetometry of magnetic nanoparticles across biological systems*
- 10:30** **Coffee**
- 11:00** **Session 6**
- **Herbert Levine: *Computational Model of Cellular Blebbing***
 - Veena Naveen: *Mathematical Modeling of Macrophage Polarization Dynamics and Molecular Feedback to Predict Immune Modulation Strategies*
 - Yu Fu: *Signal transduction through nonequilibrium nucleation of surface condensates*
- 12:00** **Poster Flash Talks B1 – B29** (each presenter 1 min & 1 slide)
- 12:30** **Poster session with lunch buffet**
- 14:30** **Session 7**
- **Seth Kenkel: *Nanoscale Molecular Mapping of Single Cells with Near Field Infrared Spectroscopic Imaging***
 - Salah Hassan: *Simulating structural transitions of HIV-1 Env glycoprotein during refolding*
 - Fabio Morella: *From Low Concentrations to Ternary Complexes: A Combined FLCS and 3-Color FCS Approach*
 - Samrat Basak: *Quantitative Nanoscale Mapping with Local PAINT and pMINFLUX*
- 15:35** **Coffee**
- 16:05** **Session 8**
- **Daniel Weissman: *Accessory genome evolution in Staphylococcus aureus***
 - Agathe Jouneau: *Investigating the dynamics of cellular rearrangements in minimal four-cell clusters*
 - Matthew Connell: *Role of substrate stiffness on cytotoxic T lymphocyte activation and differentiation*
 - Gillian McMahon: *4D mitochondrial network assumes distinct and predictive phenotypes through human lung and intestinal epithelial development*
- 17:10** **Hydration Break**
- 17:30** **Session 9**
- Halona Dantes: *Inferring Structure Factor of Living, Disordered Hyperuniform System*
 - Marie-Christin Spindler: *Spatial Organization Modulates Cellular Processes: Towards More Realistic Whole-Cell Models of Yeast*

TUESDAY, AUGUST 4

- Matheus Mello: *Cascade of conformational changes during the pre-B-to-B transition of the human spliceosome*
- Alexander Floroni: *Protocells assemble in heated rock pores*

18:30 Walk / Individual Transfer to Conference Dinner

19:00 **Conference Dinner Löwenbräukeller Beer Garden**
Stiglmaierplatz / Nymphenburger Str. 2, 80335 München
registered participants only

WEDNESDAY, AUGUST 5

- 09:00** **Pattern Formation Beyond Turing: Self-Organization Principles of Living Matter**
Erwin Frey, LMU Munich
- 09:40** **Session 10**
- Noa Goldberg: *The role of geometrical confinement on self-oscillating active matter*
 - Jinseok Lee: *From Soft Particles to Living Cells: A Framework for Tracer Diffusion in Crowded Environments*
 - Aalhad Bhatt: *Effects of spatial structure on selective sweep inference*
 - **Don Lamb: *SmFRET on Ssc1: From in vitro to in organelle***
- 10:45** **Coffee**
- 11:15** **Session 11**
- **José Onuchic: *Elucidating Cancer Metabolic Flexibility: When Genetic and Metabolic States Converge***
 - Ji Park: *Modeling a Continuum of Drug-Induced Persistence in Cancer*
 - Darin Momayezi: *Optimal transport reveals source of stochasticity in cancer immunotherapies by rare "spark" T-cells*
 - Ilan Edelstein: *Mechanistic Insights into Non-Equilibrium Membrane Motility of Influenza A Virus*
 - Natalie LiVecchi: *Towards In Situ Observation of Compressive Forces Generated in Genomes of Dividing HeLa Cells*
- 12:30** **Group Picture**
- From 14:00** **Guided Tours**
registered participants only
- From 17:00** **Topical table discussions**
Beer Garden Chinesischer Turm, Englischer Garten
more information to be announced

THURSDAY, AUGUST 6

09:00	Session 12 • Robert H. Austin: <i>Gradient metapopulation microfluidic ecologies shape genetic and biofilm drivers of T4r phage resistance in E. coli</i> • Andrea Ripamonti: <i>Transcriptional competition biases the effects of second messengers in Escherichia coli</i> • Deepthi Kailash: <i>Quantifying Spatial Correlations in Transcriptional Bursting during Embryonic Development</i> • Adam Kuhn: <i>Generative Modeling of Chromatin Conformations from High-Resolution FISH Data</i> • Vitor Leite: <i>Energy Landscapes of Intrinsically Disordered Proteins: From Physical Principles to Cancer Biology</i>
10:30	Coffee
11:00	Session 13 • Angel Mendieta: <i>Ensemble reconstruction of chromosome architecture from single-cell DNA traces</i> • Samuele Lipani: <i>Chromosome mechanics and relaxation from ensembles of polymer conformations</i> • Andrew Maytin: <i>Chromosome segregation in a minimal bacterial cell driven by SMC protein complexes</i> • Kurt Schmoller: <i>AI-driven automated microscopy video analysis reveals a major origin of species-level cell cycle diversity</i>
12:15	Lunch break
13:45	Session 14 • Eyal Karzbrun: <i>Self-organization of a human primitive gut tube driven by endoderm cell migration</i> • Sarah Zernia: <i>Single-molecule dissection of template-dependent transcription dynamics in T7 RNA polymerase</i> • Roman Tsukanov: <i>Microfluidics-Enhanced Automated Flamingo-Based Platform for Multiplexed Super-Resolution Microscopy</i> • Claudiu Gradinaru: <i>Diffusion and activation maps of GPCRs in live cells – key insights for basal and ligand-induced signaling</i>
15:00	Coffee
15:30	Session 15 • Julene Madariaga: <i>Single molecule studies of DNA-protein crosslink repair</i> • Garp Linder: <i>Single-Molecule Imaging Reveals DNA Shape Read-out by the INO80 Chromatin Remodeler</i> • Philip Tinnefeld: <i>Dynamic Structural Biology and Energy-Free DNA Computing</i>
16:20	Concluding remarks Don Lamb, LMU Munich
16:30	End of iPoLS

Poster Presentations

A1	Gadi Trocki	From local rules to a leaf-made ball ant nest.
A2	Sohit Miglani	Clustering of protein linkers drives a dynamical arrest in condensates
A3	Dana Dayan	DEPP: Dynamic Embedding Property-Based Predictor for Protein Conformational Ensembles and Drug-Protein Interactions
A4	Shubhadeep Sadhukhan	From biting to engulfment: curvature–actin coupling controls phagocytosis of soft, deformable targets
A5	Gautham Gopinath	Deformable Particle Modelling Reveals that Moving Cells have Plastic Shapes
A6	Timon Stegmaier	Single-Cell Image Analysis of Cell Size Recovery After G1 Arrest in FUCCI-Expressing RPE1 Cells using Cell-ACDC
A7	Anna Su	KnotWeaver: A Topology-Preserving Generative Model for Knotted Protein Design
A8	Abhishek Vaidyanathan	Thinking outside the cell: A theoretical approach to understanding leakage and cross-feeding in bacteria
A9	Jose Betancourt	Thermal fluctuations set fundamental limits on ion channel function
A10	Lucy Sullivan	Biophysical tradeoffs drive utilization of non-equilibrium strategies in adaptive biological signaling networks
A11	Elissa Moller	The altered stoichiometry of a non-inactivating mutant suggests the assembly sequence of the mechanosensitive channel MscS
A12	Latavia Thompson	Computational Models of Motor Prediction in the Cerebellum
A13	Arlind Kacirani	Do all roads lead to Rome? Insights from free energy calculations and molecular simulations of biomolecules
A14	Ron Michael Acda	FtsZ Filament Dynamics and Z-Ring Assembly within a Lattice-Based Reaction-Drift-Diffusion Framework
A15	Jianfei Jiang	Dissipative-particle-based simulation approach \ for amoeboid cell migration
A16	Abner Apsley	A Tour of the Yeast Genome: Efforts to Construct a Eukaryotic Whole-Cell Model
A17	Jan Willeke	Entropy-Induced Curvature: How Membrane-Anchored Proteins Shape Cell Geometry
A18	Natan Gordon	Quantifying Turing-Like Pattern Formation in Human Kidney Organoids
A19	Carlos Guilherme Tissi Batista	Probing Polymer Interactions in Softwood Cell Walls using Molecular Dynamics Simulation
A20	Chin Yuan Ong	Chemotactic control of run–reverse–flick motility in <i>Vibrio cholerae</i>
A21	Nikolas Hundt	Direct observation of lipid nanodomain-motor protein interactions using high-speed iSCAT microscopy
A22	Melanie Weiß	Interface stabilization increases the mechanical stability and speeds up folding kinetics of the de novo designed DHR14R protein
A23	Dhananjay Dhruva	Quantum-inspired super-resolution of fluorescent point-like sources

A24	Patrick Kelly	Modeling Stochastic Mesoscale Fluid-Structure Interactions
A25	Elisa Rheaume	Radio frequency dielectric permittivity of short-stranded DNA in solution with variable temperature
A26	Santiago Kuhl	Dynamics and mechanics of confined macrophage migration
A27	Kieran Hanley	Towards <i>in cellulosa</i> measurement of mechanical forces due to transcriptional chromatin remodeling
A28	Erekle Kalichava	Differential cross-lineage gene flow generates the two-mode pattern of intermediate-frequency accessory genes in <i>Staphylococcus aureus</i>
A29	Jose Gustavo Bravo Flores	A Gaussian Ion Model for Accurate and Efficient Biomolecular Simulations

B1	Venkatesh Jha	Patterns in Biology
B2	Mahathi Narayanaswamy	Emergence of Structural Colour in <i>C. lytica</i> bacterial colonies
B3	Marco Labella	Resolving heterogeneous dynamics in biomolecular phase separation with burst maximum likelihood analysis
B4	Xiaofeng Zhou	Enhancing plasmonic charge transfer via ferroelectric-semiconductor integration for methane production
B5	Tadeu L G Cabral	Insights into Enantiodiscrimination in Diffusion-NMR Using DFT and Machine Learning Interatomic Potentials
B6	Maya Geradi	Paracrine feedback generates non-additive responses to combinatorial immune signal integration
B7	Eric Arkfeld	4D Spatiotemporal Landscape of Mitochondrial Phenotypes Across Cellular States Unlocked Through Representation Learning
B8	Callum Coupland	RetroSCOPE technology effectively detects mRNA and non-coding RNA from FFPE-preserved samples
B9	Tianyi Cao	Receptor-Mediated Binding Kinetics of Ligand-Functionalized Lipid Nanoparticles for Targeted mRNA Delivery
B10	Felix Taiyang Dänekamp	Prebiotic replication of RNA by Templated Ligation
B11	Paula Tuulia Aikkila	Heat flows through rock cracks preserve RNA from alkaline and salinity-induced degradation
B12	Murilo Sanches	Mapping the Energy Landscape of Amyloid-Beta Aggregation
B13	Chaelin Lee-Eom	Live Imaging of Root–Soil Interactions in Transparent Granular Soil
B14	Nathan Zimmerberg	Hybrid filament-membrane Langevin dynamics for cytoskeletal–membrane mechanochemistry
B15	Natalie Collins	Theoretical Understanding of Target Search Dynamics in Horizontal Gene Transfer in Bacteria
B16	Emanuel Kava	Phase Behavior of Human GRASP55 Reveals a Stress-Regulated Membrane Remodeling Mechanism
B17	Aishwarya Ganesh	Negative Frequency-Dependent Selection Promotes the Coexistence of Motility and Nonmotility

B18	Miles Wetherington	tba
B19	Tereza Jahodova	Biosensor-based detection of Staphylococcus aureus gene mutation via kinetic parameters of fluorescent probe binding
B20	Iryna Poplevicheva	Native redesign of single-chain tetrameric avidins with tunable valency
B21	Quinn Reece	Using the Morphodynamic Network Model to Generate and Understand Nematic Order and Defects in Cell Monolayers
B22	Mikayla Greiner	Stiffness-dependent modulation of transcriptional bursting
B23	Marina Slawinski	Developing an Agent-Based Model of Structure-Function Relationships in Immune Response to Mycobacteria
B24	Ephraim Vazquez-Rosado	Dissecting the Role of Matrix Viscoelasticity in Growth Factor-Induced Salivary Gland Dynamics and Morphogenesis
B25	Viola Rintoul	Characterizing Genes of E. coli MG1655 and Plasmid Burden in Varied Oxidative Stress Environments
B26	Murilo Souza	Mechanistic basis of Neuropeptide Y functional amyloid formation for storage and release in secretory granules
B27	Jason Gill	Cytoskeletal Dynamics in Neural Network Activity and Learning
B28	Jiyun Jeong	Fossil Chromosomes Reveal the 3D Genome Architecture of a Woolly Mammoth
B29	Mehmet Velat Inci	Viral Diversity in a Stochastic CRISPR–Phage Coevolution Model