

# **BioSoft Frontiers: Physics of Soft and Biological Matter**

**Research Workshop of the Israel Science Foundation**

**September 18-21, 2016**

**Weizmann Institute of Science and Tel Aviv University**

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# Scientific Program

18/9/16

Weizmann Institute (Lopatie Center)

- 12:00-13:45    Arrival and Lunch
- 13:45-14:00    Opening
- 14:00-15:25    **Session 1.** Chair: Jacques Prost (Institut Curie, Paris)
- 14:00-14:30    Fred MacKintosh (VU University, Amsterdam)  
                    *Phase transitions and non-equilibrium behavior in living systems*
- 14:30-14:50    Ayelet Lesman (Tel Aviv University)  
                    *The influence of contractile forces on biological processes*
- 14:50-15:05    Xingpeng Xu (Weizmann Institute)  
                    *Nonlinear elastic responses of biopolymer gels under compression*
- 15:05-15:35    Tsvi Tlusty (IAS, Princeton)  
                    *Proteins as learning amorphous matter: dimension and spectrum of the genotype-to-phenotype map*
- 15:35-16:20    Coffee
- 16:20-17:25    **Session 2.** Chair: Nihat Berker (Sabanci University, Istanbul)
- 16:20-16:50    Christoph Schmidt (Universitaet Goettingen)  
                    *Active soft matter builds life*
- 16:50-17:05    Kinjal Dasbiswas (University of Chicago)  
                    *Mechanobiological induction of long-range contractility by diffusing biomolecules and size scaling in cell assemblies*
- 17:05-17:25    Yoram Burak (Hebrew University)  
                    *Encoding of an animal's trajectory by grid cells in the entorhinal cortex*
- 18:00            Dinner (Lopatie Center)

**19/9/16**

**Weizmann Institute (Lopatie Center)**

09:00-09:30 Arrival and coffee

09:30-10:35 **Session 3.** Chair: Erich Sackmann (Technical University, Munich)

09:30-10:00 Shigeyuki Komura (Tokyo Metropolitan University)

*Anomalous diffusion in active cells*

10:00-10:15 Dan Deviri (Weizmann Institute)

*Self-healing of holes in the nuclear envelope*

10:15-10:35 Tom Shemesh (Technion)

*Physical models for stabilization and repair of macro-apertures in endothelial cells*

10:35-11:15 Coffee

11:15-12:20 **Session 4.** Chair: Avinoam Ben-Shaul (Hebrew University)

11:15-11:45 Jean-Francois Joanny (Institut Curie, Paris)

*Activity induced Phase separation*

11:45-12:05 Assaf Zemel (Hebrew University)

*Polarizable force-dipoles in cellular systems: from cytoskeleton organization to morphogenesis*

12:05-12:25 Yael Roichman (Tel Aviv University)

*Fluctuations in active cytoskeleton networks*

12:25-14:00 Lunch

14:00-15:10 **Session 5.** Chair: Zhong-Can Ou-Yang (Institute of Theoretical Physics, Beijing)

14:00-14:30 Henri Orland (CEA, Saclay)

*Beyond Poisson-Boltzmann: Numerical sampling of charge density fluctuations*

14:30-14:50 Xingkun Man (Beihang University, Beijing)

*Defect-free Perpendicular Diblock Copolymer Thin Films*

14:50-15:10 Yair Shokef (Tel Aviv University)

*Combinatorial design of textured mechanical metamaterials*

15:10-16:00 Coffee

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## **CONTINUED: 19/9/16 (Weizmann Institute)**

- 16:00-17:00    **Session 6.** Chair: Adrian Parsegian (University of Massachusetts, Amherst)
- 16:00-16:30    Rudi Podgornik (University of Ljubljana)  
*Charge regulation – a force to be reckoned with*
- 16:30-16:45    Ram Adar (Tel Aviv University)  
*Electrostatic attraction between overall neutral surfaces*
- 16:45-17:00    Tomer Markovich (Tel Aviv University)  
*Ionic specific effects at electrolyte interfaces: surface tension and ionic profiles within a field-theory approach*
- 19:00            Gala Dinner (Herods, Tel Aviv)

**20/9/16**  
**Tel Aviv University (Beith Hatefutzot)**

- 09:00-09:20    Arrival and coffee (Beith Hatefutzot)
- 09:20-09:30    Opening
- 09:30-10:50    **Session 7.** Chair: Didier Roux (Saint-Gobain)
- 09:30-10:00    Dominique Langevin (Universite Paris Sud)  
*Electrostatic adsorption barriers at liquid interfaces: Consequences for emulsions and foams*
- 10:00-10:20    Yoav Tsori (Ben-Gurion University)  
*Hall effect in flowing electrolytes*
- 10:20-10:50    Roland Netz (Freie Universitaet, Berlin)  
*Hydration effects turn a highly stretched polymer into an energetic spring*
- 10:50-11:20    Coffee
- 11:20-12:55    **Session 8.** Chair: Michael Kozlov (Tel Aviv University)
- 11:20-11:50    Masao Doi (Beihang University, Beijing)  
*Variational principle in the dynamics of soft matter*
- 11:50-12:10    Shelly Tzlil (Technion)  
*Elastic-mediated interactions between cells*
- 12:10-12:25    Ohad Cohen (Weizmann Institute)  
*Dynamical response and synchronization of cardiac cells*
- 12:25-12:55    Ulrich Schwarz (Universitaet Heidelberg)  
*Active mechanics of stress fibers*
- 12:55-14:30    Lunch
- 14:30-15:30    **Session 9.** Chair: Michael Schick (University of Washington, Seattle)
- 14:30-14:50    Anton Zilman (University of Toronto)  
*Physics of the Nuclear Pore Complex*
- 14:50-15:10    Benjamin Friedrich (Max Planck Institute, Dresden)  
*Biaxial liquid crystal order in murine liver tissue*
- 15:10-15:30    Liraz Chai (Hebrew University)  
*Self-assembly and aggregation of bacterial extracellular matrix components*
- 15:30-16:00    Coffee

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## CONTINUED: 20/9/16 (Tel Aviv University)

16:00-17:20 **Session 10: *In memory of Loic Auvray***

Chair: Philip Pincus (University of California, Santa Barbara)

- 16:00-16:30 Françoise Brochard (ESPCI, Paris)  
*Entangled active matter: from ants to living cells*
- 16:30-16:50 Eli Sloutskin (Bar-Ilan University)  
*Morphogenesis in faceted liquid droplets: where membrane topology and crystallography meet*
- 16:50-17:20 Jean-Marc di Meglio (University Paris Diderot)  
*On ageing worms and differentiating amoebae*
- 17:20 Jean-Marc di Meglio (University Paris Diderot)  
*Loic Auvray*

**21/9/16**

**Tel Aviv University (Jaglom Auditorium, Senate Building)**

- 09:00-09:30 Arrival and coffee (Senate Building)
- 09:30-10:50 **Session 11.** Chair: William Gelbart (University of California, Los Angeles)
- 09:30-10:00 Cyrus Safinya (University of California, Santa Barbara)  
*Assembly in Neuronal Systems by Intrinsically Disordered Protein Tau*
- 10:00-10:20 David Lukatsky (Ben-Gurion University)  
*Design principles of non-consensus protein-DNA binding*
- 10:20-10:50 Pierre Sens (ESPCI, Paris)  
*Mechano-sensitive adhesion in cell spreading and crawling*
- 10:50-11:20 Coffee
- 11:20-12:30 **Session 12.** Chair: Tom Witten (University of Chicago)
- 11:20-11:50 Michael Cates (University of Cambridge)  
*Light-guided assembly of active ratchets*
- 11:50-12:10 Ofer Feinerman (Weizmann Institute)  
*The mechanics of ant cooperative transport*
- 12:10-12:30 Gil Ariel (Bar-Ilan University)  
*Levy walks in swarming bacteria*
- 12:30-13:00 Sam Safran (Weizmann Institute) and David Andelman (Tel Aviv University)  
*Closing remarks*
- 13:00-14:00 Light lunch and goodbye
- Transportation to Ben-Gurion airport