

**IUTAM Symposium on
Cellular, Molecular and Tissue Mechanics
June 18 – 21, 2008**

Tuesday, June 17

18:00 Welcome Reception

Wednesday, June 18

8:45 Opening remarks

Tissue Mechanics (Chair: E. Kuhl)

9:00 Ellen M. Arruda: *Experimental and Computational Investigation of Poroviscoelasticity in Native and Engineered Connective Tissue*

9:30 T. D. Nguyen : *A Microstructure-Based Anisotropic, Nonlinear Viscoelastic Model for Irregular Fibrous Tissues*

10:00 P. Ciarletta, A.N. Natali, P.G. Pavan & E.L. Carniel: *Hysteretic Behavior of Soft collagenous Tissues: Analysis of Energy Dissipation and Non-recoverable Strain*

10:30 BREAK

Cell-substrate Interactions (Chair: E.M. Arruda)

11:00 J.A. Stella, J. Liao, Y. Hong, W.D. Merryman, W.R. Wagner & M.S. Sacks: *Tissue-Cellular Deformation Coupling in Cell Microintegrated Elastomeric Scaffolds*

11:30 D.E. Discher: *Matrix Elasticity Directs Stem Cell Lineage: Experiments & Computational Insights*

12:00 R. De, A. Zemel & S.A. Safran: *Dynamics of Stress Response of Biological Cells*

12:30 LUNCH

Mechanotransduction in Proteins (Chair: D.E. Discher)

13:30 V. Vogel: *Tuning the Structure-function Relationship of Extra-and Intracellular Proteins: stretching fibronectin fibers and talin*

14:00 M.P. Sheetz: *Shaping Cells by Force and Rigidity Through Protein Stretching*

Mechanics of DNA (Chair: D.E. Discher)

14:30 S. Goyal, T. Lillian, N.C. Perkins, E. Meyhöfer: *Mechanics of DNA Looping by the Lac Repressor Protein: How Stress-free Shape Influences Loop Energetics and Topology*

15:00 BREAK

Mechanics of DNA(continued) (Chair: S. Goyal)

15:30 N. Clauvelin, B. Audoly & S. Neukirch: *Magnetic Tweezer Experiments as a Benchmark for Models of DNA-DNA Electrostatic Interaction*

16:00 P. Purohit: *Torsional Buckling and Plectoneme Formation in Fluctuating DNA*

16:30 Y.Y. Biton & B.D. Coleman: *On the Theory of the Sequence-dependent Mechanics of DNA Supercoiling with Electrostatic Forces Taken into Account*

Thursday, June 19

Morphogenesis (Chair: L. Taber)

8:30 M. Krieg, Y. Arboleda, P.H. Puech, J. Käfer F. Graner, C.P. Heisenberg & D.J. Müller: *Deciphering Molecular Forces that Govern Germ layer Organization during Gastrulation*

9:00 J. Dervaux & M. Ben Amar: *Morphogenesis of Growing Soft Tissues*

9:30 S.R. Lubkin: *Mechanics in Epithelio-Mesenchymal Interactions*

10:00 BREAK

Morphogenesis(continued) (Chair: S.A. Safran)

10:30 L.A. Taber: *On a Fundamental Principle for Morphomechanics*

Cell-substrate Interactions (continued) (Chair: S.A. Safran)

11:00 B. Geiger, S. Winograd-Katz, C. Luxenburg, I. Patela, T. Volberg, J. Spatz, O. Medalia, L. Addadi: *The Molecular Organization of Adhesion-signaling Complexes of the Intergrin Adhesome*

11:30 S. Jungbauer, H. Gao, J.P. Spatz & R. Kemkemer: *Universal Frequency-Dependent Response of Cells Under Cyclical Strain*

12:00 J.P. Spatz: *Chemo-Mechanical Stimulation of Cells by Nano-Digital Environments*

12:30 LUNCH

Posters

13:00 – 15:00

M. Arslan, S. Cantournet & M. Boyce: *Micromechanical Modeling of Microtubules*

S. Calve & H.G. Simon: *Extracellular Control of Limb Regeneration*

C. Castro, A. Hu, H. Pleogh, M. Boyce & M. Lang: *B Lymphocyte Membrane Reservoir Mechanics*

R. De, A. Zemel & S.A. Safran: *Dynamics of Active Cellular Response Under Stress*

Posters (continued)

A.E. Ehret, M. Itskov: *A Viscoelastic Anisotropic Model for Soft Collageneous Tissues Based on Distributed Fiber-Matrix Units*

R. P. Hoo, W.R. Walsh & M.J. Hoffman: *Analysis of Elastic-Viscous-Plastic Deformation Behavior of Cortical Bone Determined by Nanoindentation and Analytical Modelling*

S. Jungbauer, H. Gao, J.P. Spatz & R. Kemkemer: *Dynamics of Cell Responses to Mechanical Stretching*

Alexander Kohlmaier, Parthive Patel, Huaqi Jiang & Bruce Edgar: *Tissue Homeostasis by Mechanical Feedback on the Stem Cell Cycle in Vivo?*

R.Y. Kwon, A.J. Lew & C.R. Jacobs: *A Microstructurally Informed Model for the Mechanical Response of Three-dimensional Actin Networks*

J. Ma, K. Goble, T. Kostrominova, L. Larkin, E. Arruda: *Morphological and Mechanical Characteristics of Three-Dimensional Engineered Bone-Ligament-Bone Constructs from Rat and Human BMSCs*

K.L. Mills, X. Zhu, D. Huh, T. Uchida, S. Takayama & M.D. Thouless: *Nanocracking of Plasma-oxidized Polydimethylsiloxane and some Applications in Nano- and Bio-technology*

T. Mueller, G. Behme, H. Haschke, W. Dobler & R. Owen: *Quantifying Protein-mediated Cell Adhesion by Single Cell Force Spectroscopy*

S. Murtada, M. Kroon & G.A. Holzapfel: *Mechanical Modelling of Calcium Activated Contraction of Smooth Muscle Cells*

J.E. Olberding, M.D. Thouless, E.M. Arruda & K. Garikipati: *The Reaction-Limited Regime of Focal Adhesion Dynamics*

J.S. Palmer & M. Boyce: *Poroviscoelastic Modeling of Cross-linked Actin Filament Networks*

R. Paul & U. Schwarz: *Pattern Formation and Force Generation by Cell Assembly*

R. Vandiver & A. Goriely: *Tissue Tension and Axial Growth in Cylindrical Elastic Structures*

Y. Wei: *Entropic-elasticity-controlled Dissociation and Energetic-elasticity-Controlled Rupture induce catch to slip bonds in Cell-adhesion Molecules*

A. Zemel & A. Mogilner: *Active Dynamics of Polar Filament Bundles*

EXCURSIONS

15:30

Friday, June 20

Mechanics of Biopolymer Networks (Chair: E. Van der Giessen)

8:30 M.C. Boyce, J.S. Palmer, C.E. Castro & M. Arslan: *Microstructurally-Informed Constitutive Modeling of the Stress-Strain Behavior of Biological Macromolecular Networks*

9:00 F.C. MacKintosh: *Non-equilibrium Mechanics and Dynamics of Cytoskeletal Networks*

9:30 P.R. Onck, E.M. Huisman, T. van Dillen, E. van der Giessen: *The Effect of Network Architecture on the Mechanics of Three-dimensional Cross-linked Actin Networks*

10:00 BREAK

Cell Adhesion (Chair: H. Gao)

10:30 L.B. Freund: *A Model of the Forced Separation of a Molecular Bond*

11:00 J.E. Olberding, M.D. Thouless, E.M. Arruda & K. Garikipati: *A Theoretical Study of the Thermodynamics and Kinetics of Focal Adhesion Dynamics*

11:30 D. Ambrosi: *Cellular Traction on Flat Surfaces: An Inverse Problem in Linear Elasticity*

12:00 LUNCH

Growth (Chair: K. Garikipati)

13:00 R. Bernal, E.R. Rojas & J. Dumais: *The Mechanics of Tip Growth Morphogenesis: Comparing Experiments and Theory*

13:30 E. Kuhl, S. Göktepe, O. Abilez & C.K. Zarins: *Dilation and Hypertrophy – A Cell-based Continuum Mechanics Approach Towards Ventricular Growth and Remodeling*

14:00 A. Goriely & R. Vandiver: *On the Notions of Mechanical Stability and Bifurcation for Growing Elastic Soft Tissues*

14:30 BREAK

Mechanics of Biopolymer Networks (Continued) (Chair: M.C. Boyce)

15:00 M. Upmanyu, H.L. Wang & L. Mahadevan: *Bends and Twists: Stability and Elasticity of Twisted Biopolymers and their Networks*

15:30 G. Zagar, P.R. Onck & E. van der Giessen: *Effect of Cross-links on the Mechanical Response of Cross-linked Networks*

16:00 A.P. Liu, D.L. Richmond, L. Maibaum, P.G. Geissler & D.A. Fletcher: *Dynamic Self Assembly of Protrusive Actin Networks on Giant Vesicles*

16:30 BREAK

16:45 T. Kim, H. Lee, W. Hwang & R.D. Kamm: *Computational and Experimental Modeling of cytoskeletal rheology*

Passive Mechanical Response of Proteins (Chair: M.C. Boyce)

17:15 R. Ballarini, Z.L. Shen, M.R. Dodge, S.J. Eppell & H. Kahn: *Stress-strain Experiments on Individual Collagen Fibrils*

19:00 BANQUET STARTING WITH RECEPTION

Saturday, June 21

Cell Adhesion (Continued) (Chair: L.B. Freund)

8:30 J. Qian, J. Wang & H. Gao: *Nanomechanics of Biological Systems – From Single Molecular Bonds to Continuum Mechanics Descriptions of Cell Adhesion*

9:00 V.S. Deshpande, A. Pathak, R.M. McMeeking & A.G. Evans: *Simulation of the Coupling of Cell Contractility and Focal Adhesion Formation*

9:30 U. Schwarz, A. Besser, J. Colombelli & E. Stelzer: *Modeling the Coupling between Biochemistry and Mechanics in Cell Adhesion*

10:00 BREAK

Cell Adhesion (Continued) (Chair: U. Schwarz)

10:30 R.M. Springman & J.L. Bassani: *Mechano-chemical Coupling in the Adhesion of Thin Structures to Surfaces with Topography*

11:00 D. Ingber: *Mechanobiology and Developmental Control*

Poroelasticity of Bone (Chair: U. Schwarz)

11:30 M.L. Oyen: *Bone Composite Mechanics Related to Collagen Hydration State*

12:00 G.B. Gailani & S.C. Cowin: *Russian Doll Poroelasticity; A Model for Fluid Transport in Tissues*

12:30 LUNCH

13:30 Open for Discussion

Conference Ends