

## 6th Texas Soft Matter Meeting: Schedule

University of Houston, August 18, 2017

Talks held in Engineering Lecture Hall (L2D2) unless otherwise noted.

See [txsoftmatter.chee.uh.edu/information](http://txsoftmatter.chee.uh.edu/information) for detailed information. Please park in student lots.

7:45–8:25	Registration and Breakfast
8:25–8:35	Introductory remarks
8:35–9:40	Contributed session I: Mechanics, Transport, and Modeling
9:40–10:20	Invited talk: Pradeep Sharma
10:20–10:40	Coffee break
10:40–11:20	Invited talk: Sarah Bondos
11:20–12:20	Contributed session II: Polymers
12:20–13:20	Lunch (UC Satellite)
13:20–14:00	Poster session and coffee
14:00–14:40	Invited talk: Nathaniel Lynd
14:40–15:20	Contributed session III: Colloids and Nanoparticles
15:20–16:00	Invited talk: Jonathan Schaefer
16:00–16:20	Coffee break
16:20–17:00	Invited talk: S. Lisa Biswal
17:00–18:00	Contributed session IV: Interfacial Phenomena
18:00–18:05	Closing remarks



## 6th Texas Soft Matter Meeting: Invited Abstracts

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**Pradeep Sharma** (psharma@uh.edu)

Mechanical Engineering, University of Houston

*Flexoelectricity and Electrets*

The ability of certain materials to convert electrical stimuli into mechanical deformation, and *vice versa*, is a prized property. Not surprisingly, applications of such so-called piezoelectric materials are broad – ranging from energy harvesting to self-powered sensors. In this presentation, I will highlight a relatively understudied electromechanical coupling called flexoelectricity that appears to have implications in topics ranging from biophysics to the design of next-generation soft multifunctional materials. Specifically, I will argue, through computational examples, the tantalizing possibility of creating apparently piezoelectric materials without piezoelectric materials *e.g.* graphene, emergence of giant piezoelectricity at the nanoscale, and (among others) the mechanisms underpinning magnetoreception in certain animals.

**Sarah Bondos** (sebondos@medicine.tamhsc.edu)

Texas A&M Health Science Center

*Engineering and Functionalizing Protein-based Materials*

The development of materials with diverse mechanical and functional properties enables a broad range of applications. For materials composed of protein, well-established molecular biology techniques can theoretically be used to alter the mechanical and functional properties of materials. However, repetition of amino acid sequences in the constituent proteins can complicate engineering the mechanical properties. Furthermore, most protein-based materials are assembled under denaturing conditions, thus precluding incorporation of full-length proteins in an active state. Our lab discovered that the *Drosophila melanogaster* transcription factor Ultrabithorax (Ubx) self-assembles into materials. These materials are stabilized by specific dityrosine bonds that spontaneously form during assembly. The location of the participating tyrosines in unique sequence motifs enables the reliable tuning of the materials by mutagenesis to be either weaker or stronger. Because Ubx materials rapidly form in mild, aqueous buffers, a surprisingly wide variety of proteins can be incorporated via gene fusion without harming either materials assembly or the function of the appended protein. Indeed, when Ubx is fused to angiogenic growth factors, the resulting fibers control cell signaling and cell behavior *in vitro*, and can instigate and guide blood vessel formation *in vivo*. Finally, Ubx proteins in materials retain the ability to bind specific DNA sequences with high affinity. Ubx materials provide an inexpensive and facile platform for customizing materials for a variety of applications.

**Nathaniel Lynd** (lynd@che.utexas.edu)

Chemical Engineering, University of Texas – Austin

*Living polymerization of epoxides with new mono- $\mu$ -oxo-dialuminum (MOD) initiators*

Poly(ether)s derived from epoxides represent a versatile class of functional polymeric materials. Epoxide ring-strain depends little on monomer structure. This fact enables the potential for true compositional control of structure-property relationships in a macromolecular platform toolkit. Unfortunately, epoxides do not polymerize to high molecular weights and low dispersities by any method in common usage not requiring sophisticated synthetic skill and equipment. As a first step toward simplifying poly(ether) chemistry for the non-specialist, our lab has developed a class of stable, crystalline mono- $\mu$ -oxo-dialuminum (MOD) initiators that offer the control of classical anionic ring-opening polymerization, but the tolerance to chemical functionality and access to high molecular weight characteristic of catalytic approaches. The MOD initiators can be synthesized in a single step with purification afforded by direct crystallization from the reaction medium. The MOD-initiated living polymerizations create heterobifunctional materials at controlled

molecular weights. In this presentation, the historical and technical basis for the development of the versatile MOD initiators will be presented.

**Jonathan Schaefer** (jonathan.schaefer@exxonmobil.com)

ExxonMobil Chemical Company

*Confocal Raman Microscopy of the In-situ Uniaxial Deformation of Polyethylene*

Although polyethylene is one of the most common plastics, it is still a polymer that is actively being researched to produce materials with improved properties. The design of better plastics requires understanding process-structure relationships. In this work, confocal Raman microscopy was used to investigate the in-situ uniaxial deformation of a linear-low density polyethylene dog bone sample. Confocal Raman microscopy, a technique that is sensitive to the chemical and structural information of polyethylene, is used to measure changes in the orthorhombic crystalline, isotropic amorphous, and anisotropic disordered phases during a tensile test. In addition, Raman spectroscopy is sensitive to the trans and gauche conformers in the polyethylene sample, which were monitored throughout the deformation. Besides polyethylene phase information, orientation of the polyethylene chains is another important morphological feature that was measured using polarized Raman spectroscopy. The changes in polyethylene structure and orientation during deformation were monitored from the elastic region of the stress-strain curve through the yield point and into the strain hardening region. After the deformation, the polyethylene sample morphology was found to change significantly upon relaxation and lengthwise contraction of the polymer. Confocal Raman microscopy was demonstrated to be an applicable technique for studying the in situ process effects on morphology.

**S. Lisa Biswal** (biswal@rice.edu)

Chemical Engineering, Rice University

*Fidget Spinning with Paramagnetic Colloids*

One of the most exciting areas in colloid research is the control of interparticle interactions to generate new structures. The ease of tuning interactions, size, shape and composition has made these nano- and micrometer sized particles appealing probes for studying the fundamental phenomena of atomic systems. I will describe the application of time-varying magnetic fields to assemble paramagnetic colloidal atoms to investigate the dynamics of 2D interfacial and thermodynamic properties.

## 6th Texas Soft Matter Meeting: Sound Bite Titles

### Session I: Mechanics, Transport, and Modeling (8:35am–9:40am)

1. Maxwell Smith (University of Houston, maxsmith1989@gmail.com)  
*Dynamics of Filamentous Viral Nanoparticles in Semidilute Polymer Solutions*
2. Walter Chapman (Rice University, wgchap@rice.edu)  
*Molecular Thermodynamic Model of Complex Fluids: Phase Behavior, Microstructure, and Interfacial Behavior*
3. Deepak Mangal (University of Houston, dmangal@uh.edu)  
*Simulation of Nanoparticle Dynamics in Confined Polymer Solution*
4. Peng He (Rice University, ph21@rice.edu)  
*Effect of Flow Rates on the Deposition of Asphaltenes in Porous Media*
5. Kyoseung Sim (University of Houston, kyos0308@gmail.com)  
*Electronically Innervated Adaptive Fully Soft Robots*
6. Jingxiang Guo (University of Houston, jguo32@wisc.edu)  
*Homogeneous Nucleation and Crystallization Processes*
7. Steven Williams (Rice University, smw7@rice.edu)  
*Improving the Mechanical Properties of CNT Aerogels through Crosslinking*
8. Jordan Keith (University of Texas – Austin, jordan.keith@utexas.edu)  
*Mechanisms Underlying Ion Diffusion in Polymeric Ionic Liquids*
9. Evan Biggers (Rice University, egb5@rice.edu)  
*Line Tension of Sessile Microdroplets in Carbon Nanotube Liquid Crystalline Solutions*
10. Pieter in 't Veld (BASF SE, pieter.intveld@basf.com)  
*Soft Matter Modeling in an Industrial Environment*
11. Minh Vo (University of Houston, mdvo3@uh.edu)  
*Nanoparticle Transport in Complex Porous Media*
12. Madushani Dharmarwardana (University of Texas – Dallas, mxd110630@utdallas.edu)  
*Thermo-Mechanically Responsive Crystalline Organic Cantilever*
13. Daniel Vecchiolla (Rice University, Daniel.J.Vecchiolla@rice.edu)  
*Bubble Pinch-Off Under High Strain Rates in a Microfluidic Expansion Channel*
14. Renjie Chen (University of Houston, rchen8@uh.edu)  
*Simulation of Nanoparticle Diffusion in Semidilute Polymer Solutions*
15. Yuchong Zhang (Rice University, yz74@rice.edu)  
*DFT Study of Dendrimers in Solvents*
16. Benjamin Perez (University of Houston, benrperez1996@gmail.com)  
*Measuring Dynamics of M13 Bacteriophage Nanoparticles using Microscopy Techniques*
17. Pushkar Lele (Texas A&M University, plele@tamu.edu)  
*Soft Matter Mechanics and Biophysics*
18. Dejie Kong (Texas Tech University, dejie.kong@ttu.edu)  
*Dynamic Study of Circular DNA by Bulk Rheology*
19. Dipak Aryal (University of Texas – Austin, daryal@utexas.edu)  
*Effect of Salt and Water on Transport Properties of Di-block Co-Polymers: Computational Study*
20. Sarah Aderyani (University of Houston, saderyani@uh.edu)  
*Modeling Ionic Diffusion in Reduced Graphene Oxide/Aramid Nanofiber Composite Electrode in Supercapacitors*
21. Zhao Tang (Rice University, zt5@rice.edu)  
*SWNTs Brownian Dynamics in Rock-Like Porous Media*

**Session II: Polymers (11:20am–12:20pm)**

1. Rajshree Chakrabarti (University of Houston, rajshreec922@gmail.com)  
*Free Heme and Sickle Hemoglobin (HbS) Polymerization*
2. Hyosung An (Texas A&M University, qcan17pp@tamu.edu)  
*Conducting Block Copolymer Battery Electrode Binders Compared Against Their Homopolymer Blend Analogs*
3. Saman Gheyhani (University of Houston, sgheyhani@uh.edu)  
*Boosting Aqueous Batteries with Organic Electrodes*
4. Aaron Burkey (University of Texas – Austin, burkey@utexas.edu)  
*Cryoprotective Polymeric Materials*
5. Venkatesh Balan (University of Houston, vbalan@uh.edu)  
*Bio-Composites and Their Properties Made Using Agricultural Residues*
6. Chunhao Zhai (Texas Tech University, chunhao.zhai@ttu.edu)  
*Ionic Liquid Additive to Toughen Polycyanurates: Cure and Properties*
7. Zhe Su (Rice University, zhe.su@rice.edu)  
*Alignment and Charge Transport of One-Dimensional Conjugated Polymer Nanowires in Insulating Polymer Blends*
8. Shun Xi (Rice University, shun.xi@rice.edu)  
*Microstructure and Alkane Solubilization of Block Copolymer Micelles*
9. Haejin Kim (University of Houston, hkim60@central.uh.edu)  
*Rubbery Electronics and Sensors from Intrinsically Stretchable Elastomeric Composites of Semiconductors and Conductors*
10. Josh O’Neal (Texas A&M University, hammer534@tamu.edu)  
*Swelling Behavior of Polyelectrolyte Multilayers in the Presence of Various Monovalent Ions*
11. Lauren Taylor (Rice University, lwt1@rice.edu)  
*Solution Spun MnO<sub>2</sub>-Doped Carbon Nanotube Fibers for Sewable Supercapacitors*
12. Yunxiang Gao (Rice University, yunxiang.gao@rice.edu)  
*AgNWs-embedded Fast-Responsive Liquid Crystalline Elastomers (LCEs)*
13. Minjie Shen (University of Houston, jackshen1027@gmail.com)  
*Sustainable Epoxy Resins Containing Multifunctional Biobased Components*
14. Yanpu Zhang (Texas A&M University, yanpuzhang@tamu.edu)  
*The Effect of Water on the Thermal Transition Observed in Polyelectrolyte Complexes (PECs)*
15. Jialin Qiu (University of Houston, jialinqiu10@gmail.com)  
*Thermodynamic Interactions in Model Polydiene/Polyolefin Blends*
16. Rui Sun (Texas A&M University, vickiesr@tamu.edu)  
*Polymerized Ionic Liquid Derived Carbons*
17. Tyler Cooksey (University of Houston, tyler.j.cooksey@gmail.com)  
*Tuning Biocompatible Block Copolymer Micelles by Varying Solvent Uptake*
18. Bill Wheatle (University of Texas – Austin, bkw686@utexas.edu)  
*Influence of Host Polymer Dielectric Constant in Polyether-Based Battery Electrolytes*
19. Tzu-Han Li (University of Houston, tli12@uh.edu)  
*Dispersity as a Design Parameter for Engineering Responsive Polymer-Grafted Nanoparticles*
20. Xuejian Chen (Florida State University, xc12b@my.fsu.edu)  
*Phase Separation in the Melt of a Broadly Distributed Random Ethylene Copolymer Showing Special Memory Effect on Crystallization Demonstrated By SANS*

21. Matthew Bolen (Texas A&M University, mattbolen@tamu.edu)  
*FTIR Spectroscopic Investigation for Role of Hydration in Thermal Transitions of Polyelectrolyte Multilayers*
22. Wenyue Ding (University of Houston, dingwenyue1234@gmail.com)  
*Improving Mechanical Properties of Fatty Acid-Derived Thermoplastic Elastomers by Incorporating a Transient Network*

**Session III: Colloids and Nanoparticles (2:40pm–3:20pm)**

1. Yiyuan “Ben” Yin (Rice University, yy32@rice.edu)  
*Charge-Assembled Fluorescent Gold Microcapsules with Enhanced Chromium(VI) Sensitivity*
2. Sourya Banik (Texas Tech University, sourya90@gmail.com)  
*Correlating Structural Recovery in Molecular and Colloidal Glasses*
3. Luqing Qi (Rice University, lq3@rice.edu)  
*pH-responsive Polymer Coated Nanoparticles for Controlled Emulsification of Heavy Oil*
4. Wanmei Sun (Texas A&M University, wanmei@tamu.edu)  
*High Yield of Ultra-Large Graphene Flakes via Electrochemical Exfoliation*
5. Rituparna Samanta (University of Texas – Austin, rituparna@utexas.edu)  
*Influence of Dielectric Inhomogeneities in Aggregation of Charged Nanoparticles in Solution*
6. Yi-Ting Chen (University of Houston, ychen75@uh.edu)  
*Protein Detection Using Strong Magnetic Particles: A Morphology-Dependent Study*
7. Candace Benjamin (University of Texas – Dallas, ceb150230@utdallas.edu)  
*Site Selective Nucleation and Growth of Gold Nanoparticles on the Pore Structures of a Virus*
8. Smit Shah (Texas A&M University, smit.shah@tamu.edu)  
*3D Titanium Carbide (MXene) Particles Crumpled by Capillary Forces*
9. Madhusudhan Reddy Pallaka (Texas Tech University, madhusudhan.pallaka@gmail.com)  
*The Glass Transition of Supported and Unsupported Polymer Nanorods using Flash Differential Scanning Calorimetry*
10. Artee Bansal (Rice University, ab43@rice.edu)  
*Thermodynamic Model of Mixed Patchy Colloids*
11. Esmeralda Umancor (University of Houston, esmer.10@att.net)  
*Effects of Salt and Polymer Concentration on the Phase Behavior of a New Model Colloid System*
12. Qi Li (Texas Tech University, ricky.li@ttu.edu)  
*Aging and Glassy Behaviors in a Model Colloidal System*
13. Shreya Shah (University of Houston, shreyashah2005@gmail.com)  
*Highly Crystalline Iron Oxide Nanoparticles with Dual Magnetic and Optical Properties*
14. Soundar Ramchandran (Element 26 Technology, soundar.ramchandran@gmail.com)  
*Potassium Ferrate: A Molecule with Potential*

**Session IV: Interfacial Phenomena (5:00pm–6:00pm)**

1. Benjamin Keitz (University of Texas – Austin, keitz@utexas.edu)  
*Influencing Protein Aggregation with Inorganic Materials*
2. Yuechuan Xu (University of Houston, alexxyc@uw.edu)  
*Recombinant Expression of Amyloid Beta Protein*
3. Lydia St. Hill (University of Houston, lrsthill@central.uh.edu)  
*Anti-Fouling Studies of Partially Fluorinated Spiroalkanedithiol Self-Assembled Monolayer Surfaces*

4. Gordon Christopher (Texas Tech University) gordon.christopher@ttu.edu  
*Interfacial Rheology of Pellicle Formation*
5. Siwakorn Sakunkaewkasem (University of Houston, siwakornwill@hotmail.com)  
*Bidentate-Based Mixed Self-Assembled Monolayers: A Route for Interfacial Control*
6. Yifan Zhu (Rice University, yifan.zhu@rice.edu)  
*Hybrid Inorganic/Organic Materials for Up-Conversion*
7. Zhuo Chen (University of Texas – Dallas, zxc130630@utdallas.edu)  
*Fluorescent Functionalization Across Quaternary Structure of Virus-Like Particles*
8. Sixue Cheng (Texas Tech University, sixue.cheng@ttu.edu)  
*Glass Transition and Cold Crystallization of Bulk and Nanoconfined Pharmaceutical Nifedipine*
9. Peyman Irajizad (University of Houston, pirajizad@uh.edu)  
*Magnetic Slippery Extreme Icephobic Surfaces*
10. Xu Wang (University of Houston, sdxu0123@126.com)  
*Moisture-Triggered Physically Transient Electronics*
11. Amit Jain (Rice University, aj45@rice.edu)  
*Polymer-Coated Membrane Capacitive Deionization for Low Energy Desalination*
12. Wenchuan Ma (University of Houston, mawenchuan1234@gmail.com)  
*Hematin Crystallization as a Part of the Heme Detoxification Mechanism of Malaria Parasites*
13. Pilar Suarez Martinez (Texas A&M University, p.suarez\_27@tamu.edu)  
*Spray-On Polymer-Clay Multilayers as a Superior Anticorrosion Metal Pretreatment*
14. Rashid Ghanbaripour (University of Houston, r.ghanbaripour@gmail.com)  
*Synthesis and Characterization of Methyl-Terminated Partially Fluorinated Alkanethiols*
15. Minxiang Zeng (Texas A&M University, glennlands@gmail.com)  
*Underwater Superoleophobic Hybrid Membranes for Effective Oil-Water Separation from Oil-Contaminated Water*
16. Shiyu Zhu (University of Houston, zhushiyu9201@gmail.com)  
*Effect of Dispersants on Biodegradation by Bacteria of Spilled Oil*
17. R. John Clark (University of Houston, rjclark2@uh.edu)  
*Octanol Structuring Near  $\beta$ -Haematin Surface*
18. Ankur Agarwal (University of Houston, ankur9511@gmail.com)  
*Solvent structuring at zeolite surface*
19. Shaoyang Wang (Texas A&M University, shaoyang.wang@tamu.edu)  
*In-situ Mechanistic Investigation of Nitroxide Radical Polymer Cathode on Interfacial Charge and Mass Transfer*
20. Narendra Dewangan (University of Houston, ndewangan@uh.edu)  
*Effect of Dispersants on Motility and Adhesion of Bacteria on Oil/Water Interfaces*

## 6th Texas Soft Matter Meeting: Poster Titles

1. Martin Pospisil (Texas A&M University, mapospis@tamu.edu)  
*3D Finite-Element Simulations of Cellulose Nanocrystal Alignment Dynamics*
2. Sakshi Yadav, Semih Gulec, Sirui Tang (Lamar University, yadavsakshi29@gmail.com, sgulec@lamar.edu, stang1@lamar.edu)  
*A Study of Interfacial Modulus by Centrifugal Adhesion Balance*
3. Ali Masoudi (University of Houston, amasoudi@uh.edu)  
*Antiscalting Magnetic Slippery Surfaces*
4. Anish Patel (Texas A&M University, agpatel@tamu.edu)  
*Aramid Nanofiber/Graphene/Carbon Nanotube Composite Electrodes for Structural Energy and Power*
5. Johnson Hoang (University of Houston, Jhoang@central.uh.edu)  
*Binary Mixed Self-Assembled Monolayers Derived from Ammonium-Terminated Adsorbates on Gold for Oligonucleotide Immobilization*
6. Mengying Yuan (University of Houston, myuan@uh.edu)  
*Biomaterial Enhances Performance in Lithium Ion Battery*
7. Zhao Tang (Rice University, zt5@rice.edu)  
*Brownian Diffusion of Single Walled Carbon Nanotubes in Highly Confined Rock-Like Porous Media*
8. Rebecca Booth (Texas A&M Health Science Center, rmbooth@tamu.edu)  
*Building a Better Biosensor: The LOO-GFP-Ubx System*
9. Shuang Qing (Texas A&M University, bellaqin@tamu.edu)  
*Combined High Stretchability and Gas Barrier in Hydrogen-Bonded Multilayer Nanobrick Wall Thin Films*
10. Sheyda Shakiba (University of Houston, sheida.shakiba23@gmail.com)  
*Controlled Evaluation of Interactions Between Environmental Macromolecules and Photoreactive Nanomaterials*
11. Nazanin Farokhnia (University of Houston, nazanin.farokhnia@gmail.com)  
*Decoupled Hierarchical Structures for Suppression of Leidenfrost Phenomenon*
12. Gabriela Geraldo Mendes (Texas A&M Health Science Center, mendesgg@tamu.edu)  
*Developing New Forms of Protein-Based Materials*
13. Yixuan Song (Texas A&M University, dorianxuan@tamu.edu)  
*Fast Self-Healing of Polyelectrolyte Multilayer Nanocoating and Restoration of Super Oxygen Barrier*
14. Varun Kashyap (University of Houston, vkashyap@uh.edu)  
*Flexible Anti-Clogging Graphite Film for Scalable Solar Desalination by Heat Localization*
15. Pannaree Srinoi (University of Houston, psrinoi@uh.edu)  
*Gold-Silver Nanoshells Coated with Uniformly Thin Silica Shells*
16. Eric Zhang (Texas A&M University, lc Zhang123@gmail.com)  
*Janus Nanoplatelets Based on Natural Clay for Enhanced Oil Recovery*
17. Touseef Habib (Texas A&M University, touseef@tamu.edu)  
*Liquid Surfactants for Processing Boron Nitride Nanosheets (BNNS)*
18. Mohamed Alhosani (Rice University, msa5@rice.edu)  
*Molecular Dynamic Simulation to Investigate the Effect of Napthanic Acid on Water/Oil Interfacial Tension*
19. Bahareh Eslami (University of Houston, beslami@uh.edu)  
*Non-Isothermal Buoyancy-Driven Exchange Flows in Inclined Pipes*
20. Tianlang Yu (University of Houston, samuelyu2014@gmail.com)  
*Polymer Mimics Using Cyclohexyl-Terminated Derivatives as Organic Thin Films*



21. Maria Marquez (University of Houston, mdmarqu2@gmail.com)  
*Reversing the Odd-Even Effects in Self-Assembled Monolayers Using UPD Silver*
22. Simone Lazar (Texas A&M University, lazar1st@tamu.edu)  
*Self-Extinguishing Flame Retardant Clay and Intumescent Multilayer Stacked Nanocoating on Polyurethane*
23. Tingting Liu (University of Houston, tliu20@central.uh.edu)  
*Sulfur-Based Nanostructures for Lithium-Sulfur Battery Applications*
24. Daniela Rodriguez (University of Houston, drodriguez31@uh.edu)  
*Sum Frequency Generation Spectroscopy of Terminally Fluorinated Self-Assembled Monolayers on UPD Silver and Bare Gold Substrates*
25. Riddhiman Medhi (University of Houston, rmedhi@uh.edu)  
*Synthesis and Characterization of Plasmonic Nanoparticles Coated with Tin Oxide Shells*
26. Parisa Ansari (University of Houston, parisa.ansari66@gmail.com)  
*Synthesizing, Characterization and Application of Gold Nanostars in Diagnosis*
27. Kristine Arvola (Texas A&M University, kristine.arvola@tamu.edu)  
*Utilizing Nanoscale Features in Gene Fused Protein Materials to Regulate Cell Behavior for Tissue Engineering*
28. Mohammad Safari (University of Houston, moh.safari.91@gmail.com)  
*Diffusive Dynamics of Bidisperse Suspensions*
29. Ryan Roberts (University of Houston, ryancrobert88@yahoo.com)  
*Tracer Diffusion in Attractive and Repulsive Glassy Matrices*