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|--|-------------------|--------------------------------|---|---|---------------------------------------|
| REPORT DOCUMENTATION PAGE  |                   |                                | 2   | Form Approved OMB NO. 0704-0188                           |                                       |
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| 1. REPORT DATE (DD-MM-YYYY)<br>15-08-2014  |                   | 2. REPORT TYPE<br>Final Report |   | 3. DATES COVERED (From - To)<br>20-Aug-2013 - 19-Aug-2014 |                                       |
| 4. TITLE AND SUBTITLE<br>Final Report: 50th Annual Technical Meeting of the Society of Engineering Science (SES)   |                   |                                | 5a. CONTRACT NUMBER<br>W911NF-13-1-0413                 |   |                                       |
|  |                   |                                | 5b. GRANT NUMBER  |   |                                       |
|  |                   |                                | 5c. PROGRAM ELEMENT NUMBER<br>611102                    |   |                                       |
| 6. AUTHORS<br>Pradeep R. Guduru  |                   |                                | 5d. PROJECT NUMBER                                      |   |                                       |
|  |                   |                                | 5e. TASK NUMBER   |   |                                       |
|  |                   |                                | 5f. WORK UNIT NUMBER                                    |   |                                       |
| 7. PERFORMING ORGANIZATION NAMES AND ADDRESSES<br>Brown University<br>Box 1929<br><br>Providence, RI 02912 -9093   |                   |                                | 8. PERFORMING ORGANIZATION REPORT NUMBER                |   |                                       |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS (ES)<br>U.S. Army Research Office<br>P.O. Box 12211<br>Research Triangle Park, NC 27709-2211   |                   |                                | 10. SPONSOR/MONITOR'S ACRONYM(S)<br>ARO                 |   |                                       |
|  |                   |                                | 11. SPONSOR/MONITOR'S REPORT NUMBER(S)<br>63688-MS-CF.1 |   |                                       |
| 12. DISTRIBUTION AVAILABILITY STATEMENT<br>Approved for Public Release; Distribution Unlimited   |                   |                                |   |   |                                       |
| 13. SUPPLEMENTARY NOTES<br>The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other documentation.  |                   |                                |   |   |                                       |
| 14. ABSTRACT<br>The Joint Conference of the 50th Annual Technical Meeting of the Society of Engineering Science (SES) and the ASME-AMD Annual Summer Meeting was held at Brown University during July 28-31, 2013. The SES Technical Meeting is held annually to foster and promote the exchange of ideas and information among the various disciplines of engineering and the fields of physics, chemistry, mathematics, bioengineering, and related scientific and engineering fields. The 2013 SES 50th Annual Technical Meeting was hosted by the School of Engineering, Brown University, located in Providence, Rhode Island. The symposium tracks were: (i) Mechanics of Fluids and Thermal   |                   |                                |   |   |                                       |
| 15. SUBJECT TERMS  |                   |                                |   |   |                                       |
| 16. SECURITY CLASSIFICATION OF:  |                   | 17. LIMITATION OF ABSTRACT     |   | 15. NUMBER OF PAGES                                       | 19a. NAME OF RESPONSIBLE PERSON       |
| a. REPORT<br>UU  | b. ABSTRACT<br>UU | c. THIS PAGE<br>UU             | UU  |   | Pradeep Guduru                        |
|  |                   |                                |   |   | 19b. TELEPHONE NUMBER<br>401-863-3362 |

## Report Title

Final Report: 50th Annual Technical Meeting of the Society of Engineering Science (SES)

### ABSTRACT

The Joint Conference of the 50th Annual Technical Meeting of the Society of Engineering Science (SES) and the ASME-AMD Annual Summer Meeting was held at Brown University during July 28-31, 2013. The SES Technical Meeting is held annually to foster and promote the exchange of ideas and information among the various disciplines of engineering and the fields of physics, chemistry, mathematics, bioengineering, and related scientific and engineering fields. The 2013 SES 50th Annual Technical Meeting was hosted by the School of Engineering, Brown University, located in Providence, Rhode Island. The symposium tracks were: (i) Mechanics of Fluids and Thermal Systems; (ii) Mechanics of Biological and Soft Materials; (iii) Mechanics of Solids and Structures; (iv) Mechanics in Materials Science; (v) Mechanics Education; (vi) SES 50th Anniversary Symposium (invited visionary talks). Each of the above tracks have multiple symposia that spanned the spectrum of research topics of current and future interest. Several symposia were planned to bring together communities of scientists and engineers spanning Applied Mechanics, Applied Mathematics, Materials Science, Chemistry, Physics, Biology & Medicine and Geology. The conference website (<http://www.brown.edu/Conference/ses2013/>) serves as the primary means of dissemination. All abstracts and the technical program is archived on the conference website, which is and will continue to be open to public without any restrictions. A copy of the technical program is included below, which can also be accessed (with live links) at: <http://www.brown.edu/Conference/ses2013/program.htm>. Abstracts of all talks can be accessed at: [http://www.brown.edu/Conference/ses2013/tracks\\_symposia.htm](http://www.brown.edu/Conference/ses2013/tracks_symposia.htm).

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**Enter List of papers submitted or published that acknowledge ARO support from the start of the project to the date of this printing. List the papers, including journal references, in the following categories:**

**(a) Papers published in peer-reviewed journals (N/A for none)**

| <u>Received</u> | <u>Paper</u> |
|-----------------|--------------|
|-----------------|--------------|

**TOTAL:**

**Number of Papers published in peer-reviewed journals:**

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**(b) Papers published in non-peer-reviewed journals (N/A for none)**

| <u>Received</u> | <u>Paper</u> |
|-----------------|--------------|
|-----------------|--------------|

**TOTAL:**

**Number of Papers published in non peer-reviewed journals:**

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**(c) Presentations**

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**Non Peer-Reviewed Conference Proceeding publications (other than abstracts):**

Received      Paper

**TOTAL:**

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**Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts):**

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**Peer-Reviewed Conference Proceeding publications (other than abstracts):**

Received      Paper

**TOTAL:**

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**Number of Peer-Reviewed Conference Proceeding publications (other than abstracts):**

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**(d) Manuscripts**

Received      Paper

**TOTAL:**

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**Number of Manuscripts:**

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**Books**

Received      Book

**TOTAL:**

ReceivedBook Chapter**TOTAL:****Patents Submitted****Patents Awarded****Awards****Graduate Students**

| <u>NAME</u>            | <u>PERCENT SUPPORTED</u> |
|------------------------|--------------------------|
| <b>FTE Equivalent:</b> |                          |
| <b>Total Number:</b>   |                          |

**Names of Post Doctorates**

| <u>NAME</u>            | <u>PERCENT SUPPORTED</u> |
|------------------------|--------------------------|
| <b>FTE Equivalent:</b> |                          |
| <b>Total Number:</b>   |                          |

**Names of Faculty Supported**

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|------------------------|--------------------------|
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**Names of Under Graduate students supported**

| <u>NAME</u>            | <u>PERCENT SUPPORTED</u> |
|------------------------|--------------------------|
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### Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period: ..... 0.00

The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:..... 0.00

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Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):..... 0.00

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### Names of Personnel receiving masters degrees

NAME

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**Total Number:**

### Names of other research staff

NAME

PERCENT SUPPORTED

**FTE Equivalent:**

**Total Number:**

### Sub Contractors (DD882)

### Inventions (DD882)

### Scientific Progress

Please see the attachment.

### Technology Transfer

Not applicable.

## **Grant # W911NF-13-1-0413**

### **Report for the ARO grant for Partial Support of the Joint Conference: 50<sup>th</sup> Annual Technical Meeting of the Society of Engineering Science (SES) and the Annual Summer Meeting of ASME-AMD**

Conference Location: Brown University, Providence, RI

Dates: July 28 – 31, 2013

Conference Co-chairs

Pradeep R. Guduru and Allan F. Bower  
Brown University

Program Manager: Dr. David Stepp  
david.m.stepp.civ@mail.mil, (919) 549-4329

## Project Report

The Joint Conference of the 50<sup>th</sup> Annual Technical Meeting of the Society of Engineering Science (SES) and the ASME-AMD Annual Summer Meeting was held at Brown University during July 28-31, 2013. The SES Technical Meeting is held annually to foster and promote the exchange of ideas and information among the various disciplines of engineering and the fields of physics, chemistry, mathematics, bioengineering, and related scientific and engineering fields. The 2013 SES 50th Annual Technical Meeting was hosted by the **School of Engineering, Brown University**, located in Providence, Rhode Island. Brown University is the seventh-oldest college in the United States and was founded in 1764. Brown is an independent, coeducational, Ivy League institution comprising of undergraduate and graduate programs, along with the Warren Alpert Medical School and the School of Engineering. This SES Technical Meeting aims to convene a diverse and interdisciplinary group of leading researchers in all engineering, mathematics and science disciplines. Topics of interest include, but are not limited to, mechanics of structural materials; dynamic behavior of materials; mechanics of thin films, soft and composite materials; nanostructures and microelectronic materials; energy storage and energy harvesting; coupled mechano-chemical phenomena; geomechanics and geological materials; computational methods in solid and fluid mechanics; materials design; mechanics of biological materials at tissue, cell and molecular levels; microfluidics; rheology; animal, cell and bacterial mobility; and mechanics education at K-12, undergraduate, and graduate levels.

**Conference Tracks:** The symposium tracks were: (i) Mechanics of Fluids and Thermal Systems; (ii) Mechanics of Biological and Soft Materials; (iii) Mechanics of Solids and Structures; (iv) Mechanics in Materials Science; (v) Mechanics Education; (vi) SES 50<sup>th</sup> Anniversary Symposium (invited visionary talks). Each of the above tracks have multiple symposia that spanned the spectrum of research topics of current and future interest. Several symposia were planned to bring together communities of scientists and engineers spanning Applied Mechanics, Applied Mathematics, Materials Science, Chemistry, Physics, Biology & Medicine and Geology.

**Location and Dates:** The conference was held on Brown University campus during July 28-31, 2013. Brown is conveniently located in a region with a high concentration of Colleges and Universities, which helped attract a large audience, with significant student participation. Further, the historically strong tradition of Mechanics at Brown resulted in wider international participation. The time frame of July allowed researchers to travel during summer, without conflicting with academic year schedules.

**Relation to ARO topics of interest:** The conference tracks and symposia directly address the following areas of interest to ARO: Materials Science and Mechanical Sciences. In particular, the conference covered the following topics: Mechanical Behavior of Materials, Materials by Design, Physical Properties of Materials, Fluid Dynamics, Mechanics of Heterogeneous Systems, Mechanics of Soft Materials & Biologic Systems, Mechanics of Phase Transformations and Dynamic Behavior and Failure of Materials. In addition, interdisciplinary symposia in bio-mechanics and energy are closely related to topics of interest in Chemical Sciences and Life Sciences as well.

**Conference Organizers:** The conference was co-chaired by (i) Pradeep R. Guduru, James R. Rice Associate Professor of Engineering, Brown University; and (ii) Allan F. Bower, Royce Family Professor of Teaching Excellence and Professor of Engineering, Brown University.

Pradeep Guduru received Bachelor's degree in Mechanical Engineering from Sri Venkateswara University, India, and Master's degree in Aerospace Engineering from Indian Institute of Science. He earned his Ph.D. in Aeronautics from California Institute of Technology in 2001. Subsequently he joined the Division of Engineering at Brown University as a postdoctoral research associate and joined the Solid Mechanics faculty there as an Assistant Professor of Engineering in 2002. He has been an Associate Professor of Engineering since 2008 and the James R. Rice Associate Professor of Engineering since January 2009. Professor Guduru was the recipient of PECASE - Presidential Early Career Award for Scientists and Engineers – in 2007; and the National Science Foundation CAREER award in 2006. He received the William F. Ballhaus prize for outstanding doctoral dissertation in Aeronautics (Caltech, 2001), the Ernest E. Sechler Memorial Award for the most significant contributions to teaching and research in Aeronautics (Caltech, 1998); Donald W. Douglas fellowship (Caltech, 1994); the Senate Commendation for academic excellence (Indian Institute of Science, 1994). Guduru's research interests span a variety of problems in Experimental Solid Mechanics such as Mechanical Effects in Catalysis, Mechanics of Energy Storage Materials and Contact Mechanics. The thrust of the current research is on problems at the interface between Solid Mechanics and Chemistry, with applications to energy technologies.

Allan Bower is Royce Family Professor of Teaching Excellence and Professor of Engineering at Brown University. He received undergraduate and graduate degrees from the University of Cambridge. He currently co-directs the GM-Brown collaborative research laboratory in computational materials research. His research interests have included contact mechanics, fracture mechanics, electromigration failures in interconnects, and multiscale modeling of formability in advanced high-strength steels, as well as Aluminum and Magnesium alloys. He is the recipient of the Institution of Mechanical Engineers Thomas Stephens Prize, Institute of Mechanical Engineers Bronze Medal for Tribology, ASME Journal of Tribology Best paper award, Brown University Philip J Bray Teaching Award and General Motors 'Most Valuable Colleague' Award.

**Track Chairs, Symposium Organizers and Participants:** The conference tracks were chaired by the following: Kenneth Breuer, Shreyas Mandre, Petia Vlahovska (Mechanics of Fluids and Thermal Systems); Christian Franck, Jay Tang, Anubhav Tripathi (Mechanics of Biological and Soft Materials); Allan Bower and Pradeep Guduru (Mechanics of Solids and Structures); Eric Chason, Sharvan Kumar, Nitin Padture (Mechanics in Materials Science); Janet Blume, Karen Haberstroh (Mechanics Education); Huajian Gao, Kyung-Suk Kim (SES 50<sup>th</sup> Anniversary Symposium).

An open call was issued to the community through the conference website (<http://www.brown.edu/Conference/ses2013/>) for proposals to organize symposia. In addition, the track chairs identified symposium organizers on topics of targeted interest. The number of participants was around 550.

**Dissemination:** The conference website (<http://www.brown.edu/Conference/ses2013/>) serves as the primary means of dissemination. All abstracts and the technical program is archived on the conference website, which is and will continue to be open to public without any restrictions. A copy of the technical program is included below, which can also be accessed (with live links) at: <http://www.brown.edu/Conference/ses2013/program.htm>. Abstracts of all talks can be accessed at: [http://www.brown.edu/Conference/ses2013/tracks\\_symposia.htm](http://www.brown.edu/Conference/ses2013/tracks_symposia.htm).





**Monday 8:00 - 8:50 Salomon 101 SE Medal Lecture**  
*Session Chairs: Pradeep Sharma (University of Houston)*  
**Mechanics and Physics of Lipid Bilayers**  
**David Steigmann (U. C. Berkeley)**

# Monday 9:00 - 10:30

## AWARDS SYMPOSIA

*Eringen Medal Symposium in honor of G. Ravichandran*  
 Salomon 001

*Session Chairs: Weinong Chen (Purdue), Ghatu Subhash (University of Florida)*

- *An observation on the roughening of the surfaces of rapidly growing cracks in brittle materials*  
Ben Freund (University of Illinois at U-C)
- *Experimental and Computational Biomechanics of Human Blood Cell Diseases*  
Ming Dao (MIT), George Karniadakis (Brown University), Subra Suresh (MIT)
- *Thermo-mechanical modeling of laser-driven non-contact transfer printing: two-dimensional analysis*  
Yonggang Huang (Northwestern University)

*Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials*  
 MacMillan 117

*Session Chairs: Jackie Li (City University of New York), Abhijit Bhattacharyya (University of Arkansas at Little Rock)*

- *Micromechanical Modeling and Analysis of Shape Memory Alloy Composite Materials at Different Scales*  
Dimitris Lagoudas (Texas A&M - Aerospace Eng.), Brian Lester (Texas A&M - Aerospace Eng.), Austin Cox (Texas A&M - Aerospace Eng.), Theocharis Baxevanis (Texas A&M - Aerospace Eng.)
- *Cyclic deformation and the interplay between phase transformation and plasticity in shape-memory alloys.*  
Kaushik Bhattacharya (California Institute of Technology)
- *Effects of loading frequency on cyclic responses of shape memory alloys*  
Qingping SUN (Hong Kong Univ. of Sci. & Tech)
- *Shape memory alloy-based tunable split ring resonators*  
Abhijit Bhattacharyya (University of Arkansas at Little Rock), Vasundara Varadan (University of Arkansas), Mehmet Ozturk (University of Arkansas at Little Rock), Liming Ji (University of Pennsylvania)
- *Design of ferromagnetic shape memory alloy composites for robust and low-cost actuators under applied magnetic field gradient* ♦

Minoru Taya (University of Washington)

**SES Medal Symposium in honor of D.J. Steigmann**  
**MacMillan 115**

*Session Chairs* Ashutosh Agrawal (University of Houston), Amit Acharya (Carnegie Mellon University)

- **Two Dimensional Green's Function for Anisotropic Bimaterials with Imperfect Interface**  
Les Sudak (University of Calgary)
- **Thermal Fluctuations of Lipid Bilayer Membranes: Renormalization of Elastic and Electromechanical**  
Pradeep Sharma (University of Houston), Liping Liu (Rutgers)
- **Weyl Geometry and the Nonlinear Mechanics of Distributed Point Defects**  
Arash Yavari (Georgia Institute of Technology)
- **Bi-potential plasticity and parametric hypoplasticity**  
Joe Goddard (University of California, SD)

**MECHANICS EDUCATION**

**Mechanics Education**  
**RI Hall 108**

*Session Chairs* Thomas Webster (Northeastern University)

- **Use of Interactive Games in Mechanics Education**  
Dr. Shivakumar Ranganathan (American University of Sharjah)
- **A student-centered laboratory approach for teaching tissue mechanics**  
Kristen Billiar (Worcester Polytechnic Institut)
- **First-year Project-Based Engineering Education**  
Janet Blume (Brown University), Karen Haberstroh (Brown University)

**MECHANICS OF FLUIDS AND THERMAL SYSTEMS**

**Computational Mechanics of Biomembranes**  
**Barus-Holley 160**

*Session Chairs* Petia Vlahovska (Brown University), Shravan Veerapaneni (University of Michigan)

- **The flow of red blood cells through narrow, spleen-like filtering slits**  
Jonathan Freund (University of Illinois at Urbana)
- **Shape dynamics and lipid hydrodynamics of bilayer membranes**  
Mohammad Rahimi (), Marino Arroyo (UPC-BarcelonaTech)
- **Role of Target Geometry in Endocytosis: Laying Down to Stand Up**  
Sulin Zhang (Penn State University), Changjin Huang (The Pennsylvania State Univer), Yao Zhang (The Pennsylvania State Univer)
- **Dynamics of a multi-component vesicle in viscous fluids**  
Shuwang Li (Illinois Institute of Technolo), John lowengrub (UC-Irvine), Jinsun Sohn (UCLA math department), Kai Liu (Illinois Institute of Technology)

**Electrohydrodynamics and electrokinetics of fluid systems**  
**Barus-Holley 161**

*Session Chairs* Aditya Khair (Carnegie Mellon University), Brian Kirby (Cornell University)

- **Nonlinear Electrokinetics of Leaky Membranes**  
Martin Bazant (MIT)
- **Direct Numerical Simulation of Electrohydrodynamic Chaos Near Ion-Selective Surfaces**  
Ali Mani (Stanford University), Mathias Andersen (), Clara Druzgalski (Stanford University)
- **Nonlinear electrophoresis at arbitrary field strengths**  
Ory Schnitzer (Technion), Ehud Yariv ()

- **Electrophoresis of bubbles**  
Ory Schnitzer (Technion), Itzhak Frankel (), Ehud Yariv ()

## MECHANICS OF BIOLOGICAL AND SOFT MATERIALS

### *Experimental Nanobiomechanics* *Barus-Holley 163*

*Session Chairs Hadi Tavakoli Nia (MIT), Pranav Shrotriya (Iowa State University)*

- **Micro-Mechanics of Neuronal Compression II: The Cytoskeleton Strikes Back**  
Adam Fournier (Johns Hopkins), K.T. Ramesh (Johns Hopkins University)
- **Determination of Correlations between Mechanical and Microstructural Properties of Aorta by Nanoindentation Technique**  
Ali Hemmasizadeh (Temple University), Soroush Assari (Temple University), Michael Autieri (Temple University), Kurosh Darvish (Temple University)
- **Molecular Mechanisms Underlying Cartilage Poroelectricity**  
Hadi Tavakoli Nia (MIT), Lin Han (), Iman Soltani (), Kamal Youcef-Toumi (), Christine Ortiz (), Alan Grodzinsky ()
- **Role of A-kinase anchoring proteins (AKAPs) in activation of the sickle cell disease red blood cell adhesion receptor BCAM/Lu**  
Jamie Maciaszek (University of Connecticut), Biree Andemariam (University of Connecticut Health Center), George Lykotrafitis (University of Connecticut)

### *Mechanics and Physics of Biological Cells* *Barus-Holley 166*

*Session Chairs Kuo-Kang (Isaac) Liu (University of Warwick), Franck Vernerey (University of Colorado Boulder)*

- **Neuromechanics of neuronal transport**  
Taher Saif (University of Illinois at Urbana), Wylie Ahmed (University of Illinois at Urbana-Champaign), Alireza Tofangchi (University of Illinois at Urbana-Champaign)
- **Microphysical Derivation of the Canham-Helfrich Free-Energy Density**  
Brian Seguin (McGill University), Eliot Fried (McGill University)
- **Simulation of the defective erythrocyte membrane**  
HE LI (UCONN), George Lykotrafitis (University of Connecticut)
- **Biofilm streamer formation in a microfluidic porous media mimic**  
Mahtab Hassanpourfard (University of Alberta), Xiaohui Sun (University of Alberta), Amin Valiei (), Yang Liu (University of Alberta), Alope Kumar (University of Alberta), Thomas Thundat (University of Alberta)

### *Mechanics of cell sheets, multicellular assemblies and tissues* *Barus-Holley 141*

*Session Chairs Guy Genin (Washington University), Jeffrey Fredberg (Harvard School of Public Health)*

- **Emergent Dynamics of Collective and Individual Invasion in Malignant Cancer**  
Ian Wong (Brown University)
- **Controlling Embryonic Cell Sheet Migration Using Microfluidics**  
Melis Hazar (Carnegie Mellon university), YongTae Kim (Koch Institute for Integrative Cancer Research Massachusetts Institute of Tech), Lance Davidson (Departments of Bioengineering and Developmental Biology University of Pittsburgh), Philip LeDuc (Carnegie Mellon University), William Messner (Tufts University)
- **Quantifying stretching and rearrangement in epithelial sheet migration**  
Rachel Lee (), Douglas Kelley (), Kerstin Nordstrom (), Nicholas Ouellette (), Wolfgang Losert ()
- **Colony Edge Effect on the Cancer Cell Detachment**  
Yao Zhang (The Pennsylvania State Univer), Changjin Huang (The Pennsylvania State Univer), Sulin Zhang (Penn State University)

## MECHANICS IN MATERIALS SCIENCE

***From Atomistics to Reality: Spanning Scales in Simulations and Experiments***  
***CIT 165***

*Session Chairs* Ellad Tadmor (University of Minnesota), Harley Johnson (University of Illinois)

- ***Simulation of Heteroepitaxial Growth using KMC: Lattice and Off-Lattice Approaches***  
Peter Smereka (University of Michigan), Tim Schulze (University of Tennessee), Henry Boateng (University of Michigan)
- ***Nanoindentation Simulation of a Thin Ni Film Using Hyper-QC***  
Ellad Tadmor (University of Minnesota), Woo Kyun Kim (University of Minnesota)
- ***Connectivity-based parallel replica dynamics method for simulating chemically reactive systems using ReaxFF reactive force field method***  
Kaushik Joshi (Penn State University), Adri van Duin (Pennsylvania State University), Sumathy Raman (ExxonMobil)
- ***Atomistic Modeling of Focused Ion Beam Processing***  
Kallol Das (University of Illinois), Jonathan Freund (University of Illinois at Urbana-Champaign), Harley Johnson (University of Illinois)

***Lithium ion batteries: When Chemistry meets Mechanics***  
***Salomon 003***

*Session Chairs* Siva Nadimpalli (Brown University), Kejie Zhao (MIT)

- ***High Energy Batteries: Materials Design and Mechanics at the Nanoscale***  
Yi Cui (Stanford University)
- ***The Effect of Stress and Fracture on Lithiation Kinetics in Silicon Nanoparticles***  
Matthew McDowell (Stanford University), Seok Woo Lee (Stanford University), Ill Ryu (Stanford University), Chongmin Wang (Pacific Northwest National Laboratory), William Nix (Stanford University), Yi Cui (Stanford University)
- ***Fracture of germanium pillar during electrochemical lithiation***  
Seok Woo Lee (Stanford University), Ill Ryu (Stanford University), Lucas Berla (Stanford University), Matthew McDowell (Stanford University), William Nix (Stanford University), Yi Cui (Stanford University)
- ***Robustness of micro-scaled amorphous silicon during the initial lithiation/delithiation cycle***  
Lucas Berla (Stanford University), Seok Woo Lee (Stanford University), Ill Ryu (Stanford University), Yi Cui (Stanford University), William Nix (Stanford University)

***Materials for Extreme Environments: Multiscale Experiments and Simulations***  
***Salomon 203***

*Session Chairs* Shailendra Joshi (National University of Singapore), Jaafar El-Awady (Johns Hopkins University)

- ***Dimension Reduction of Irradiation-Induced Defect Properties for Application in 2D Dislocation Dynamics***  
Ilker Topuz (Materials Innovation Institute & University of Groningen), Erik Van der Giessen (University of Groningen)
- ***Recent progress in dislocation dynamics***  
Sylvie Aubry (LLNL), Athanasios Arsenlis (LLNL)
- ***Size Effects on the Strength and Ductility of Nanocrystalline Materials***  
Yong-Wei Zhang (IHCP Singapore)
- ***Damage Mechanisms in Irradiated Metallic Glasses***  
Richard Baumer (MIT), Michael Demkowicz (MIT)

***Slip Avalanches in Amorphous Metals***  
***Barus-Holley 168***

*Session Chairs* Todd Hufnagel (Johns Hopkins University), Karin Dahmen (University of Illinois)

- ***Modeling plastic deformation and the dynamics and the statistics of the associated crackling noise in Bulk Metallic Glasses***  
Karin Dahmen (University of Illinois), James Antonaglia (University of Illinois at Urbana-Champaign), M Wraith (UIUC), Michael Leblanc (UIUC), Wendelin Wright (Bucknell University), Todd Hufnagel (Johns Hopkins University), Peter Liaw (UIUC), Junwei Qiao (UIUC), J Uhl (UIUC)



- **Plastic Deformation of Metallic Glasses**  
Frans Spaepen (Harvard University), Katharine Jensen (Harvard University), David Weitz (Harvard University)
- **Study of Serrated Flows in Bulk Metallic Glasses (BMGs)**  
Peter Liaw (), Xie Xie (University of Tennessee), James Antonaglia (University of Illinois at Urbana Champaign), Junpeng Liu (), Junwei Qiao (), Yong Zhang (), Gongyao Wang (University of Tennessee), Karin Dahmen (University of Illinois)
- **Serration Statistics in the stress versus strain curves of Bulk Metallic Glasses: comparing high time-resolution experiments to a simple model**  
Wendelin Wright (Bucknell University), Rachel Byer (Bucknell University), Xiaojun Gu (Bucknell University), Todd Hufnagel (Johns Hopkins University), James Antonaglia (University of Illinois at Urbana Champaign), Jonathan Uhl (), Karin Dahmen (University of Illinois)

## MECHANICS OF SOLIDS AND STRUCTURES

### *Instability in Solids and Structures* *Barus-Holley 190*

*Session Chairs* Samantha Daly (University of Michigan), Ryan Elliott (University of Minnesota)

- **Effect of grain size on macroscopic phase transition stress hysteresis of polycrystalline materials**  
Qingping SUN (Hong Kong Univ. of Sci. & Tech)
- **Instabilities during Tension-Torsion of Superelastic NiTi Tubes**  
John Shaw (University of Michigan), Benjamin Reedlunn (Sandia National Laboratories), Samantha Daly (University of Michigan)
- **Asymmetric Tension/Compression Response of NiTi and its Effect on Bending of Tubes**  
Nathan Bechle (University of Texas at Austin), Stelios Kyriakides (University of Texas at Austin)
- **Crack propagation and buckling interaction: The case of tube splitting**  
ALI LIMAM (INSA Lyon), DINH CUONG TRAN (INSA Lyon)

### *Multiscale Mechanics of Particulate Media* *Sayles 105*

*Session Chairs* David Henann (Brown University), Joshua Dijkstra (Duke University)

- **Granular Impact Dynamics: Grain scale to Macroscale**  
Abram Clark (Duke University), Robert Behringer ()
- **Soft particle packings near jamming: correlations in static structure**  
Kamran Karimi (Carnegie Mellon University), Craig Maloney (Carnegie Mellon University)
- **Imaging Forces on Stressed Spheres**  
Joshua Dijkstra (Duke University), Nicolas Brodu (Duke University), Hu Zheng (Tongji University), Robert Behringer ()
- **Granular Dynamics during Impact**  
Kerstin Nordstrom (), Emily Lim (), Matt Harrington (), Wolfgang Losert ()

### *Plasticity at Different Length Scales* *CIT 219*

*Session Chairs* Jay Carroll (Sandia National Laboratories), Yujie Wei (Institute of Mechanics, Chinese Academy of Sciences)

- **Intergranular Strain Evolution near Fatigue Crack Tips in Polycrystalline Metals**  
Yanfei Gao (University of Tennessee), Peter Liaw ()
- **Experimental Validation of Crystal Plasticity Models**  
Jay Carroll (Sandia National Laboratories), Hojun Lim (Sandia National Laboratories), Brad Boyce (Sandia National Laboratories), Corbett Battaile (Sandia National Laboratories), Christopher Weinberger (Sandia National Laboratories)
- **Deformation Behavior of Magnesium Single Crystals Compressed Along [0001]**  
Jie Geng (Brown University), Sharvan Kumar (Brown University), Matthew Chisholm (Materials Science and Technology Division, Oak Ridge National Laboratory), Raj Mishra (GM Research and Development Center, Warren, Michigan, 48090), Anil Sachdev (GM Research and Development Center, Warren, Michigan, 48090)
- **Atomistic Simulations of  $c+a$  Pyramidal Slip in Magnesium Single Crystal under Compression**  
Xiaozhi Tang (MIT & BJTU), Yafang Guo (Beijing Jiaotong University), Yue-Sheng Wang (Institute of

**Soft Materials and Structures**  
**Barus-Holley 158**

*Session Chairs* Evan Hohlfeld (UMass Amherst), Pedro Reis (MIT)

- **Wrinkling of Thin PDMS Films on Ecoflex Substrates**  
Nanshu Lu (University of Texas at Austin)
- **Wrinkling Crystallography on Curved Surfaces**  
Miha Brojan (MIT), Denis Terwagne (Massachusetts Institute of Technology), Pedro Reis (MIT)
- **Swell Induced Wrinkling and Creasing on the Surface of Hydrogel Bilayers**  
Zhigen Wu (), Nikolas Bouklas (), Rui Huang (University of Texas at Austin)
- **Buckling to Creasing Transition in Soft Materials**  
Shengqiang Cai (UCSD)

**Symposium in honor of Rod Clifton on the occasion of his 75th Birthday**  
**Salomon 101**

*Session Chairs* K.T. Ramesh (Johns Hopkins University), Alain Molinari (University of Lorraine)

- **Ruga mechanics and Ruga phase diagrams**  
Kyung-Suk Kim (Brown University)
- **Recent Developments in Dynamic Testing of Materials**  
Amos Gilat (Ohio State University), Jeremy Seidt (Ohio State University)
- **Dynamically expanding self-similar Inclusions: self-similar Motion**  
Xanthippi Markenscoff (University of California, San ), Luqun Ni (UCSD)
- **An investigation on the deformation and failure behaviors of 2D cellular solids**  
Wei Tong (Southern Methodist University), Lin Wang (Southern Methodist University)

# Monday 10:45 - 12:15

## AWARDS SYMPOSIA

**Eringen Medal Symposium in honor of G. Ravichandran**  
**Salomon 001**

*Session Chairs* Samantha Daly (University of Michigan), Mark Walter (Ohio State University)

- **The Mechanical Response and Phase Transformation Kinetics of NiTi Under a Rapid Heating Pulse**  
Doron Shilo (Technion - IIT), Shahaf Vollach (Technion, Israel Institute of Technology)
- **Application of Digital Image Correlation and Acoustic Emission to Determining Materials Properties of Carbon Fiber Composites**  
Hisham Sawan (The Ohio State University), Mark Walter (Ohio State University)
- **Microstructural Modeling of Intergranular and Transgranular Failure Modes in crystalline Materials**  
Mohammed Zikry (North Carolina State University), Qifeng Wu (N.C. State University)
- **A fresh look at why spinel outperforms sapphire during ballistic tests despite its inferior properties- A mechanisms perspective**  
Ghatu Subhash (University of Florida)

**Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials**  
**MacMillan 117**

*Session Chairs* Minoru Taya (University of Washington), Dimitris Lagoudas (Texas A&M University)

- **Experimental study on super-resolution imaging with a near-zero effective mass acoustic metamaterial**

- Xiaoming Zhou (), Gengkai Hu (BIT)
- **Design of low temperature thermoelectric materials with high efficiencies**  
Mona Zebarjadi (Rutgers University)
  - **Reformulation of Nosé-Hoover Thermostat for Heat Conduction Simulation at Nanoscale**  
Jiaoyan Li (The George Washington University), James Lee (George Washington University)
  - **Controllable Microstructure and the Effective Thermophysical Properties of Suspensions under External Fields**  
Mark Seitel (Rutgers University), Chen Lin (Rutgers University), Wuhan Yuan (Rutgers University), Corinne Baresich (Rutgers University), Stephen Tse (Rutgers University), Liping Liu (Rutgers), Jerry Shan (Rutgers University)
  - **Micromechanics of thermoelectric composites**  
Jiangyu Li (University of Washington)

**SES Medal Symposium in honor of D.J. Steigmann**  
**MacMillan 115**

*Session Chairs* Joe Goddard (University of California, SD), Arash Yavari (Georgia Institute of Technolog)

- **Tension field theory and a far-from-threshold expansion of Föppl-von Kármán equations: Quantitative approach to pattern formation in stressed sheets**  
Benny Davidovitch (UMass Amherst)
- **A transversely isotropic visco-hyperelastic constitutive model for soft tissues**  
Sahil Kulkarni (Texas A&M University), Xin-Lin Gao (University of Texas at Dallas)
- **What is fundamental - gauge fields or gauge invariance? A perspective from modeling defects in continuum mechanics**  
Amit Acharya (Carnegie Mellon University)
- **Pure Complementary Energy Principle and Analytical Solutions to General 3-D Nonlinear Elasticity**  
David Gao (Univ Ballarat/ANU)

**MECHANICS EDUCATION**

**Mechanics Education**  
**RI Hall 108**

*Session Chairs* Janet Blume (Brown University)

- **Differential Retention in Physics & Engineering Majors**  
Carolyn Cardamone (Brown University)
- **Increasing interest in mechanics education using on-line tools**  
Thomas Webster (Northeastern University)
- **Projects for introductory Newtonian dynamics courses**  
Allan Bower (Brown University)

**MECHANICS OF FLUIDS AND THERMAL SYSTEMS**

**Computational Mechanics of Biomembranes**  
**Barus-Holley 160**

*Session Chairs* Jonathan Freund (University of Illinois at Urbana), Sulin Zhang (Penn State University)

- **Electrostatic effects in the mechanics of a cell membrane**  
Prashant Purohit (University of Pennsylvania)
- **Sharp Interface Three-Dimensional Electrohydrodynamic Vesicle Simulations: Formulation and Numerical Methods**  
David Salac (University at Buffalo SUNY), Mohammad Kolahdouz (University at Buffalo SUNY), Prerna Gera (University at Buffalo SUNY)
- **Morphology and chirality control self-assembly of sickle hemoglobin inside red blood cells**  
Xuejin Li (Brown University), Bruce Caswell (Brown University), George Karniadakis (Brown University)
- **TETHERING AND PEARLING OF A SETTLING VESICLE**  
Gwenn Boedec (IRPHE), Marc Jaeger (M2P2), Marc Leonetti (IRPHE)

***Electrohydrodynamics and electrokinetics of fluid systems***  
***Barus-Holley 161***

*Session Chairs* Zachary Gagnon (Johns Hopkins University), Martin Bazant (MIT)

- ***Electrokinetic characterization of Zeonor and Nafion Surfaces: Onsager kinetic matrices for polymer-water systems***  
Brian Kirby (Cornell University)
- ***Nonlinear electrophoresis of ideally polarizable particles: a numerical approach***  
Bruno Figliuzzi (MIT), Cullen Buie (Massachusetts Institute of Technology), Wai Chan (Massachusetts Institute of Technology)
- ***Streaming potentials near a rotating disk bearing a thick fuzzy surface layer***  
Dennis Prieve (Carnegie Mellon University), Paul Sides (Carnegie Mellon Univ.)
- ***Theoretical investigation of polarizability of soft biological particles***  
Naga Neehar Dingari (MIT), Cullen Buie (Massachusetts Institute of Technology)

**MECHANICS OF BIOLOGICAL AND SOFT MATERIALS**

***Experimental Nanobiomechanics***  
***Barus-Holley 163***

*Session Chairs* Ahmed Elbanna (University of Illinois (UC)), Taher Saif (University of Illinois at Urba)

- ***Biological ferroelectricity in aortic walls***  
Jiangyu Li (University of Washington)
- ***Structural and Mechanical Studies of the Individual Building Block of a Natural Transparent Armor of *Placuna placenta****  
Ling Li (MIT), Christine Ortiz ( )
- ***A living artificial swimmer from soft flagella and cardiac cells***  
Taher Saif (University of Illinois at Urba), Brian Williams (University of Illinois at Urbana-Champaign), Sandeep Anand (University of Illinois at Urbana-Champaign)

***Mechanics and Physics of Biological Cells***  
***Barus-Holley 166***

*Session Chairs* William Klug (UCLA), Kai-Tak Wan (Northeastern University)

- ***Mechanics of Bacterial Osmotic Shock***  
William Klug (UCLA)
- ***Biocompatible Nanoparticles Trigger Rapid Bacteria Clustering***  
Anubhav Tripathi (Brown University)
- ***In vivo Mechanical Behavior of *Drosophila* Neurons***  
Jagannathan Rajagopalan (Arizona State University), Alireza Tofangchi (University of Illinois at Urbana-Champaign), Taher Saif (University of Illinois at Urba)
- ***Tonic PKA activity regulates the expression of native SK channels in living neurons***  
Krithika Abiraman (University of Connecticut), Anastasios Tzingounis (University of Connecticut), George Lykotrafitis (University of Connecticut)

***Mechanics of cell sheets, multicellular assemblies and tissues***  
***Barus-Holley 141***

*Session Chairs* Katherine Zhang (Boston University), Ian Wong (Brown University)

- ***Biological Stability and Adaptivity of Arteries Subject to Stress-Mediated Growth and Remodeling***  
Christian Cyron (Yale University), Jay Humphrey (Yale University)
- ***Elastin in arterial ECM: mechanical properties, biochemical degradation, and microstructures***  
Katherine Zhang (Boston University)
- ***Probing the membrane characteristics and long-term volumetric response of live cells***  
T.H. Hui (The University of Hong Kong), Yuan Lin (The University of Hong Kong), A.H.W. Ngan (The



University of Hong Kong)

- **Cardiac pathologies emerging from collective cellular behavior: a study of cardiac fibrosis in vitro and in silico**

Teresa Abney (), Kenneth Pryse (), Ali Nekouzadeh (), ShengLin Lee (), William McConaughy (), Elliot Elson (), Guy Genin (Washington University)

## MECHANICS IN MATERIALS SCIENCE

### ***From Atomistics to Reality: Spanning Scales in Simulations and Experiments***

**CIT 165**

*Session Chairs* Shaofan Li (University of California), John Bassani (University of Pennsylvania)

- **Non-Associated Plastic Flow**  
John Bassani (University of Pennsylvania)
- **Investigation of grain size effects and other stacking fault width dependencies using a DFT-informed 3D phase field dislocation dynamics (PFDD) model**  
Abigail Hunter (Los Alamos National Laboratory), Irene Beyerlein (Los Alamos National Laboratory), Timothy Germann (Los Alamos National Laboratory)
- **Multiscale Crystal Defect Dynamics: A nonlocal strain gradient process zone approach**  
Shaofan Li (University of California)

### ***Lithium ion batteries: When Chemistry meets Mechanics***

**Salomon 003**

*Session Chairs* Ting Zhu (), Scott Mao (Dept of Mechanical Eng. and materials Science, University of Pittsburgh)

- **In-situ Mechanics on lithiation process at nano and atomistic scale**  
Scott Mao (Dept of Mechanical Eng. and materials Science, University of Pittsburgh), Li Zhong (Dept of Mechanical Eng. and materials Science, University of Pittsburgh), Jiangwei Wang ()
- **In-situ TEM experiment of quantitative tensile strength measurements of lithiated nanowires**  
Akihiro Kushima (MIT), Jianyu Huang (), Ju Li (MIT)
- **In Situ TEM Study of Self-healing Gallium Nanodroplets under Electrochemical Cycling**  
Wentao Liang (Penn State University), Liang Hong (Penn State University), Hui Yang (Penn State University), Long-Qing Chen (Penn State University), Jianyu Huang (), Ting Zhu (), Sulin Zhang (Penn State University)
- **Two-Phase Electrochemical Lithiation in Amorphous Silicon**  
Feifei Fan (Georgia Tech), Ting Zhu (), Jiangwei Wang (), Scott Mao (), Shuman Xia (Georgia Tech)

### ***Materials for Extreme Environments: Multiscale Experiments and Simulations***

**Salomon 203**

*Session Chairs* Sylvie Aubry (LLNL), Erik Van der Giessen (University of Groningen)

- **On modeling the oxidation of high-temperature alloys**  
Lallit Anand (MIT)
- **Diffusion and Stress Coupling Effect during Oxidation at High Temperature**  
Xue Feng (Tsinghua University)
- **Ultra High Temperature Indentation Studies of Si Based Ceramics at Nanoscale to Micron scale**  
Ming Gan (Purdue University), Vikas Tomar (Purdue)
- **Atomistic Investigation of the Role of Grain Boundary Structure on Hydrogen Segregation and Embrittlement in alpha Fe**  
Kiran Solanki (Arizona State University), Mark Tschopp (ORAU/Army Research Laboratory), Mehul Bhatia ()

### ***Slip Avalanches in Amorphous Metals***

**Barus-Holley 168**

*Session Chairs* Ekhard Salje (University of Cambridge), Peter Liaw ()

- **Slip avalanches and shear localization in lattice models for amorphous plasticity**  
Stefano Zapperi (CNR-IENI, Milano, Italy)

- **Non-Linear Dynamics in the shear rate dependence of the flow stress in model amorphous Si samples**  
Anne TANGUY (Universit Lyon 1), Claudio Fusco (universit Lyon 1)
- **Initial stages of shear localization investigated by simulated tensile tests of metallic glass nanowires**  
Eric Homer (Brigham Young University), Christopher Schuh (Massachusetts Institute of Technology)
- **Formation of persistent shear in model amorphous covalent system from molecular dynamics**  
Tristan Albaret (Universit Lyon 1, France), Anne TANGUY (Universit Lyon 1)

## MECHANICS OF SOLIDS AND STRUCTURES

### *Instability in Solids and Structures* *Barus-Holley 190*

Session Chairs ALI LIMAM (INSA Lyon), John Shaw (University of Michigan)

- **Complete Solutions to Post-Buckling Problems of Large Deformed Elastic Beam**  
David Gao (Univ Ballarat/ANU)
- **Imperfection-Insensitive Axially-Loaded Cylindrical Shells**  
Xin Ning (Caltech), Sergio Pellegrino (California Institute of Technology)
- **The Mechanics of Curly Hair**  
Pedro Reis (MIT), Jay Miller (MIT), Arnaud Lazarus (MIT), Basile Audoly (University Paris 6 and CNRS)
- **Three-dimensional Curling of Pre-strained Elastomeric Strips: From Hemi-helix to Helix**  
Jia Liu (Harvard University), Jiangshui Huang (), Tianxiang Su (), Katia Bertoldi (Harvard University), David Clarke ()

### *Multiscale Mechanics of Particulate Media* *Sayles 105*

Session Chairs Richard Reguero (University of Colorado at Boulder), Ken Kamrin (MIT)

- **Modeling of Size-Effects in 2D Granular Flows**  
Ken Kamrin (MIT), Georg Koval (INSA Strasbourg)
- **Predicting granular flow experiments: continuum modeling with a length-scale**  
David Henann (Brown University), Ken Kamrin (MIT)
- **Self-organization and rheology of dense non-Brownian flows -- a geometric approach**  
Edan Lerner (New York University), Gustavo Doring (New York University), Matthieu Wyart (New York University)
- **The granular element method: From tomographic data to discrete computations**  
Keng-Wit Lim (Caltech), Jose Andrade (Caltech)

### *Plasticity at Different Length Scales* *CIT 219*

Session Chairs Yujie Wei (Institute of Mechanics, Chinese Academy of Sciences), Ashraf Bastawros ()

- **Experimental Analysis of Shear Band Deformation State in Bulk Metallic Glasses**  
Ashraf Bastawros (), Hui Wang (), Antonia Antoniou (Georgia Institute of Technology)
- **Effects of atomic scale fluctuations and notches on the plastic deformation and failure of metallic glasses**  
Yong-Wei Zhang (IHCP Singapore), Zhendong Sha (Institute of High Performance Computing, A\*Star, Singapore), Murali Palla (), R. Narasimhan (Department of Mechanical Engineering, Indian Institute of Science, Bangalore ), Huajian Gao (Brown University)
- **Shear band mechanics in metallic plates: the Poisson's effect and strength softening**  
Yujie Wei (Institute of Mechanics, Chinese Academy of Sciences), Xianqi Lei (), Wei-Hua Wang (), A. Greer ()

### *Soft Materials and Structures* *Barus-Holley 158*

Session Chairs Shengqiang Cai (UCSD), Katia Bertoldi (Harvard University)

- **Tunable mechanical response of elastic media : from negative Poisson ratio to negative compressibility**

Corentin Coulais (Leiden University), Martin van Hecke (Leiden University), Bastiaan Florijn (Leiden University)

- *Phase Diagrams of Instabilities in Compressed Film-Substrate Systems*  
Qiming Wang (Duke University), Xuanhe Zhao (Duke University)
- *Patterns from scale-free instabilities in soft solids*  
Evan Hohlfeld (UMass Amherst)
- *3D soft and tunable metamaterials*  
Sahab Babaee (Harvard university), Jongmin Shim (), Pai Wang (Harvard University), Katia Bertoldi (Harvard University)

*Symposium in honor of Rod Clifton on the occasion of his 75th Birthday*  
*Salomon 101*

*Session Chairs: Xanthippi Markenscoff (University of California, San ), Horacio Espinoza (Northwestern University)*

- *Adiabatic shear banding and scaling laws in chip formation with application to cutting of Ti-6Al-4V*  
Alain Molinari (University of Lorraine), Henar Miguelez (), Xavier Soldani ()
- *Computational Mechanics Role in Solving Manufacturing Problems*  
Troy Marusich (Third Wave Systems)
- *Ignition Criterion for Heterogeneous Energetic Materials Based on Hotspot Size-Temperature Threshold*  
Min Zhou (Georgia Institute of Technology), Ananda Barua (Georgia Institute of Technology), Seokpum Kim (Georgia Institute of Technology), Yasuyuki Horie (Air Force Research Lab)
- *Near-Field Particle Velocity Signatures of Supershear Ruptures: Theory and Experiments*  
Michael Mello (Georgia Institute of Technology), Ares Rosakis (California Institute of Technology)

**Monday 1:30 - 2:30 Salomon 101 SES 50 Anniversary**  
**Plenary Lecture**

*Session Chairs: Huajian Gao (Brown University)*

**[Some mechanics studies of earth faults and ice sheets](#)**

**James Rice (Harvard)**

**Monday 2:40 - 4:00**

**AWARDS SYMPOSIA**

*Eringen Medal Symposium in honor of G. Ravichandran*  
*Salomon 001*

*Session Chairs: Lallit Anand (MIT), Michael Mello (Georgia Institute of Technology)*

- *Micron-scale thermoplastic forming of metallic glasses*  
Lallit Anand (MIT)
- *Experimental Investigations of Full-Field Deformation Behavior at the Microstructural Length Scale*  
Samantha Daly (University of Michigan)
- *Multiscale Characterization of Deformation and Fracture in Electrochemical Materials*  
Shuman Xia (Georgia Tech)

**Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials**  
**MacMillan 117**

Session Chairs Qingping SUN (Hong Kong Univ. of Sci. & Tech), Mona Zebarjadi (Rutgers University)

- **Nucleation-Controlled Distributed Plasticity In Penta-Twinned Silver Nanowires**  
 Horacio Espinosa (Northwestern University), Tobin Filleter (), Senghua Ryu (), Keonwook Kang (), Jie Yin (), Rodrigo Bernal (), Kwon Sohn (), Jiaxing Huang (), Wei Cai ()
- **Engineering Science Aspects of the Hall-Petch Relation**  
 Ronald Armstrong (University of Maryland)
- **A Gradient Plasticity Update**  
 Elias Aifantis (Aristotle University of Thessa)
- **Influence of particle size and debonding damage on an elastic-plastic singular field around a crack-tip in particulate-reinforced composites**  
 Keiichiro Tohgo (Shizuoka University)
- **On the macroscopic response, microstructure evolution, and macroscopic stability of short-fiber-reinforced elastomers at finite strains**  
 Reza Avazmohammadi (), Pedro Ponte Castaneda (Univ. of Pennsylvania)

**SES Medal Symposium in honor of D.J. Steigmann**  
**MacMillan 115**

Session Chairs Julius Kaplunov (Keele University), Stanislav Potapenko (University of Waterloo)

- **Long wave motion in layered elastic media**  
 Graham Rogerson (Keele University)
- **Moving-contact problems of dynamic elasticity**  
 Michele Brun (Universit di Cagliari), Leonid Slepyan (School of Mechanical Engineering, Tel Aviv University.)
- **A general isotropic remodeling law.**  
 Ben Nadler (University of Victoria)
- **Analytical Mechanics of Continua with Microstructure**  
 Francesco Dell'Isola (Universit di Roma and MEMOCS )

**MECHANICS OF FLUIDS AND THERMAL SYSTEMS**

**Computational Mechanics of Biomembranes**  
**Barus-Holley 160**

Session Chairs David Salac (University at Buffalo SUNY), Marino Arroyo (UPC-BarcelonaTech)

- **Numerical Algorithms for Vesicle Flows**  
 Shravan Veerapaneni (University of Michigan)
- **Simulations of 3D vesicles and capsules with boundary integral method using singularity subtraction technique**  
 Alexander Farutin (LIPhy, CNRS & UJF Grenoble), Chauqi Misbah (LIPhy, CNRS & UJF Grenoble)
- **Symmetric and non-symmetric elongation of vesicles in extensional flows**  
 Andrew Spann (Stanford), Vivek Narsimhan (Stanford University), Eric Shaqfeh (Stanford University)
- **Analysis of nanoprobe penetration through a lipid bilayer**  
 Fei Liu (MIT), Dan Wu (), Roger Kamm (MIT), ken Chen (Tsinghua University)

**Electrohydrodynamics and electrokinetics of fluid systems**  
**Barus-Holley 161**

Session Chairs Aditya Khair (Carnegie Mellon University), Petia Vlahovska (Brown University)

- **A Hexatic-to-Disorder Transition in Colloidal Crystals near Electrodes: Stronger Flow Yields Less Order**  
 Cari Dutcher (University of California Davis), Taylor Woehl (University of California Davis), Nicholas Talken (University of California Davis), William Ristenpart (University of California Davis)

- **Electrohydrodynamic interaction of spherical particles under Quincke rotation**  
Debasish Das (University of Illinois), David Saintillan (University of Illinois at Urbana-Champaign)
- **Deformation and stability of biomimetic membranes in DC electric pulses**  
Paul Salipante (Brown University), Petia Vlahovska (Brown University)
- **Maxwell-Wagner Polarization at Liquid-Liquid Interfaces**  
Zachary Gagnon (Johns Hopkins University)

## MECHANICS OF BIOLOGICAL AND SOFT MATERIALS

### *Mechanics and Physics of Biological Cells* *Barus-Holley 141*

*Session Chairs Taher Saif (University of Illinois at Urbana), Jagannathan Rajagopalan (Arizona State University)*

- **Shock Wave Induced Damage in Tumor Cells: Experiments and Simulation**  
Martin Steinhauser (Fraunhofer Research Institute ), Mischa Schmidt (Fraunhofer Research Institute)
- **Computational modeling of plant trichome branch growth using finite element and imaging approaches**  
Anastasia Desyatova (University of Nebraska-Lincoln, Mechanical and Materials Engineering), Samuel Belteton (Purdue University, Agronomy), Makoto Yanagisawa (Purdue University, Agronomy), Tzu-Ching Wu (Purdue University, Agricultural and Biological Engineering), Daniel Szymanski (Purdue University, Agronomy), David Umulis (Purdue University, Agricultural and Biological Engineering), Joseph Turner (University of Nebraska-Lincoln, Mechanical and Materials Engineering)
- **Sacrificial bonds and hidden length in biomaterials -- a kinetic, constitutive description of strength and toughness in bone**  
Charles Lieou (UC Santa Barbara), Ahmed Elbanna (Univ. of Illinois at Urbana-Champaign), Jean Carlson (UC Santa Barbara)
- **Acousto-mechanical response of the human tympanic membrane measured by high-speed digital holography**  
Ivo Dobrev (Worcester Polytechnic Institut), Cosme Furlong (Worcester Polytechnic Institute), John Rosowski (Massachusetts Eye and Ear Infirmary), Jeffrey Cheng (Massachusetts Eye and Ear infirmary)

### *Mechanics of cell sheets, multicellular assemblies and tissues* *Barus-Holley 141*

*Session Chairs Taher Saif (University of Illinois at Urbana), Jagannathan Rajagopalan (Arizona State University)*

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## MECHANICS IN MATERIALS SCIENCE

### *Advancement in Coating Science and Technology* *RI Hall 108*

*Session Chairs Eric Jordan (University of Connecticut), Filippo Casadei (Harvard university)*

- **Inter-diffusion Induced Strains in Coatings**



David Clarke (), Vladimir Tolpygo (Honeywell)

- **Finite element study of multi-modal vibration damping for multifunctional thermal barrier coating applications**  
Filippo Casadei (Harvard university), Katia Bertoldi (Harvard University), David Clarke ()
- **Thin Film Metallic Glasses: Unique Properties and Potential Applications**  
Jinn Chu (Nat'l Taiwan Univ. of Sci.Tech)

***From Atomistics to Reality: Spanning Scales in Simulations and Experiments***  
**CIT 165**

Session Chairs Marino Arroyo (UPC-BarcelonaTech), Pradeep Sharma (University of Houston)

- **Multiscale modeling of molecular systems with data-driven collective variables**  
Behrooz Hashemian (), Daniel Millan (), Marino Arroyo (UPC-BarcelonaTech)
- **TRREAT: An algorithm to search a Potential Energy Surface along low curvature pathways. Applications to molecular conformations.**  
Carlos Campana (Carleton University), Ronald Miller (Carleton University)
- **Finding Minimum Energy Paths of Droplets on Superhydrophobic Surfaces: A Phase Field Approach**  
Kellen Petersen (New York University)

***From Atomistics to Reality: Spanning Scales in Simulations and Experiments***  
**CIT 227**

Session Chairs Ryo Kobayashi (Nagoya Institute of Technology), Yang Xiang (Hong Kong Univ of Sci and Tech)

- **Atomistic Study of Hydrogen Effects on Dislocation Mobility and Pile-ups in alpha-Fe**  
Jun Song (McGill University), W. A. Curtin (EPFL), Shyam Keralavarma (EPFL)
- **Hydrogen Effects on Dislocation Motion in BCC Iron: Hybrid Quantum and Classical Simulation**  
Ryo Kobayashi (Nagoya Institute of Technology), Tomoyuki Tamura (Nagoya Institute of Technology), Shuji Ogata (Nagoya Institute of Technology)
- **From atomistic to discrete dislocation dynamics modelling of bcc metals: deformation of tungsten**  
Daniel Weygand (KIT), Kinshuk Srivastava (KIT), Peter Gumbsch (KIT)
- **Continuum models for dislocation structure, energy and dynamics of dislocation arrays and low angle grain boundaries**  
Yang Xiang (Hong Kong Univ of Sci and Tech)

***Lithium ion batteries: When Chemistry meets Mechanics***  
**Salomon 003**

Session Chairs Hamed Haftbaradaran (Brown University), Kejie Zhao (MIT)

- **Lithiation Induced Stresses and Interfacial Phenomena in Li Ion Battery Electrodes**  
Brian Sheldon (Brown University), Anton Tokranov (Brown University), Ravi Kumar (Brown University), Xingcheng Xiao (General Motors), Peng Lu (General Motors), Yue Qi (General Motors R&D), Mark Verbrugge (General Motors)
- **Modeling of progressive delamination in a thin film electrode driven by diffusion-induced stresses**  
Yicheng Song (Shanghai University), JunQian Zhang (Shanghai University)
- **Fracture, interfacial delamination and fatigue in patterned silicon thin film electrodes subject to lithium cycling**  
Hamed Haftbaradaran (Brown University), Huajian Gao (Brown University), Xingcheng Xiao (General Motors)
- **Pressure-sensitive plasticity of lithiated silicon in Li-ion batteries**  
Kejie Zhao (MIT), Laurence Brassart ()

***Materials for Extreme Environments: Multiscale Experiments and Simulations***  
**Salomon 203**

Session Chairs Kiran Solanki (Arizona State University), Xue Feng (Tsinghua University)

- **Role of Pressure and Strain Rate in Structural Amorphization in Boron Carbide**

- Ghatu Subhash (University of Florida), Dipankar Ghosh (California Institute of Technology)
- **Atomistic Studies of Crack Growth Mechanisms in Silicon Carbide**  
Kelvin Leung (Cornell University), Zhi liang Pan (), Derek Warner (Cornell University)
  - **Exploring Deformation and Failure in Nano-Solids: Flaw-Driven Fracture in Nanocrystalline Pt and Grain boundary Sliding in Bi-crystalline Al**  
Julia Greer (Caltech), X Gu (Caltech), Zachary Aitken (Caltech), Yong-Wei Zhang (IHCP Singapore), Zhaoxuan Wu (IHCP Singapore)
  - **Effects of stress state on the deformation and damage mechanisms of Mg alloys**  
Babak Kondori (Texas A&M University), A. Amine Benzerga (Texas A&M University)

## MECHANICS OF SOLIDS AND STRUCTURES

### *Characterization and Imaging of Structural and Material Imperfections* **Barus-Holley 191**

*Session Chairs Maria Chierichetti (Worcester Polytechnique Institute), Stefano Gonella (University of Minnesota)*

- **Multimodality analysis of vibrations in a biomechanical model of vocal folds**  
Babak Aghazadeh (Mass. Eye & Ear Infirmary), Ivo Dobrev (Worcester Polytechnic Institute), Cosme Furlong (Worcester Polytechnic Institute), Ramon Franco (Massachusetts Eye and Ear Infirmary)
- **Experimental full-field response identification with limited set of operational data**  
Maria Chierichetti (Worcester Polytechnique Institute)
- **Experimental verification of the topological sensitivity approach to elastic-wave imaging**  
Roman Tokmashev (University of Minnesota), Antonin Tixier (Ecole Polytechnique), Bojan Guzina (University of Minnesota)
- **Non-destructive testing (NDT) by laser shearography and fringe projection**  
Xiaoran Chen (Worcester Polytechnic Ins.), Morteza Khaleghi (WPI), Ivo Dobrev (Worcester Polytechnic Institute), Cosme Furlong (Worcester Polytechnic Institute)

### *Discrete Dislocation Plasticity* **CIT 227**

*Session Chairs Steffen Brinckmann (Max-Planck Institut Dösselndorf)*

- **Atomistic Study of Hydrogen Effects on Dislocation Mobility and Pile-ups in alpha-Fe**  
Jun Song (McGill University), W. A. Curtin (EPFL), Shyam Keralavarma (EPFL)
- **Hydrogen Effects on Dislocation Motion in BCC Iron: Hybrid Quantum and Classical Simulation**  
Ryo Kobayashi (Nagoya Institute of Technology), Tomoyuki Tamura (Nagoya Institute of Technology), Shuji Ogata (Nagoya Institute of Technology)
- **From atomistic to discrete dislocation dynamics modelling of bcc metals: deformation of tungsten**  
Daniel Weygand (KIT), Kinshuk Srivastava (KIT), Peter Gumbsch (KIT)
- **Continuum models for dislocation structure, energy and dynamics of dislocation arrays and low angle grain boundaries**  
Yang Xiang (Hong Kong Univ of Sci and Tech)

### *Instability in Solids and Structures* **Barus-Holley 190**

*Session Chairs K Ravi-Chandar (University of Texas at Austin), Sung Kang (Harvard University)*

- **Electrically Tunable Composites by Making Positive Use of Instabilities**  
Charles Wojnar (Caltech), Dennis Kochmann (California Institute of Techn.)
- **Shock Propagation in Aluminum Open-Cell Foam Under Impact**  
Andrew Barnes (), Krishnaswamy Ravi-Chandar (University of Texas at Austin), Stelios Kyriakides (University of Texas at Austin)
- **Modeling of Shock Propagation in Aluminum Foam Under Impact**  
Stavros Gaitanaros (University of Texas at Austin), Stelios Kyriakides (University of Texas at Austin)
- **Uniaxial Tensile instabilities of a Class of Compressible Solids with Plastic Non-Normality.**  
Nisha Mohan (Caltech), Julia Greer (Caltech), Alan Needleman (University of North Texas), Justine Cheng (Polytechnic School)

**Multiscale Mechanics of Particulate Media**  
**Sayles 105**

Session Chairs Dr. Shivakumar Ranganathan (American University of Sharjah), Robert Behringer ()

- **Investigating micro-mechanical origin of liquefaction**  
Utkarsh Mital (Caltech), Jose Andrade (Caltech), Sergio Torres ()
- **A resistive force model for complex intrusion in granular media**  
Tingnan Zhang (Georgia Institute of Technology), Chen Li (University of Berkeley), Daniel Goldman (Georgia Institute of Technology)
- **Microscopic origin of macroscopic strength in granular media: Friction**  
Alex Jerves (California Institute of Techno), Jose Andrade (Caltech), Sergio Torres ()

**Plasticity at Different Length Scales**  
**CIT 219**

Session Chairs Harold S. Park (Boston University), Ercan Gurses (METU)

- **Atomistic Simulation of nano-porous Fe**  
Martin Hummel (IMWF), Peter Binkele (IMWF, Stuttgart), Siegfried Schmauder (IMWF, Stuttgart)
- **A Three Dimensional Model for Nanocrystalline Materials based on Grain Interior and Grain Boundary Deformation Mechanisms**  
Ercan Gurses (METU)
- **An Energy Landscape Approach to Investigating Strain-Rate and Temperature-Dependence of Plastic Deformation Mechanisms in Amorphous Solids**  
Harold S. Park (Boston University), Xi Lin (), Penghui Cao ()

**Soft Materials and Structures**  
**Barus-Holley 158**

Session Chairs Pradeep Sharma (University of Houston), Xue Feng (Tsinghua University)

- **Tunable hierarchical nano-micro-structures by harnessing localized instabilities**  
Changyong Cao (Duke University), Xuanhe Zhao (Duke University), Qinghua Qin (Australian National University)
- **How does Gauss' theorem "materialize": Scarring, blistering, wrinkling and crumpling of adhesive films on curved topographies**  
Benny Davidovitch (UMass Amherst)
- **Soft Periodic Structures with multiple folding mechanisms**  
Sicong Shan (Harvard University), Sung Kang (Harvard University), James Weaver (Harvard University), elizabeth Chen (Harvard University), Katia Bertoldi (Harvard University), Cangyu Qu (Tsinghua University)
- **Rigidity and Stability of Spherical Shells**  
Sina Youssefian (Worcester Polytechnic Institu), Nima Rahbar (Worcester Polytechnic Institute), Eduardo Torres-Jara ()

**Symposium in honor of Rod Clifton on the occasion of his 75th Birthday**  
**Salomon 101**

Session Chairs Min Zhou (Georgia Institute of Technolog), Wei Tong (Southern Methodist University)

- **Deformation and Fracture in Nanotwinned Materials**  
Huajian Gao (Brown University)
- **Investigating MWCNT-graphene interactions via in situ SEM peeling**  
Horacio Espinosa (Northwestern University), Michael Roenbeck (), Xiaoding Wei (), Allison Beese (), Alona Furmanchuk (), Jeffrey Paci (), George Schatz ()
- **Thermal Transport in 3D CNT-graphene and CNT-CNT Networks**  
Vikas Prakash (Case Western Reserve Univ), Jungkyu Park (Case Western )
- **Effective yield criterion accounting for microvoid coalescence in a porous solid**  
A. Amine Benzerga (Texas A&M University), Jean-Baptiste Leblond (University Pierre et Marie Curie)



# Monday 4:20 - 5:40

## AWARDS SYMPOSIA

### *Eringen Medal Symposium in honor of G. Ravichandran Salomon 001*

*Session Chairs* Amos Gilat (Ohio State University), Mohammed Zikry (North Carolina State University)

- **Orientation and misorientation statistics on experimental data from thousand-grain microstructures**  
Laurence Bodelot (Ecole Polytechnique), G. Ravichandran (Caltech)
- **Diffraction Interferometer for Mapping the Surface Deformation of Fine-pitch Grating Structures**  
Michael Mello (Georgia Institute of Technology), Bongtae Han (University of Maryland), Zhaoyang Wang (The Catholic University of America)
- **Extended digital image correlation for full-field deformation measurements: comparison of local and global approaches**  
Wei Tong (Southern Methodist University)
- **The Role of Surface Roughness on Adhesion and Friction of Soft Materials**  
Pradeep Guduru (Brown University)

### *Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials MacMillan 117*

*Session Chairs* Ronald Armstrong (University of Maryland), Stephen Tse (Rutgers University)

- **Nanomechanics of Nanocomposites**  
Catherine Brinson (Northwestern University)
- **Dynamic mechanical analysis of magnetorheological nanocomposites filled with carbon nanotubes**  
Rui Li (UCI), Lizhi Sun (UC Irvine)
- **Numerical investigation of fracture behavior of nanostructured metals with bimodal grain size distribution**  
Xiang Guo (Tianjin University), Xunyang Dai (School of Mechanical Engineering, Tianjin University, Tianjin 300072, China), Linli Zhu (Zhejiang University), Jian Lu (City University of Hong Kong)
- **Coaxial Tungsten-Oxide/Aluminum Thermite Nanocomposite**  
Stephen Tse (Rutgers University), Zhizhong Dong (Rutgers University), Bernard Kear (Rutgers University), Jafar Al-Sharab (Rutgers University)
- **Transversely Isotropic Composites with Statistically Oriented Inclusions**  
Salvatore Federico (The University of Calgary), Alfio Grillo (Polytechnic of Torino), Walter Herzog (The University of Calgary)

### *SES Medal Symposium in honor of D.J. Steigmann MacMillan 115*

*Session Chairs* Graham Rogerson (Keele University), Ben Nadler (University of Victoria)

- **MODE-III CRACK-TIP STRESS FIELDS IN GRADIENT ELASTICITY INCORPORATING SURFACE EFFECT**  
Alireza Ostadhosseini (Pennsylvania State University)
- **Stress Intensity Factor for an Embedded Elliptical Crack under Arbitrary Normal Loading**  
Stanislav Potapenko (University of Waterloo), Elena Atroshchenko (Universidad de Chile)
- **On the long-wave explicit model for the surface wave on a coated half-space**  
Julius Kaplunov (Keele University), Danila Prikazchikov (Keele University, UK)
- **Planck's law of thermal radiation in the presence of a steady heat flux**  
Bair Budaev (UC, Berkeley), David Bogy (UC Berkeley)
- **Pure Complementary Energy Principle and Analytical Solutions to General 3-D Nonlinear Elasticity**  
David Gao (Univ Ballarat/ANU)

## MECHANICS OF FLUIDS AND THERMAL SYSTEMS

### *Electrohydrodynamics and electrokinetics of fluid systems*

#### *Barus-Holley 161*

*Session Chairs* Petia Vlahovska (Brown University), Aditya Khair (Carnegie Mellon University)

- **Unsteady electrohydrodynamic drop deformation**  
Javier Lanauze (Carnegie Mellon University), Lynn Walker (Carnegie Mellon University), Aditya Khair (Carnegie Mellon University)
- **Effects of drop-fluid interface and hydrodynamic interactions on Quincke rotation**  
Malika Ouriemi (Brown university), Petia Vlahovska (Brown University)
- **Electro-deformation of a surfactant-laden viscous drop**  
Yuan-Nan Young (New Jersey Inst. Tech.), Herve Nganguia (NJIT), Petia Vlahovska (Brown University), Hao Lin (Rutgers University)
- **An electrokinetically driven Janus micromotor: stability and rotation**  
G Yossifon (Technion), A Boymelgreen (Technion), T Miloh (Tel Aviv University)

## MECHANICS OF BIOLOGICAL AND SOFT MATERIALS

### *Experimental Nanobiomechanics*

#### *Barus-Holley 163*

*Session Chairs* Hadi Tavakoli Nia (MIT), Ahmed Elbanna (University of Illinois (UC))

- **Development of holographic methods to characterize form and function of the Tympanic Membrane**  
Morteza Khaleghi (WPI), Cosme Furlong (Worcester Polytechnic Institute), Jeffrey Cheng (Massachusetts Eye and Ear infirmary), John Rosowski (Massachusetts Eye and Ear Infirmary)
- **Crack propagation in bone at the scale of mineralized collagen fibrils: Implications for bone toughness**  
Ahmed Elbanna (University of Illinois (UC)), wenyi Wang (), Charles Lieou (UC Santa Barbara), Jean Carlson (UC Santa Barbara)
- **Electrostatic Actuation based Modulation of Binding Interaction between Protein and DNA Aptamer via Dynamic Force Spectroscopy**  
Xiao Ma (Iowa State University), Pranav Shrotriya (Iowa State University)

### *Mechanics and Physics of Biological Cells*

#### *Barus-Holley 141*

*Session Chairs* Martin Steinhauser (Fraunhofer Research Institute ), Jin Qian (Zhejiang University)

- **Hierarchical Multiscale Simulation for Enhancing Adhesion of Bone Cells to Metallic Implants**  
ross Stewart (Alfred University), Jinghong Fan (Alfred University)
- **A Computational Model for the Geometric and Mechanical Characterization of Electrospun Scaffolds**  
James Carleton (University of Texas at Austin), Antonio D'Amore (University of Pittsburgh), Gregory Rodin (ICES, UT Austin), Michael Sacks (University of Texas)
- **The transient viscoelastic measurement of TMV superlattice with a novel AFM-based method**  
Haoran Wang (North Dakota State University), Xinnan Wang (NDSU)
- **Lock and key mechanism for ligand binding with adrenergic receptors and the arising mechanical effects on the cell membrane**  
Luca Deseri (Carnegie Mellon University), Laura Lunghi ()

### *Mechanics of cell sheets, multicellular assemblies and tissues*

#### *Barus-Holley 141*

*Session Chairs* Jin Qian (Zhejiang University), Martin Steinhauser (Fraunhofer Research Institute )

- **Hierarchical Multiscale Simulation for Enhancing Adhesion of Bone Cells to Metallic Implants**  
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Luca Deseri (Carnegie Mellon University), Laura Lunghi ()

## MECHANICS IN MATERIALS SCIENCE

### **Advancement in Coating Science and Technology** **RI Hall 108**

Session Chairs *Filippo Casadei (Harvard university), Eric Jordan (University of Connecticut)*

- **Metal nanoparticles influence on nanocomposite optical properties**  
Jovita Pudlauskait (KTU), Virginija Jankauskait (Kaunas University of technology), Igoris Prosycevas (Kaunas University of Technology), Pranas Narmontas (Kaunas University of Technology)
- **Synergetic effect of microporous coating and nanofinishing on the properties of barrier textile**  
Paule Bekampiene (Textile Institute), Audrone Sankauskaite (Textile Institute), Danute Tumeniene (Textile Institute, Lithuania)

### **From Atomistics to Reality: Spanning Scales in Simulations and Experiments** **CIT 165**

Session Chairs *Frederic Legoll (ENPC), Amit Acharya (Carnegie Mellon University)*

- **Time-averaging of ODE systems with highly oscillatory response**  
Amit Acharya (Carnegie Mellon University)
- **Effective dynamics for slow (and not so slow) reaction coordinates**  
Frederic Legoll (ENPC)
- **Multiple Length/Time Scale Modeling of Multi-physics**  
Jiaoyan Li (The George Washington University), James Lee (George Washington University)
- **Autonomous Damage Recovery of Austenite Steels by Probabilistic Multiscale Mechanokinetic Modeling**  
Eduard Karpov (University of Illinois-Chicago), Mansoor Ariyan (University of Illinois-Chicago)

### **From Atomistics to Reality: Spanning Scales in Simulations and Experiments** **CIT 227**

Session Chairs *Ryan Elliott (University of Minnesota), YASHASHREE KULKARNI (UNIVERSITY OF HOUSTON)*

- **Kinetics of a Fast Moving Twin Boundary**  
K.T. Ramesh (Johns Hopkins University), Neha Dixit (Johns Hopkins University), Nitin Daphalapurkar (Johns Hopkins University)
- **Multi-scale Dynamics of Twinning in Ferrous Materials**  
Doron Shilo (Technion - IIT), Eilon Faran (Technion - IIT)
- **Elucidating the Kinetics of Twin Boundaries from Thermal Fluctuations**  
Dengke Chen (University of Houston), YASHASHREE KULKARNI (UNIVERSITY OF HOUSTON)
- **A New Framework for the Interpretation of Modulated Martensites in Shape Memory Alloys**  
Ryan Elliott (University of Minnesota), Vincent Jusuf (University of Minnesota)

### **Lithium ion batteries: When Chemistry meets Mechanics** **Salomon 003**

Session Chairs *Jianmin Qu (Northwestern University), Ill Ryu (Stanford University)*

- **Experimental Observations and Measurements of Stress and Damage Evolution During Initial Lithiation and Delithiation of Crystalline Silicon**  
Michael Chon (Brown University), Vijay Sethuraman (Brown University), Pradeep Guduru (Brown University), Allan Bower (Brown University)
- **Interface-Reaction Controlled Diffusion in Binary Solids with Applications to Lithiation of Silicon in Lithium Ion Batteries**

Jianmin Qu (Northwestern University), Zhiwei Cui (), Feng Gao ()

- **Kinetics of Initial Lithiation of Crystalline Silicon Electrodes of Lithium-ion Batteries**  
Matt Pharr (Harvard University), Zhigang Suo (Harvard University), Kejie Zhao (MIT), Joost Vlassak (Harvard University)
- **Microscopic model for Fracture of Crystalline Si-NWs for Lithium Ion Batteries**  
Ill Ryu (Stanford University), Seok Woo Lee (Stanford University), Yi Cui (Stanford University), William Nix (Stanford University)

**Materials for Extreme Environments: Multiscale Experiments and Simulations**  
**Salomon 203**

Session Chairs Ghatu Subhash (University of Florida), Julia Greer (Caltech)

- **Molecular Dynamics Simulations of Metallic Nanoglasses**  
Sara Adibi Sedeh (NUS), Paulo BRANICIO (IHPC), Shailendra Joshi (National University of Singapore)
- **Curvature Interferometry based In-Situ Measurement of Stresses Associated with Electrochemical Reactions**  
Omer Ozgur Capraz (Iowa State University), Pranav Shrotriya (Iowa State University), Kurt Hebert (Iowa State University)
- **Mechanical and temperature effects on the performance of anodes in electrochemical batteries**  
Sergei Manzhos (National Uni. of Singapore), Oleksandr Malyi (National University of Singapore), Yang Wei, Koh (Bioinformatics Institute, A\*STAR)
- **Constitutive modeling of ceramic matrix composites**  
Varun Rajan (University of California at Sa), Frank Zok ()
- **Atomistic modeling of plane shock loading in high strength ceramics**  
Paulo BRANICIO (IHPC)

**Slip Avalanches in Amorphous Metals**  
**Barus-Holley 165**

Session Chairs Eric Homer (Brigham Young University), Stefano Zapperi (CNR-IENI, Milano, Italy)

- **Failure mechanism in porous materials under compression: crackling noise in mesoporous Goethite, Corundum and SiO<sub>2</sub>**  
Ekhard Salje (University of Cambridge)
- **Controlling avalanche criticality in 2D nano arrays**  
Yaalat-Chen Zohar (Hebrew University), Yossi Paltiel (HEBREW UNIVERSITY), Shira Yochelis (HEBREW UNIVERSITY), Grzegorz jung (Ben-Gurion University), Karin Dahmen (University of Illinois)

**MECHANICS OF SOLIDS AND STRUCTURES**

**Characterization and Imaging of Structural and Material Imperfections**  
**Barus-Holley 191**

Session Chairs Stefano Gonella (University of Minnesota), Nooshin Nabizadeh (University of Miami)

- **Qualitative identification of the interfacial condition in cracks via the method of topological sensitivity**  
Fateme Pourahmadian (University of Minnesota), Bojan Guzina (University of Minnesota)
- **Automated Defect Localization Via Low Rank Plus Outlier Modeling of Propagating Wavefields**  
Stefano Gonella (University of Minnesota), Jarvis Haupt (University of Minnesota, Department of Electrical and Computer Engineering)
- **Improved optical strain mapping, with detection of strain localization**  
John Boyle (), Maiko Kume (), Victor Birman (), Robert Pless (), Stavros Thomopoulos (), Guy Genin (Washington University)
- **MRI Tumor Segmentation applying Different Wavelet Transform Features, Sparse Representation-Based Classifier and Snake Algorithm**  
Nooshin Nabizadeh (University of Miami)
- **Weak formulation of the Green's function for elastic wave propagation with mixed boundary problems**  
Terumi Touhei (Tokyo University of Science), Kojiro Masada (Tokyo University of Science)

**Discrete Dislocation Plasticity**  
**Barus-Holley 157**

Session Chairs *Pilar Ariza (University of Seville)*

- **Combining 3D Discrete Dislocation Dynamics and Molecular Dynamics into a Concurrent Multiscale Model**  
Steffen Brinckmann (Max-Planck Institut D $\diamond$ sseldorf)
- **The Genome of Size-Dependent Plasticity in Metals**  
Jaafar El-Awady (Johns Hopkins University)
- **Statistics of Dislocation Slip Avalanches in Nanosized Single Crystals Show Tuned Critical Behavior Predicted by a Simple Mean Field Model**  
Nir Friedman (), Andrew Jennings (), Georgios Tsekenis (), Ju-Young Kim (), Molei Tao (), Jonathan Uhl (), Julia Greer (Caltech), Karin Dahmen (University of Illinois)
- **On the role of dissipative hardening in predicting indentation size effects**  
Prabhat Agnihotri (University of Groningen), Eduardo Bittencourt (), Erik Van der Giessen (University of Groningen)

**Instability in Solids and Structures**  
**Barus-Holley 190**

Session Chairs *Stelios Kyriakides (University of Texas at Austin), Akanksha Garg (CMU)*

- **Extracting Materials Properties from Crackling Noise and Slip-Avalanche Statistics of Slowly-Sheared Materials**  
Karin Dahmen (University of Illinois), Xie Xie (University of Tennessee), James Antonaglia (University of Illinois at Urbana Champaign), Marina Laktionova (), Elena Tabachnikova (), Zhi Tang (), Junwei Qiao (), Jien-Wei Yeh (), Che Wei Tzai (), Yong Zhang (), Jonathan Uhl (), Peter Liaw ()
- **Extraction of Material Properties from 3-D Deformation Measurements**  
Andrew Gross (University of Texas, Austin), K Ravi-Chandar (University of Texas at Austin)
- **Combined Constrained Crystal Plasticity Finite Element Modeling of Single Crystal Niobium**  
Aboozar Mapar (Michigan State University), Farhang Pourboghrat (Michigan State University), Thomas Bieler (Michigan State University), Christopher Compton (National Superconducting Cyclotron Lab)
- **Application of Modified Mohr-Coulomb Necking Locus with Forming Severity Concept to Predict Metal Sheets Necking under Nonlinear Strain Path**  
Yuanli Bai (University of Central Florida), Tomasz Wierzbicki (MIT)

**Multiscale Mechanics of Particulate Media**  
**Sayles 105**

Session Chairs *Ken Kamrin (MIT), David Henann (Brown University)*

- **Invariants of Mesoscale Thermal Conductivity and Resistivity Tensors in Planar Random Checkerboards**  
Dr. Shivakumar Ranganathan (American University of Sharjah), Ahmed Dalaq (American University of Sharjah)
- **Effects of Pore Pressures on the Brittle-Ductile Transition in Porous Geomaterials: Laboratory Constraints on the Strength of Seismogenic Faults**  
Taka Kanaya (Brown University), Greg Hirth (Brown University)
- **A model of sheared gouge layer with thermally varying material properties**  
Ahmed Elbanna (University of Illinois (UC)), Jean Carlson (UC Santa Barbara)

**Plasticity at Different Length Scales**  
**CIT 219**

Session Chairs *A.K. Soh (The University of Hong Kong), DOUGLAS BAMMANN (MISSISSIPPI STATE UNIVERSITY)*

- **Thermo - Mechanical Responses of Metals in Small Scale on the Fast Transient Process**  
Danial Faghihi (ICES - UT Austin), George Voyiadjis (Louisiana State University)
- **An Internal State Variable Model of Micropolar Elasto-Vicoplasticity**  
DOUGLAS BAMMANN (MISSISSIPPI STATE UNIVERSITY)
- **Autowave Model of the Transition from Stable Plastic Flow to Ductile Failure in Solids**



Lev Zuev (Institute of Strength Physics )

*Soft Materials and Structures*  
Barus-Holley 158

*Session Chairs: Rui Huang (University of Texas at Austin), Prashant Purohit (University of Pennsylvania)*

- *Buckling of Dielectric Elastomeric Plates for Soft, Microfluidic Pumps*  
Behrouz Tavakol (Virginia Tech), Michael Bozlar (Princeton University), Guillaume Froehlicher (Princeton University), Howard Stone (Princeton University), Ilhan Aksay (Princeton University), Douglas Holmes (Virginia Tech)
- *Electrically-Powered Soft Matter Composites with Tunable Elastic Rigidity*  
Carmel Majidi (Carnegie Mellon University), Wanliang Shan (Carnegie Mellon University), Tong Lu (Carnegie Mellon University)
- *Electromechanical response of polymer networks with long-chain molecules*  
Gal DeBotton (Ben-Gurion Univ.), Noy Cohen (Ben-Gurion Univ.)
- *Mechanics and Electrostatics on Supercoiled DNA*  
David Argudo (University of Pennsylvania), Prashant Purohit (University of Pennsylvania)

*Symposium in honor of Rod Clifton on the occasion of his 75th Birthday*  
Salomon 101

*Session Chairs: Vikas Prakash (Case Western Reserve Univ), Troy Maruzich (Third Wave Systems)*

- *Extension of the Torsional Wave Experiment (TWE) to enable the Measurement of the Viscoelastic Properties of Biological Tissues*  
Tong Jiao (Brown University), Sean Teller (Intel Corporation), Rodney Clifton (School of Engineering, Brown University)
- *The Consequences of Impact on Asteroids*  
K.T. Ramesh (Johns Hopkins University)
- *Shock Waves in Heterogeneous Particulate Composites*  
Michael Rauls (Caltech), G. Ravichandran (Caltech)

**Tuesday 8:00 - 8:50 Salomon 101 Prager Medal Lecture**  
*Session Chairs: Dimitris Lagoudas (Texas A& M - Aerospace Eng.)*  
**Micromechanics and Some Aspects of Phase Fields in Ferroelectric Crystals**

**George Weng (Rutgers University)**  
**Tuesday 9:00 – 10:30**  
**Awards Symposia**

**Eringen Medal Symposium in honor of G. Ravichandran  
Salomon 001**

Session Chairs Srinivasan Arjun Tekalur (Michigan State University), Tong Jiao (Brown University)

- **The Dynamics of Brain Injury**  
K.T. Ramesh (Johns Hopkins University)
- **Role of Mean Stress in Yield Behavior of Solid Foams**  
Ravi Ayyagari (Illinois Institute of Technology), Murat Vural (Illinois Institute of Technology)
- **THE BEHAVIOR OF AN ELASTOMER AT HIGH PRESSURES AND HIGH STRAIN RATES**  
Tong Jiao (Brown University), Rodney Clifton (School of Engineering, Brown University)

**Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials  
MacMillan 117**

Session Chairs Dimitris Lagoudas (Texas A&M University), Lizhi Sun (UC Irvine)

- **Materials and Mechanics for Stretchable Electronics**  
Yonggang Huang (Northwestern University)
- **Electrical and mechanical performance of graphene sheets under oxidative environments**  
Huiling Duan (Peking University)
- **Vibrational stability of graphene**  
Biao Wang (Sun Yat-sen University), Yulan Liu (Sun Yat-sen University)
- **Mechanics of Stretchable and highly sensitive graphene-on-polymer strain sensors**  
Quanshui Zheng (Tsinghua University), Hongwei Zhu (Tsinghua University), Wen Wang (Tsinghua University)
- **The overall response of solids containing non-interacting defects**  
Gregory Rodin (ICES, UT Austin)

**SES Medal Symposium in honor of D.J. Steigmann  
MacMillan 115**

Session Chairs Christian Linder (Stanford University), Patrizio Neff (University of Duisburg-Essen)

- **On the use of the QR or upper triangular decomposition in finite elasticity**  
Arun Srinivasa (Texas A&M University)
- **Asymptotic theories for thin-walled beams**  
Roberto Paroni (University of Sassari)
- **Preliminary modeling for adhesion of graphene and lipid layers**  
Luca Deseri (Carnegie Mellon University), Nicola Pugno (University of Trento), Pietro Pollaci (University of Trento)
- **STRAIN LIMITING THEORIES OF ELASTICITY: THEORY, APPLICATION AND OPEN PROBLEMS**  
Jay Walton (Texas A&M University)

**MECHANICS OF FLUIDS AND THERMAL SYSTEMS**

**Complex Fluids: Suspensions, Emulsions, and Gels  
Barus-Holley 160**

Session Chairs Arun Ramachandran (University of Toronto), Roseanna Zia (Cornell University)

- **The Five S's: Chemical Swimming, Sailing, Surfing, Squirring and Swarming**  
John Brady (Calif. Institute of Technology)
- **Study of Particle Motion in Closed-Streamline Flows**  
Hamed Haddadi (City College of New York), Shahab Shojaei-Zadeh (Rutgers University), Kevin Connington (The Levich Institute), Jeffrey Morris (Levich Institute and Dept. of Chemical Engineering, CCNY)
- **Rotational Behavior of Porous Elliptical Cylinders in a Simple Shear Flow**  
Hassan Massoud (NYU), Howard Stone (Princeton University), Michael Shelley (NYU)
- **Secondary convection due to second normal stress differences: A new mechanism for the mass transport of solutes in flowing, non-colloidal suspensions**  
Arun Ramachandran (University of Toronto)

**Hydrodynamics of Swimming Microorganisms**  
**Barus-Holley 191**

Session Chairs *Arezoo Ardekani (University of Notre Dame), Jeffrey Guasto (MIT)*

- **Movements of tethered Marine Bacterium with a Polar Flagellum**  
Xiao-Lun Wu (University of Pittsburgh)
- **Propulsion of model monotrichous bacteria in weakly viscoelastic fluids**  
Alexander Morozov (University of Edinburgh)
- **Cell-kinematics and the swimming motility of an individual bacterium**  
Bin Liu (Brown University), Thomas Powers (Brown University), Kenneth Breuer (Brown University)
- **Turning failure into function: Marine bacteria reorient via a flagellar buckling instability**  
Kwangmin Son (MIT), Jeffrey Guasto (MIT), Roman Stocker (MIT)

**MECHANICS OF BIOLOGICAL AND SOFT MATERIALS**

**Mechanics and Physics of Biological Cells**  
**Barus-Holley 141**

Session Chairs *Allen Liu (University of Michigan), Christian Franck (Brown University)*

- **Biophysical model of the coupled mechanisms of cell adhesion, contraction and spreading**  
Franck Vernerey (University of Colorado Boulder)
- **Tuning Molecular Adhesion via Material Anisotropy**  
Jin Qian (Zhejiang University)
- **Investigating viscoelastic effects on cell adhesion using Atomic Force Microscopy**  
Kuo-Kang (Isaac) Liu (University of Warwick), Eleftherios Siamantouras (), Paul Squires (), Claire Hills ()
- **ECM ligands type and substrate stiffness regulate 3T3 Fibroblast cell traction force**  
Mina Shojaeizadeh (WPI), Qian Xuyu (WPI), Jared Franklin (WPI), Qi Wen (WPI)

**MECHANICS IN MATERIALS SCIENCE**

**From Atomistics to Reality: Spanning Scales in Simulations and Experiments**  
**CIT 165**

Session Chairs *Antonio DiCarlo (Universita Roma Tre), Ronald Miller (Carleton University)*

- **Arrays of mutually interacting MD cells**  
Antonio DiCarlo (Universita Roma Tre), Manuela Minozzi (Universita Roma Tre), Matteo Paoluzzi (IPCF-CNR)
- **Coupling Molecular dynamics to a continuum in LibMultiScale: how to address thermal and dislocation issues**  
Guillaume Ancaux (EPFL), Srinivasa Ramiseti (EPFL), Till Junge (EPFL), Jean-François Molinari (EPFL)
- **Computational challenges of coarse-grained atomistics by the quasicontinuum method**  
Jeffrey Amelang (Caltech), Gabriela Venturini (Caltech), Dennis Kochmann (California Institute of Techn.)
- **A coarse-grained molecular dynamics model for unfolded proteins in nuclear pores**  
Ali Ghavami (University of Groningen), Erik Van der Giessen (University of Groningen), Patrick Onck (University of Groningen)

**Lithium ion batteries: When Chemistry meets Mechanics**  
**Salomon 003**

Session Chairs *Vijay Sethuraman (Brown University), Joost Vlassak (Harvard University)*

- **Nanocomposites for Energy Storage Electrodes: High Power, High Energy, High Strength (invited)**  
Gleb Yushin (Georgia Institute of Technology)
- **A beaded-string silicon anode for lithium ion battery**  
Teng Li (University of Maryland), Zheng Jia (University of Maryland)
- **Real time stress measurements on composite lithium-battery electrodes**



- Vijay Sethuraman (Brown University), Nathan Van Winkle (Brown University), Annam Nguyen (Brown University), Siva Nadimpalli (Brown University), Michael Chon (Brown University), Hailong Wang (Brown University), Daniel Abraham (Argonne National Laboratory), Allan Bower (Brown University), Vivek Shenoy (The University of Pennsylvania), Pradeep Guduru (Brown University)
- **Stress-modulated driving force for lithiation reaction in hollow nano-anodes**  
Zheng Jia (University of Maryland), Teng Li (University of Maryland)

***Mechanics of Phase Transforming and Multifunctional Materials***  
***CIT 219***

*Session Chairs* Liping Liu (Rutgers), Yongmei Jin (Michigan Tech)

- **Phase separation of polymeric gels - domain dilation vs. coarsening**  
Wei Hong (Iowa State University), Xiao Wang (Iowa State University)
- **Phase Field Modeling and Computer Simulation of Multiferroic Materials**  
Yongmei Jin (Michigan Tech), Yu Wang (Michigan Tech), Stephen Kampe (Michigan Tech), Shuxiang Dong (Peking University)
- **Effect of Semiconducting nature on the fracture behavior of Ferroelectric films.**  
BHARAT PENMECHA (California Institute of Techno), Kaushik Bhattacharya (California Institute of Technology)
- **Shape and size dependence of the phase transition temperature for ferroelectric/ferromagnetic nanoparticles**  
Liping Liu (Rutgers), Lixin Hu (Rutgers University)

***Synthesis, Characterization, and Modeling of Low-Dimensional Nanomaterials***  
***Salomon 202***

*Session Chairs* Ashwin Ramasubramaniam (University of Massachusetts Amherst), Cristian Ciobanu (Colorado School of Mines)

- **Mechanics of graphene bubbles**  
Peng Wang (), Wei Gao (), Zhiyi Cao (), Kenneth Liechti (), Rui Huang (University of Texas at Austin)
- **The Influence of Defect-Induced Amorphization on the Structural and Mechanical Properties of Single Layer Graphene**  
Ashwin Ramasubramaniam (University of Massachusetts Amherst), Corinne Carpenter (University of Massachusetts Amherst), Dimitrios Maroudas (University of Massachusetts Amherst)
- **Orientation-dependent binding energy of graphene on palladium**  
Branden Kappes (), Abbas Ebnonnasir (), Suneel Kodambaka (), Cristian Ciobanu (Colorado School of Mines)
- **A continuum model of polygonization in multiwalled carbon nanotubes**  
Dmitry Golovaty (University of Akron)

**MECHANICS OF SOLIDS AND STRUCTURES**

***Contact Mechanics***  
***Barus-Holley 163***

*Session Chairs* Mircea Teodorescu (UC Santa Cruz), Bart Raeymaekers (University of Utah)

- **A Model for Adhesive Wear Particle Volume using Extended Finite Element Modeling**  
Deepak Patil (Univ. of Wisconsin - Madison), Melih Eriten (University of Wisconsin-Madison)
- **Perspectives on the development of general contact for Abaqus/Standard**  
Harry Harkness (Dassault Systemes Simulia Corp), George Ang (Dassault Systemes Simulia Corp), Dan Cojocaru (Dassault Systemes Simulia Corp)
- **Finite element implementation of an eigenfunction solution for the contact pressure variation due to wear**  
James Barber (University of Michigan), Yong Hoon Jang (Yonsei University, Korea), Yuwei Liu (Beijing Institute of Technology)
- **Improving estimates of wear rates in grid-to-rod fretting (GTRF) through microscale simulations**  
Areg Hayrapetian (MIT), Michael Demkowicz (MIT)

***Crack initiation and growth: methods, applications, and challenges***

**Sayles Auditorium**

Session Chairs Gregory Rodin (ICES, UT Austin), John Dempsey (Clarkson University)

- **Three dimensional fracture growth as a standard dissipative system: some general theorems and preliminary numerical analysis.**  
Alberto Salvadori (University of Brescia / TUE), Francesca Fantoni (University of Brescia, Italy)
- **A Variational Approach to Hydraulic Fracturing**  
Blaise Bourdin (Lsu), Chukwudi Chukwudozie (LSU)
- **3-D Simulation of Arbitrary Crack Growth Using a New Energy-Based Formulation**  
Brett Davis (Cornell University), Paul Wawrzynek (), Anthony Ingraffea (Cornell University)
- **Three dimensional finite element simulations of ductile to brittle failure mode transition in glassy amorphous polymers**  
Brunda Kattakola (IIT Kanpur), Sumit Basu (Indian Institute of Technology)

**Discrete Dislocation Plasticity****RI Hall 108**

Session Chairs Amine Benzerga (Texas A&M University)

- **A Coupled Framework For Climb-Assisted Glide In Discrete Dislocation Plasticity**  
Vikram Deshpande (Cambridge University), Can Ayas (Cambridge University), Hans van Dommelen (Technical University of Eindhoven)
- **The Dislocation Network Evolution under Irradiation Conditions in Dislocation Dynamics Simulations**  
Dan Mordehai (Technion), Emmanuel Clouet (CEA), Laurent Dupuy (CEA)
- **Climb Enabled Discrete Dislocation Plasticity of Particle Reinforced Composites**  
Can Ayas (Cambridge University), Vikram Deshpande (Cambridge University)

**Engineering Mechanics and Materials in the Oilfield****Sayles 105**

Session Chairs Pedro Reis (MIT), Nathan Wicks (Schlumberger)

- **REALITIES AND TECHNICAL CHALLENGES FACING THE OIL AND GAS INDUSTRY**  
Francois Auzeais (Schlumberger)
- **Rapid microscale chemo-mechanical characterization of microstructural diversity in oil/gas shales**  
Nicola Ferralis (MIT)
- **Chemistry of interfaces between inorganic minerals and porous carbons: Implications for the mechanical properties of gas shale**  
Gyorgy Hantal (MIT), Laurent Brochard (MIT/ENPC), Roland Pellenq (CNRS/MIT), Franz-Joseph Ulm (MIT), Benoit Coasne (CNRS-MIT)

**Instability in Solids and Structures****Barus-Holley 190**

Session Chairs Dai Okumura (Nagoya University), Yoshitaka Umeno (The University of Tokyo)

- **Post-bifurcation analysis of a regular honeycomb structure under bi-axial loading**  
Ryan Elliott (University of Minnesota), Pierre Henry (Ecole Polytechnique, France)
- **Effects of geometrical imperfection on swelling induced buckling patterns of gel film with square lattice of holes**  
Dai Okumura (Nagoya University), Tsuyoshi Kuwayama (Nagoya University), Nobutada Ohno (Nagoya University)
- **Formation of complex ordered patterns by harnessing mechanical instability in geometrically frustrated lattices**  
Sung Kang (Harvard University), Sicong Shan (Harvard University), Katia Bertoldi (Harvard University)
- **Torsional Buckling Instability in Hollow Nanolattices**  
Lucas Meza (Caltech), Julia Greer (Caltech)

**Dynamic Behavior of Materials**  
**Salomon 101**

Session Chairs Venkitanarayanan Parameswaran (IIT Kanpur), Xu Nie (University of North Texas)

- **Flaw distributions, subscale crack interactions, and dynamic failure of ceramics**  
Andrew Tonge (The Johns Hopkins University), K.T. Ramesh (Johns Hopkins University)
- **Experimental and numerical study of dynamic fracture in polycarbonate**  
Anshul Faye (IIT Kanpur), Venkitanarayanan Parameswaran (IIT Kanpur), Sumit Basu (Indian Institute of Technology)
- **Towards a microstructurally informed model for dynamic ductile failure**  
Justin Wilkerson (Johns Hopkins University), K.T. Ramesh (Johns Hopkins University)
- **Microscopic modeling of ignition and burning for well-arranged energetic crystals in response to drop-weight impact**  
Yanqing Wu (Beijing Institute of Technology)

**Materials Design and Biomimetic Material Concepts**  
**CIT 227**

Session Chairs Haimin Yao (Hong Kong Polytechnic Univ), Vikas Tomar (Purdue)

- **Biomimetic cilia and flagella for lab-on-chip devices**  
Syed Khaderi (University of Cambridge), Sandeep Namdeo (), Jaap Den Toonder (Philips/TU-Eindhoven), Patrick Onck (University of Groningen)
- **Toughening of dissimilar interfaces with patterned morphology**  
Fernando Cordisco (Purdue), Pablo Zavattieri (Purdue), Louis J. Hector, Jr. (General Motors R&D), Allan Bower (Brown University)
- **Toughening mechanisms in multilayered materials**  
Sina Askarnejad (Worcester Polytechnic(WPI)), Nima Rahbar (Worcester Polytechnic Institute)
- **Mechanics of pharyngeal teeth of black carp (*Mylopharyngodon piceus*) crushing mollusk shells**  
Haimin Yao (Hong Kong Polytechnic Univ)

**Mechanics of Thin Films and Multilayered Structures**  
**Salomon 203**

Session Chairs Nancy Sottos (Dept. of Materials Science and Eng., Univ. of Illinois at Urbana-Champaign), Junlan Wang (University of Washington)

- **Molecular Tailoring of Thin Film Adhesion**  
Nancy Sottos (Dept. of Materials Science and Eng., Univ. of Illinois at Urbana-Champaign), Martha Grady (), Philippe Geubelle ()
- **Transduction of molecular binding associated conformational changes to mechanical deformation**  
Yue Zhao (Iowa State University), Pranav Shrotriya (Iowa State University)
- **Adhesion Map for Thin Films**  
Guangxu Li (Texas Instruments), Kai-Tak Wan (Northeastern University)
- **BLISTER ADHESION MEASUREMENTS OF LARGE AREA GRAPHENE**  
Kenneth Liechti (), Zhiyi Cao (), Peng Wang (UT Austin), Rui Huang (University of Texas at Austin)

**Soft Materials and Structures**  
**Barus-Holley 158**

Session Chairs Christian Franck (Brown University), Nanshu Lu (University of Texas at Austin)

- **Determining a Failure Strain Envelope for Neurons in Uniaxial Compression**  
Jonathan Estrada (Brown University), Eyal Bar-Kochba (Brown University), Christian Franck (Brown University)
- **Flexoelectricity in Soft and Biological Materials**  
Pradeep Sharma (University of Houston), Liping Liu (Rutgers), Qian Deng (University of Houston)
- **Mechanics of the Venus flytrap's fast motion and Bio-mimetic flytrap-robots**  
Zi Chen (Washington University), Qiaohang Guo (), Huang Zheng (), Stephen Xie (), Wei Li (), Guiping Su (), Junjie Lin (), Yuxin Liu (), Yiting Ding (), Wenzhe Chen (), Larry Taber ()

# Tuesday 10:45 - 12:15

## AWARDS SYMPOSIA

### *Eringen Medal Symposium in honor of G. Ravichandran Salomon 001*

*Session Chairs* Christian Franck (Brown University), Vikas Prakash (Case Western Reserve Univ)

- **Liquid crystal elastomers**  
Kaushik Bhattacharya (California Institute of Technology)
- **Dynamic Punch Test**  
Amos Gilat (Ohio State University), Jeremy Seidt (Ohio State University)
- **Damage Tolerance in Biomimetic Composites**  
Srinivasan Arjun Tekalur (Michigan State University), Abhishek Dutta ()

### *Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials MacMillan 117*

*Session Chairs* Huanyu CHENG (Northwestern University), CHUNYU LI (Purdue University)

- **Modeling of flexoelectric effects in ferroelectric epitaxial thin films**  
A.K. Soh (Monash University), H.T. Chen (The University of Hong Kong)
- **Cryogenic Fracture of Cracked Piezoelectric Ceramics in Three-Point Bending under Electric Fields**  
Yasuhide Shindo (Tohoku University), Fumio Narita (Tohoku University)
- **An internal variable based model for the electric breakdown and piezoelectricity of ferroelectrets**  
Baixiang Xu (TU Darmst), Dietmar Gross (Division of Solid Mechancis, TU Darmstadt)
- **Effect of Aged Binder on Piezoelectric Properties of Cement-Based Piezoelectric Composites**  
Huang Hsing Pan (Kaohsiung U. of App. Sciences)
- **Loading frequency-dependent hysteresis behaviors of ferroelectric polycrystals: a phase-field study**  
Ning Liu (), Yu Su (Beijing Institute of Tech)

### *SES Medal Symposium in honor of D.J. Steigmann MacMillan 115*

*Session Chairs* Roberto Paroni (University of Sassari), Jay Walton (Texas A&M University)

- **Reflection and transmission of plane waves at surfaces carrying material properties and embedded in second-gradient materials**  
Angela Madeo (INSA-Lyon)
- **Computational Homogenization of Random Network Microstructures in Soft Matter Materials**  
Christian Linder (Stanford University)
- **Mass-related order parameters**  
Antonio DiCarlo (Universita Roma Tre)
- **The Hencky strain energy measures the geodesic distance of the deformation gradient  $F \in GL_+(3)$  to  $SO(3)$  in the canonical left-invariant Riemannian metric on  $GL_+(3)$ .**  
Patrizio Neff (University of Duisburg-Essen)

## MECHANICS OF FLUIDS AND THERMAL SYSTEMS

### *Complex Fluids: Suspensions, Emulsions, and Gels Barus-Holley 160*

*Session Chairs* Jeffrey Morris (Levich Institute and Dept. of Chemical Engineering, CCNY), Roseanna Zia (Cornell University)

- **Direct measurement of 3D suspension microstructure**

- James Gilchrist (Lehigh University), Bu Xu (Lehigh University), M.Tharanga Perera (Lehigh University)
- **Direct Investigation of Suspension Flow in an Ideal Micro-porous medium**  
M.Tharanga Perera (Lehigh University), Bu Xu (Lehigh University), James Gilchrist (Lehigh University)
  - **Discontinuous shear thickening: fluid dynamics or granular physics?**  
Ryohei Seto (Levich Institute, CCNY), Romain Mari (Levich Institute / CCNY), Jeffrey Morris (Levich Institute and Dept. of Chemical Engineering, CCNY), Morton Denn (Levich Institute and Dept. of Chemical Engineering, City College of New York)
  - **Microstructure and rheology of colloidal suspension in simple shear and dynamic oscillatory flows: theory and simulation.**  
Ehssan Nazockdast (CUNY), Stephanie Marenne (City College of New York), Jeffrey Morris (Levich Institute and Dept. of Chemical Engineering, CCNY)

### ***Hydrodynamics of Swimming Microorganisms*** ***Barus-Holley 191***

*Session Chairs Jeffrey Guasto (MIT), Arezoo Ardekani (University of Notre Dame)*

- **Trapped in Flow**  
Roman Stocker (MIT), Roberto Rusconi (MIT), Jeffrey Guasto (MIT), William Durham (Oxford University), Michael Barry (MIT), Eric Climent (Institute the Mechanique des Fluids de Toulouse), Guido Boffetta (Universita' di Torino), Filippo DeLillo (Universita' di Torino), Massimo Cencini (Consiglio Nazionale della Ricerche, Roma, Italy)
- **Reverse engineering the euglenoid movement**  
Marino Arroyo (UPC-BarcelonaTech), Luca Heltai (), Daniel Millan (), Antonio DeSimone ()
- **Unsteady inertial effects on small swimming organisms**  
Shiyang Wang (University of Notre Dame), Arezoo Ardekani (University of Notre Dame)
- **Gyrotactic Bioconvection at Pycnoclines**  
Alireza Karimi (University of Notre Dame), Arezoo Ardekani (University of Notre Dame)

## **MECHANICS OF BIOLOGICAL AND SOFT MATERIALS**

### ***Mechanics and Physics of Biological Cells*** ***Barus-Holley 141***

*Session Chairs Kuo-Kang (Isaac) Liu (University of Warwick), Franck Vernerey (University of Colorado Boulder)*

- **On Cell-Nanomaterial Interactions**  
Huajian Gao (Brown University)
- **Substrate Stiffness Regulates Cellular Uptake of Nanoparticles**  
Changjin Huang (The Pennsylvania State Unvers), Peter Butler (Pennsylvania State University), Sheng Tong (Georgia Institute of Technology and Emory University), Hari Muddana (The Pennsylvania State University), Gang Bao (Georgia Institute of Technology and Emory University), Sulin Zhang (Penn State University)
- **Mechanics of clathrin-mediated endocytosis**  
Nikhil Walani (University of Houston), Jennifer Torres (University of Houston), Ashutosh Agrawal (University of Houston)
- **Spatial Dynamics of Clathrin-Mediated Endocytosis**  
Allen Liu (University of Michigan), Xinyu Tan (University of Michigan)

## **MECHANICS IN MATERIALS SCIENCE**

### ***From Atomistics to Reality: Spanning Scales in Simulations and Experiments*** ***CIT 165***

*Session Chairs Dan Mordehai (Technion), Dov Sherman (Technion)*

- **Crack initiation and propagation in brittle crystals at the low energy regime**  
Dov Sherman (Technion)
- **The Origin of Fracture Surface Instabilities in (111) silicon crystal**  
Liron Ben Bashat Bergman (Technion), Dov Sherman (Technion)
- **Flaw-Governed Failure in Nanocrystalline Pt Nanostructures**  
X Gu (Caltech), Zhaoxuan Wu (Institute of High Performance Computing, Singapore), Yong-Wei Zhang (IHCP)

Singapore), David Srolovitz (University of Pennsylvania), Julia Greer (Caltech)

- **Modeling the Size-Dependent Strength of Metallic Nanoparticles at the Nanoscale**  
Dan Mordehai (Technion), Seok-Woo Lee (CalTech), David Srolovitz (University of Pennsylvania), William Nix (Stanford University), Eugen Rabkin ()

***Lithium ion batteries: When Chemistry meets Mechanics***  
**Salomon 003**

*Session Chairs* Kejie Zhao (MIT), Joost Vlassak (Harvard University)

- **Predicting the transport and mechanical properties of the solid electrolyte interphase in Li-ion batteries**  
Yue Qi (General Motors R&D), Siqi Shi (Brown University), Louis J. Hector, Jr. (General Motors R&D), Kevin Leung (Sandia National Lab)
- **A reactive molecular dynamics simulation of the Lithiated Silicon/Carbon composite anode in Lithium ion batteries**  
Alireza Ostadhossein (Pennsylvania State University), Adri van Duin (Pennsylvania State University)
- **Multi-scale and multi-physics modelling of Li-ion batteries: a computational homogenization approach.**  
Alberto Salvadori (University of Brescia / TUE), Davide Grazioli (University of Brescia, Italy)
- **Brittle to Ductile Transition for Amorphous Silicon Electrodes**  
Chao Chen (Harvard University), Weili Wang (Harvard University), Efthimios Kaxiras (Harvard University), Zhigang Suo (Harvard University)

***Mechanics of Phase Transforming and Multifunctional Materials***  
**CIT 219**

*Session Chairs* Doron Shilo (Technion, Israel Institute of Technology), Ying Chen (RPI)

- **SMALL-SCALE TRANSFORMATION BEHAVIOR IN SHAPE MEMORY ALLOYS**  
Samantha Daly (University of Michigan)
- **Co-existence of phases in twisted DNA**  
David Argudo (University of Pennsylvania), Prashant Purohit (University of Pennsylvania)
- **Mesoscale Simulation of Reversible Martensitic Transformations in Shape Memory Alloys**  
Ying Chen (RPI)

***Synthesis, Characterization, and Modeling of Low-Dimensional Nanomaterials***  
**Salomon 202**

*Session Chairs* Dmitry Golovaty (University of Akron), J. Patrick Wilber (University of Akron)

- **Adhesion and Peeling Instability of an Elastic Rod**  
Carmel Majidi (Carnegie Mellon University), Oliver O'Reilly (UC Berkeley)
- **Mechanics of Self-Folding of Single-layer Graphene**  
Jianliang Xiao (University of Colorado Boulder), Ming Li (Dalian University of Technology), Xianhong Meng (Beihang University)
- **Controlling folding patterns in supported graphene by adhesion, friction and strain anisotropy**  
Kuan Zhang (UPC), Marino Arroyo (UPC-BarcelonaTech)
- **Buckling of a Graphene Sheet Perpendicular to a Rigid Substrate**  
J. Patrick Wilber (University of Akron), Dmitry Golovaty (University of Akron), Shawn Ryan (sdryan8032@hotmail.com)

**MECHANICS OF SOLIDS AND STRUCTURES**

***Contact Mechanics***  
**Barus-Holley 163**

*Session Chairs* Melih Eriten (University of Wisconsin-Madison), Deepak Patil (Univ. of Wisconsin - Madison)

- **Burnishing Wear Mechanism of Thin Carbon Film during High Speed Sliding Contact**  
Chang-Dong Yeo (Texas Tech University), Sungae Lee ()
- **Determination of the Limits of QuasiStatic and Dynamic**



David Hills (University of Oxford), Matthew Brake (Sandia National Laboratories)

- **Simulation of High Speed Impact in the Cold Spray Deposition Process**  
Jing XIE (INSA DE LYON), Daniel NELIAS (INSA Lyon), Helene WALTER-LE-BERRE (), Kiyohiro ITO (), Yuji ICHIKAWA (), Kazuhiro OGAWA ()
- **Statistical Model on Nearly Complete Elastic Rough Surface Contact**  
Yang Xu (Auburn University), Robert L. Jackson (Auburn University), Dan Marghitu (Auburn University)

***Crack initiation and growth: methods, applications, and challenges***  
**Sayles Auditorium**

*Session Chairs* Alberto Salvadori (University of Brescia / TUE), Sumit Basu (Indian Institute of Technology)

- **The threshold for subcritical crack growth**  
Gregory Rodin (ICES, UT Austin)
- **T-stresses for short and long cracks**  
John Dempsey (Clarkson University)
- **Derivation of linear elastic from rescaled non-linear elastic quasi-static crack evolutions**  
Rodica Toader (University of Udine)
- **Gradient Fracture Mechanics**  
Elias Aifantis (Aristotle University of Thessa)

***Discrete Dislocation Plasticity***  
**RI Hall 108**

*Session Chairs* Erik Van der Giessen (University of Groningen)

- **Influence of Forest Hardening on Fracture Toughness using a New 2.5d DD Model**  
W. A. Curtin (EPFL), Shyam Keralavarma (EPFL)
- **A Discrete Dislocation Analysis of Hydrogen-Assisted Mode I Fracture**  
Nilgoon Irani (Eindhoven University of Tech.), Joris J. C. Remmers (Eindhoven University of Technology), Vikram Deshpande (Cambridge University)
- **Thermomechanical growth of nanovoids in FCC single crystals**  
Pilar Ariza (University of Seville), Mauricio Ponga (Caltech), Michael Ortiz (Caltech)
- **Plastic response of surface asperities during contact loading**  
Lucia Nicola (Delft), R.-J. Dikken (TU Delft), F Sun (TU Delft)

***Engineering Mechanics and Materials in the Oilfield***  
**Sayles 105**

*Session Chairs* Buc Slay (Weatherford), Nathan Wicks (Schlumberger)

- **Stochastic Approaches for Nonlinear Drill String Dynamic Analyses**  
POI SPANOS (RICE UNIV>), David Rowatt (Schlumberger), Kesh Keshavan (Schlumberger), Eleazar Marquez (Rice University)
- **Review of Research at Tulsa University Drilling Research Projects (TUDRP)**  
Stefan Miska (University of Tulsa), Mengjiao Yu (University of Tulsa)
- **Deployable Structures and Compliant Mechanisms: Enabling Down hole Zonal Isolation**  
Julio Guerrero (Draper Lab)
- **In Situ Visualization of Swell Packer Failure**  
Benjamin Druecke (MIT), Nathan Wicks (Schlumberger), Elizabeth Dussan V. (), Agathe Robisson (Schlumberger), Anette Hosoi (MIT)

***Instability in Solids and Structures***  
**Barus-Holley 190**

*Session Chairs* Jay Miller (MIT), Dennis Kochmann (California Institute of Techn.)

- **Analysis of global instability mode in atomistic model**  
Yoshitaka Umeno (The University of Tokyo), Wolfram Noehring (), Albert Iskandarov (), Atsushi Kubo (), Erik

Bitzek ()

- **Mapping the Stochastic Response of Nanostructures**  
Ellad Tadmor (University of Minnesota), Ryan Elliott (University of Minnesota), Subrahmanyam Pattamatta (University of Minnesota)
- **Elastic instabilities in single crystal thin film during nano-indentation loading**  
Akanksha Garg (CMU), Craig Maloney (Carnegie Mellon University)
- **Operation of devices based on shape transitions in bistable carbon nanotubes**  
Oleg Shklyaev (The Penn State University)

### ***Dynamic Behavior of Materials Salomon 101***

*Session Chairs* Leslie Lamberson (Drexel), Hongbing Lu (Univ. of Texas at Dallas)

- **Measuring Techniques in the Split Hopkinson Pressure-shear Bars**  
fangyun Lu (), Pengduo Zhao (), Chen R (NUDT China), banghai Jiang ()
- **Effects of Particle Size and Moisture on the High-strain-rate Compressive Behavior of Eglin Sand under Confinement**  
Huiyang Luo (Dept of Mechanical Engineering, Univ. of Texas at Dallas), William Cooper (Eglin Air Force Base, FL 32542), Hongbing Lu (Univ. of Texas at Dallas)
- **The Art of Cortical Bone Dynamic Fracture**  
Leslie Lamberson (Drexel)

### ***Materials Design and Biomimetic Material Concepts CIT 227***

*Session Chairs* Nima Rahbar (Worcester Polytechnic Institute), Rouzbeh Shahsavari (Rice University)

- **An Analytical Model of Reactive Diffusion for Transient Electronics**  
HuanYu CHENG (Northwestern University), Yonggang Huang (Northwestern University)
- **Fabrication and Deformation of Three-Dimensional Hierarchical Ceramic Nano-Lattices**  
Lucas Meza (Caltech), Dongchan Jang (California Institute of Technology), Frank Greer (), Julia Greer (Caltech)
- **Mechanistic investigation of shear load transfer between dissimilar tablets**  
Rouzbeh Shahsavari (Rice University), Navid Sakhavand (Rice University)
- **Interfacial Biomechanics Of Material Interfaces in Tropocollagen Based Materials**  
Vikas Tomar (Purdue), Tao Qu (Purdue University)

### ***Mechanics of Thin Films and Multilayered Structures Salomon 203***

*Session Chairs* Nanshu Lu (University of Texas at Austin), Rui Huang (University of Texas at Austin)

- **A Physically Transient Form of Silicon Electronics (Part I)**  
Yonggang Huang (Northwestern University)
- **Wrinkling and Delamination of Thin Films on Compliant Substrates**  
Rui Huang (University of Texas at Austin)
- **Buckling Sensitivity and Deformation of Lines in Integrated Circuits**  
Peter Woytowicz (Lam Research Corp.), Keerthi Gowdaru (Lam Research Corp.)
- **Stretchability of Polymer-Supported ITO Serpentine Thin Films**  
Shixuan Yang (University of Texas at Austin), Nanshu Lu (University of Texas at Austin)

### ***Soft Materials and Structures Barus-Holley 158***

*Session Chairs* Benny Davidovitch (UMass Amherst), Zi Chen (Washington University)

- **Phase field model for the fracture of soft elastomers**  
Wei Hong (Iowa State University), Xiao Wang (Iowa State University)



- Directional Delamination of Elastic Ellipsoidal Shells  
Hamid Ebrahimi (Northeastern University), Amin Ajdari (Northwestern University), Arezki Boudaoud (), Dominic Vella (University of Oxford), Ashkan Vaziri ()
- Mechanics of Deformable Layered Materials: Experiments, Simulations and Exact Solutions  
Stephan Rudykh (Massachusetts Institute of Technology), Mary Boyce (Massachusetts Institute of Technology)

## Tuesday 1:30 - 2:30 Salomon 101 SES 50th Anniversary Plenary Lecture

*Session Chairs: Kyung-Suk Kim (Brown University)*

### Brain Research: Past, Present and Future

Leon Cooper (Brown University)

Tuesday 2:40 - 4:00

#### AWARDS SYMPOSIA

*Eringen Medal Symposium in honor of G. Ravichandran*  
Salomon 001

*Session Chairs: Harish Tippur (Auburn University), Kenji Oguni (Keio University)*

- Experimental use of the Granular Element Method in opaque 3D grains  
Jose Andrade (Caltech), Ryan Hurley (), Eloise Marteau ()
- FABRICATION AND DEFORMATION OF THREE-DIMENSIONAL BIOMIMETIC CERAMIC NANO-ARCHITECTED MATERIALS  
Julia Greer (Caltech), Lucas Meza (Caltech), Dongchan Jang (California Institute of Technology)
- Toughening and asymmetry in peeling of heterogeneous adhesives  
Laurent Ponson (Institut Jean Le Rond d'Alembert Université Pierre et Marie Curie), Shuman Xia (Georgia Tech), Kaushik Bhattacharya (California Institute of Technology), G. Ravichandran (Caltech)
- Thermal Conductivity of high performance yarn-like Carbon-nanotube Fibers  
Vikas Prakash (Case Western Reserve Univ), Eric Mayhew (CWRU)

*Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials*  
MacMillan 117

*Session Chairs: Jackie Li (City University of New York), A.K. Soh (Monash University)*

- Thermal transport modeling from first-principles  
Keivan Esfarjani (Rutgers University)
- Analyzing the mechanical response of bio-polymer networks via a combined finite element-Langevin dynamics (FEM-LD) approach  
Yuan Lin (The University of Hong Kong), Wei Xi (The University of Hong Kong), Jin Qian (Zhejiang University), K.Y. Sze (The University of Hong Kong), Vivek Shenoy (The University of Pennsylvania)
- Effects of Statistics of Cell Size and Shape Irregularity on Mechanical Properties of 2D and 3D Voronoi Foams  
Liqun Tang (South China Univ. of Tech.), Xuepeng Shi (), Lue Zhang (), Zejia Liu (), Zhenyu Jiang (), Yiping

Liu ()

- **A quantitative analysis of strengthening mechanisms and rate-dependence in a high strength aluminum alloy**  
K.T. Ramesh (Johns Hopkins University), Buyang Cao (), Matthew Shaeffer (Johns Hopkins University)
- **A super-generalized plane stress problem**  
Minzhong Wang (Dept. of Mechanics and Aerospace Engineering, College of Engineering, Peking Uni), Baixiang Xu (TU Darmst), Yang Gao (College of Science, China Agricultural University)

**SES Medal Symposium in honor of D.J. Steigmann  
MacMillan 115**

Session Chairs Ashutosh Agrawal (University of Houston), Adair Aguiar (University of São Paulo)

- **Eshelby driving forces on interacting defects at the microscale and their homogenized effect on the macro: examples in microcrack/hole interaction and damage amplification**  
Xanthippi Markenscoff (University of California, San )
- **Hyperelastic fiber composites - homogenization and macroscopic stability**  
Gal DeBotton (Ben-Gurion Univ.), Gal Shmuel (CalTech), Stephan Rudykh (Massachusetts Institute of Technology), Tal Oren (Ben-Gurion Univ.)
- **Grain-size dependent elastic properties of bulk nanocrystalline materials**  
Tae-Yeon Kim (McGill University), Eliot Fried (McGill University)
- **Plane Strain Problem in Elastically-Rigid Finite Plasticity**  
Anurag Gupta (IIT Kanpur)

**MECHANICS OF FLUIDS AND THERMAL SYSTEMS**

**Complex Fluids: Suspensions, Emulsions, and Gels  
Barus-Holley 160**

Session Chairs Hassan Massoud (NYU), James Gilchrist (Lehigh University)

- **Structure and flow behavior of cubic nanoparticle suspensions**  
Rajesh Mallavajula (Cornell University), Lynden Archer (Cornell University), Donald Koch (Cornell University)
- **Relaxation processes in nano-colloidal suspensions**  
Samanvaya Srivastava (Cornell University), Lynden Archer (Cornell University)
- **Synthesis and characterization of nano-fluids containing metal oxide nanoparticles**  
Phuoc Tran (NETL), Mehrdad Massoudi (NETL)

**Hydrodynamics of Swimming Microorganisms  
Barus-Holley 191**

Session Chairs Marino Arroyo (UPC-BarcelonaTech), Thomas Powers (Brown University)

- **Undulatory Swimming in Complex & Heterogeneous Media**  
Paulo Arratia (University of Pennsylvania)
- **Understanding Sperm Motility in Changing Environments**  
Julie Simons (Tulane University), Lisa Fauci (Tulane University), Ricardo Cortez (Tulane University)
- **Hydrodynamic Interactions of Sperm**  
Sarah Olson (WPI), Lisa Fauci (Tulane University)
- **The phylogeny of swimming kinematics: The environment controls flagellar waveforms in sperm motility**  
Jeffrey Guasto (MIT), Lisa Burton (MIT), Anette Hosoi (MIT), Roman Stocker (MIT)

**MECHANICS OF BIOLOGICAL AND SOFT MATERIALS**

**Mechanics and Physics of Biological Cells  
Barus-Holley 141**

Session Chairs Evan Hohlfeld (UMass Amherst), Markus Buehler (MIT)

- **Tension induced growth in cells**  
Prashant Purohit (University of Pennsylvania)
- **Dynamics of cell invasion in three dimensions**  
Jacob Notbohm (Caltech), Ayelet Lesman (), David Tirrell (), G. Ravichandran (Caltech)
- **3D Neutrophil Traction in Changing Microenvironments**  
Jennet Toyjanova (Brown University), Estefany Flores-Cortez (Rhode Island Hospital), Jonathan Reichner (Rhode Island Hospital), Christian Franck (Brown University)
- **One Cell as a Mixture: Simulations of the Micropipette Aspiration Responses of valvular interstitial cells**  
Yusuke Sakamoto (ICES, University of Texas at A), Michael Sacks (The University of Texas at Austin)

## MECHANICS IN MATERIALS SCIENCE

### *From Atomistics to Reality: Spanning Scales in Simulations and Experiments* CIT 165

*Session Chairs* Albert To (University of Pittsburgh), Gang Lu (CA State University Northridge)

- **Multiscale quasicontinuum modelling of fibrous materials**  
Lars Beex (Cardiff University), Ron Peerlings (Eindhoven University of Technology), Marc Geers (Eindhoven University of Technology)
- **Multiresolution Molecular Mechanics: Accuracy, Stability, and Convergence Analysis**  
Albert To (University of Pittsburgh), Qingcheng Yang (University of Pittsburgh), Emre Biyikli (University of Pittsburgh)
- **Multiscale modeling of strain rate effects in molecular systems at finite temperature**  
Pan Xiao (Institute of Mechanics, CAS), Yilong Bai (LNM, Institute of Mechanics, CAS)
- **Quantum Mechanics Based Multiscale Modeling of Materials**  
Gang Lu (CA State University Northridge)

### *From Atomistics to Reality: Spanning Scales in Simulations and Experiments* CIT 227

*Session Chairs* Arshad Tahir (ICAMS Ruhr Universit  $\diamond$ t Bochum, Germany), Catalin Picu (Rensselaer Polytechnic Institutu)

- **Strength of defective graphene  $\diamond$  atomistic modeling and experiments**  
Catalin Picu (Rensselaer Polytechnic Institutu), Ardavan Zandiatashbar (), Nikhil Koratkar (), Gwan Hyoun Lee (), James Hone ()
- **Multiscale modeling and experimental determination of the intergranular fracture strength of transition metals in the presence of carbon**  
Arshad Tahir (ICAMS Ruhr Universit  $\diamond$ t Bochum, Germany), Rebecca Janisch (ICAMS Ruhr Universit  $\diamond$ t Bochum), Alexander Hartmaier (ICAMS Ruhr Universit  $\diamond$ t Bochum)
- **An Ab-initio Investigation of Environmental Impurities at a Crack Tip in Aluminum**  
Richard Zamora (Cornell University), Derek Warner (Cornell University)
- **A multiscale framework for coupling dislocation dynamics with vacancy diffusion theory**  
A. Amine Benzerga (Texas A&M University), Shyam Keralavarma (EPFL)

### *Lithium ion batteries: When Chemistry meets Mechanics* Salomon 003

*Session Chairs* Kejie Zhao (MIT), Siva Nadimpalli (Brown University)

- **Effects of Coherency Strain in Phase Separating Li-ion Battery Materials**  
Martin Bazant (MIT), Daniel Cogswell (Samsung SAIT America), Todd Ferguson ()
- **Chemo-mechanics of Li-ion intercalation of Silicon-based anodes**  
Claudio Di Leo (MIT), Lallit Anand (MIT)
- **Continuum modeling of plasticity, diffusion and chemical reactions in Li-ion batteries**  
Laurence Brassart (University of Louvain), Kejie Zhao (MIT), Zhigang Suo (Harvard University)
- **Anisotropic Compositional Expansion and Chemical Potential for Amorphous Lithiated Silicon under Stress Tensor**  
Valery Levitas (Iowa State University), Hamed Attariani (ISU)

***Mechanics of Phase Transforming and Multifunctional Materials  
CIT 219***

*Session Chairs* Kaushik Dayal (Carnegie Mellon University), Gal Shmuel (CalTech)

- **Phase field approach to multiple twinning and variant-variant transformations in martensite**  
Arunabha Mohan Roy (Iowa State University), Valery Levitas (Iowa State University)
- **Modeling and simulation in strain-induced phase transformations in a diamond anvil cell**  
Biao Feng (Iowa state university), Valery Levitas (Iowa State University), Oleg Zarechnyy (Iowa state university)
- **Adaptive wavelet-based approach for predicting the mechanical behavior of polycrystals**  
Gal Shmuel (CalTech), Kaushik Bhattacharya (California Institute of Technology)
- **Phase-Field Model for Melt-Mediated Solid-Solid Phase Transformation**  
Kasra Momeni (Iowa State University), Valery Levitas (Iowa State University)

***Synthesis, Characterization, and Modeling of Low-Dimensional Nanomaterials  
Salomon 202***

*Session Chairs* Yong Zhu (North Carolina State University), Pilar Ariza (University of Seville)

- **Quantitative In Situ Tensile Testing of Suspended Graphene**  
Peng Zhang (), Cheng Peng (), Phillip Loya (), Zheng Liu (), Lulu Ma (Rice University), Yongji Gong (Rice University), Jiangnan Zhang (), Pulickel Ajayan (), Jun Lou (Rice University)
- **Topological defects in graphene**  
Pilar Ariza (University of Seville), Juan Mendez (University of Seville), Michael Ortiz (Caltech)
- **Highly compliant and stretchable patterned graphene**  
Shuze Zhu (University of Maryland), Teng Li (University of Maryland)
- **Pseudomagnetic Field in a Graphene Drumhead under Localized Deformation**  
Shuze Zhu (University of Maryland), Yinjun Huang (University of Maryland), Teng Li (University of Maryland)

**MECHANICS OF SOLIDS AND STRUCTURES**

***Contact Mechanics  
Barus-Holley 161***

*Session Chairs* Longqiu Li (Harbin Institute of Technology), James Barber (University of Michigan)

- **Elastic Contact Between a Geometrically-Anisotropic Bi-Sinusoidal Surface and a Rigid Base**  
Amir Rostami (Auburn University), Yang Xu (Auburn University), Robert L. Jackson (Auburn University)
- **Full Scale Mixed Lubrication Modeling Approach**  
Gagan Srivastava (CMU), C. Fred Higgs (Carnegie Mellon University)
- **VISCOELASTIC EFFECTS IN A POLYMER MICROFIBER DUE TO SURFACE CONTACT**  
Nicholas Cramer (University of California Santa), Mircea Teodorescu (UC Santa Cruz)
- **Collective behavior of viscoelastic sliders on a rigid rough surface**  
Srivatsan Hulikal (Caltech), Nadia Lapusta (Caltech), Kaushik Bhattacharya (California Institute of Technology)

***Crack initiation and growth: methods, applications, and challenges  
Sayles Auditorium***

*Session Chairs* Kenneth Liechti (), Rena Yu (University of Castilla-La Manc)

- **The onset of cavitation for the equations of polyconvex elasticity**  
Athanasios Tzavaras (University of Crete)
- **On vertical root fracture from condensation of gutta-percha**  
Herzl Chai (Tel-Aviv University), Aviad Tamse (Tel Aviv University)
- **Flaw Insensitive Fracture in Nanocrystalline Graphene**  
Teng Zhang (Brown university), Xiaoyan Li (Tsinghua University), sara kadkhodaei (Brown university), Huajian Gao (Brown University)



**Discrete Dislocation Plasticity**  
**RI Hall 108**

Session Chairs Lucia Nicola (Delft)

- **A Dynamic Discrete Dislocation Plasticity Method for Simulating Extremely High Strain Rate Plasticity**  
Be at Gurrutxaga Lerma (Imperial College London), Daniel Balint (Imperial College London), Daniele Dini (Imperial College London), Daniel Eakins (Imperial College London), Adrian Sutton (Imperial College London)
- **Advanced phase field approach to dislocation evolution**  
Mahdi Javanbakht (Iowa State University), Valery Levitas (Iowa State University)
- **New algorithms for modeling high homologous temperature plastic deformation**  
Run Zhu (Northeastern University), Srinath Chakravarthy (Northeastern University)
- **Discrete Dislocation Dynamics in comparison to Discrete Dislocation Dynamics**  
Steffen Brinckmann (Max-Planck Institut Dsseldorf), Benjamin Reinholz (), Alexander Hartmaier (ICAMS, Ruhr-University Bochum), Peter Mullner (Boise State University)

**Engineering Mechanics and Materials in the Oilfield**  
**Sayles 105**

Session Chairs Dmitry Chuprakov (Schlumberger), Francois Auzerais (Schlumberger)

- **Extended Reach of Coiled Tubing**  
Nathan Wicks (Schlumberger), Jahir Pabon (Schlumberger)
- **Buckling of a thin rod under cylindrical constraint**  
Jay Miller (MIT), Tianxiang Su (Harvard), Katia Bertoldi (Harvard University), Pedro Reis (MIT)
- **Analytic Solutions for Post-Buckling of Pipe Constrained by a Wellbore**  
Robert Mitchell (Halliburton)

**Instability in Solids and Structures**  
**Barus-Holley 190**

Session Chairs Katia Bertoldi (Harvard University), Zheng Jia (University of Maryland)

- **Mechanical instability of a biopolymer-reinforced thin elastic rod: from short-wavelength buckling to localized failure**  
Wanliang Shan (Carnegie Mellon University), Zi Chen (Washington University), Cliff Brangwynne (Princeton University)
- **Magnetic brush: a soft structure with highly tunable stiffness**  
Wei Hong (Iowa State University)
- **Mechanical instability in bat wing skin**  
Alyssa Skulborstad (University of Michigan), Nakhiah Goulbourne (University of Michigan)
- **Mechanical Instability in Bioinspired Multistable Structures**  
Zi Chen (Washington University), Qiaohang Guo (), Steven Shillig (), Kevin Chu (), Chi Li (), Douglas Holmes (Virginia Tech)

**Dynamic Behavior of Materials**  
**Salomon 101**

Session Chairs Demirkan Coker (METU), Vikram Deshpande (University of Cambridge)

- **Dynamic failure of curved interfaces in composite and bonded polymer materials under quasi-static loading**  
Demirkan Coker (METU), Denizhan Yavas (METU-Ankara), Burak Gozluclu (Turkish Aerospace Industries)
- **Dynamic response of Hastelloy X plates subjected to oblique shock wave loading at high temperatures**  
Prathmesh Naik Parrikar (University of Rhode Island), Sandeep Abotula (University of Rhode Island), Arun Shukla (University of Rhode Island)
- **Initiation of adiabatic shear bands from a microstructural standpoint**  
Shmuel Osovski (University of North Texas), Daniel Rittel (), peri Landau (), Arie Venkert ()
- **An experimental investigation of the impact of sand slugs against monolithic and sandwich beams**  
Tobias Uth (University of Cambridge), Vikram Deshpande (University of Cambridge)

**Materials Design and Biomimetic Material Concepts**  
**Barus-Holley 158**

Session Chairs Vikas Tomar (Purdue), Steven Cranford (Northeastern University)

- **The Free Energy Landscape of Cellulose Nanocrystal Adhesion and Its Effect on Composite Strength**  
Sinan Keten (Northwestern University), Shawn Mishra ()
- **Multiscale Modeling of Cellulose Nanocrystals (CNCs)**  
Fernando Dri (Purdue University), Pablo Zavattieri (Purdue), Louis Hector Jr. (General Motors Research and Development Center), Robert Moon (Purdue University)
- **Coupling Molecules and Cooperative Molecular Systems**  
Steven Cranford (Northeastern University)
- **A material system with dorsal-ventral bending asymmetry**  
Thomas Siegmund (Purdue University), Somesh Khandelwal (Purdue), Zhwei Wu (Purdue)

**Mechanics of Thin Films and Multilayered Structures**  
**Salomon 203**

Session Chairs Kai-Tak Wan (Northeastern University), Junlan Wang (University of Washington)

- **A kinetic model of stress evolution in thin films**  
Eric Chason (Brown University)
- **Identifying origins of the mechanical properties of nanoporous metals**  
Antonia Antoniou (Georgia Institute of Technology)
- **Quantitative In-situ TEM Study of Stress Assisted Grain Growth**  
Sandeep Kumar (UC,Riverside), Aman Haque ()
- **Size and Orientation Dependent Thermal Strengthening of Ti/Ni Multilayer Thin Films**  
Junlan Wang (University of Washington), Zhou Yang (University of Washington)

# Tuesday 4:20 - 5:40

## AWARDS SYMPOSIA

**Eringen Medal Symposium in honor of G. Ravichandran**  
**Salomon 001**

Session Chairs Shuman Xia (Georgia Tech), Tong Jiao (Brown University)

- **Cohesive Zone Law Extraction from an Experimental Peel Test**  
Christopher Kovalchick (Becton, Dickinson and Company), G. Ravichandran (Caltech), Alain Molinari (University of Lorraine)
- **A new Fourier-based large deformation Digital Volume Correlation Algorithm**  
Eyal Bar-Kochba (Brown University), Jennet Toyjanova (Brown University), Erik Andrews (), Kyung-Suk Kim (Brown University), Christian Franck (Brown University)
- **Analysis of dynamic propagation of cracks based on Particle Discretization Scheme Finite Element Method (PDS-FEM)**  
Kenji Oguni (Keio University)
- **Computational Prediction of Probabilistic Ignition Behavior of PBXs from Microstructural Stochasticity**  
Min Zhou (Georgia Institute of Technology), Ananda Barua (Georgia Institute of Technology), Seokpum Kim (Georgia Institute of Technology), Yasuyuki Horie (Air Force Research Lab)

**Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials**  
**MacMillan 117**

Session Chairs Keivan Esfarjani (Rutgers University), Yuan Lin (The University of Hong Kong)



- **Study on Mechanics behavior of Magnetolectric Laminate Composites based on surface-effect Modeling and Experimental Characterization**  
Daining Fang (College of Engineering, Peking), Faxin Li (College of Engineering, Peking University), Feng Hao (), Hao Zhou (College of Engineering, Peking University), Jing Ma (College of Engineering, Peking University)
- **On Causes of Tectonic Earthquakes with External and/or Internal Loadings**  
Zhong-qi Quentin Yue (The University of Hong Kong)
- **Equivalent inclusion method based simulation of the sedimentation of many particles toward functionally graded material manufacturing**  
Huiming Yin (Columbia University)
- **Effects of elastic strain energy and interfacial stress on the equilibrium morphology of misfit particles in heterogeneous solids**  
Xujun Zhao (Northwestern University), Jianmin Qu (Northwestern University)

**SES Medal Symposium in honor of D.J. Steigmann  
MacMillan 115**

*Session Chairs Anurag Gupta (IIT Kanpur), Tae-Yeon Kim (McGill University)*

- **Effects of Boundary Reinforcement on Local Singular Fields in Linearly Elastic Materials**  
Peter Schiavone (University of Alberta), Chun Il Kim (University of California, Berkeley), Chong-Qing Ru (University of Alberta)
- **NUMERICAL AND ASYMPTOTIC INVESTIGATION OF A BIFURCATION PHENOMENON IN A CLASS OF HYPERELASTIC LAMINATES**  
Adair Aguiar (University of São Paulo), Leslie P rez-Fern ndez (Institute of Physics and Mathematics, Federal University of Pelotas, RS, Brazil), Edmar Prado (Dept. of Struct. Engrng, S o Carlos School of Engrng, University of S o Paulo)
- **Magnetoactive Elastomers at Finite Strains: Macroscopic Response, Microstructure Evolution and Instabilities**  
Pedro Ponte Castaneda (Univ. of Pennsylvania), Evan Galipeau ()
- **Mechanics of structured plates and shells**  
Katia Bertoldi (Harvard University)
- **Anisotropic spontaneous curvature in lipid membranes**  
Ashutosh Agrawal (University of Houston), Nikhil Walani (University of Houston)

**MECHANICS OF FLUIDS AND THERMAL SYSTEMS**

**Complex Fluids: Suspensions, Emulsions, and Gels  
Barus-Holley 160**

*Session Chairs Kevin Connington (The Levich Institute), Lynn Walker (Carnegie Mellon University)*

- **Impact of irreversibly adsorbed surfactant layers at fluid-fluid interfaces on coalescence**  
Lynn Walker (Carnegie Mellon University), Matthew Reichert (Carnegie Mellon Univ.), Shelley Anna (Carnegie Mellon Univ.)
- **Dispersal of nano-droplets in the water column by bursting bubbles in a liquid-liquid interface**  
Jie Feng (Princeton University), matthieu Roche (), danielle Vigolo ( Institute for Chemical and Bioengineering, ETH), Luben Arnaudov (Unilever), Simeon Stoyanov (), Howard Stone (Princeton University)
- **Collective dynamics of arrays of confined rigid spheres and deformable drops**  
kevin Shen (caltech), Michael Loewenberg (Yale university), Jerzy Blawdziewicz (Texas Tech University), Pieter Janssen (Sabic Innovative Plastics), Eligiusz Wajnryb (polish academy of science), Patrick Anderson (Eindhoven University), Matthew Baron (Princeton University)
- **Lattice Boltzmann Simulations of Finite-Sized Particles in Interfaces**  
Kevin Connington (The Levich Institute), Taehun Lee (The City College of New York, Mechanical Engineering), Jeffrey Morris (Levich Institute and Dept. of Chemical Engineering, CCNY)

**Hydrodynamics of Swimming Microorganisms  
Barus-Holley 191**

*Session Chairs Sarah Olson (WPI), Paulo Arratia (University of Pennsylvania)*

- **Intrinsic Viscosity of Actively Swimming Microalgae Suspensions**

Michael Johnston (UIUC), Lucas Caretta (U of MN), Randy Ewoldt (UIUC)

- **Dynamics and propulsion modes of anchored and freely moving, frictional filament of active, polar, Brownian particles**  
Arvind Gopinath (Max Planck Institute ), Raghunath Chelakkot (Harvard University), Tobias Schneider (MPIDS)
- **Swimming microorganisms in complex fluids**  
Thomas Powers (Brown University)
- **The mechanics of motion and confinement of flagellated bacteria at air-water interface**  
Michael Morse (Brown University), Jay Tang (Brown University)

## MECHANICS OF BIOLOGICAL AND SOFT MATERIALS

### *Mechanics and Physics of Biological Cells*

#### *Barus-Holley 141*

*Session Chairs* Michael Sacks (The University of Texas at Austin), Tianzhi Luo (Johns Hopkins School of Medicine)

- **Molecular mechanics of vimentin and lamin protein networks**  
Markus Buehler (MIT)
- **The effects of extreme fluctuations in a many-body Brownian ratchet**  
Evan Hohlfeld (UMass Amherst), Phillip Geissler (UC Berkeley)
- **Tuning the entropic spring: Self-assembly and fracture mechanics of polymer conjugated peptide nanotubes**  
Sinan Keten (Northwestern University), Luis Ruiz ()
- **Multiscale modeling of actin filaments and crosslinked actin networks**  
Tamara Bidone (MIT), TaeYoon Kim (), Marco Deriu (), Umberto Morbiducci (), Roger Kamm (MIT)

## MECHANICS IN MATERIALS SCIENCE

### *From Atomistics to Reality: Spanning Scales in Simulations and Experiments*

#### *CIT 165*

*Session Chairs* Phanish Suryanarayana (Georgia Tech), Kaushik Bhattacharya (California Institute of Technology)

- **Linking electronic structure with continuum fields: Coarse-graining Density Functional Theory**  
Phanish Suryanarayana (Georgia Tech)
- **Coarse-Grained DFT**  
Mauricio Ponga (Caltech), Michael Ortiz (Caltech), Kaushik Bhattacharya (California Institute of Technology)
- **Spectral finite-element based methodology for large scale-electronic structure calculations using Kohn-Sham density functional theory**  
Phani Motamarri (University of Michigan Ann Arb), Vikram Gavini (University of Michigan)
- **A Novel Spectral Scheme for Abinitio Simulations of Objective Structures**  
Amartya Banerjee (University of Minnesota), Ryan Elliott (University of Minnesota), Richard James (University of Minnesota)

### *From Atomistics to Reality: Spanning Scales in Simulations and Experiments*

#### *CIT 227*

*Session Chairs* Hossein Talebi (GRK, MFPA Bauhaus University), Robert Lipton (LSU)

- **Peridynamics, Scaling, and Dynamic Fracture in Brittle Materials**  
Robert Lipton (LSU)
- **Deformation of Al nanowires in an oxygen environment**  
Fatih Sen (University of Windsor), Yue Qi (General Motors R&D), Adri van Duin (Pennsylvania State University), Ahmet Alpas (University of Windsor)

### *Lithium ion batteries: When Chemistry meets Mechanics*

#### *Salomon 003*

*Session Chairs* Siva Nadimpalli (Brown University), Vijay Sethuraman (Brown University)

- **Diffusion-induced stresses of electrode materials in lithium-ion batteries: the effects of the shell and surface stress**  
Daining Fang (College of Engineering, Peking), Feng Hao ()
- **Diffusion Models for Li-ion Batteries**  
Elias Aifantis (Aristotle University of Thessa)
- **Modulation of diffusion kinetics and cyclic hysteresis of Li-alloy electrodes by deformation-diffusion coupling**  
Yifan Gao (Georgia Institute of Tech.), Min Zhou ()
- **2D Micro-Structure Resolved Model for Silicon Anode in Li-Ion Battery**  
Miao Wang (Michigan State University), Xinran Xiao (Michigan State University)

### **Mechanics of Phase Transforming and Multifunctional Materials CIT 219**

Session Chairs Samantha Daly (University of Michigan), Aman Haque ()

- **Principles of Ultrafast Transmission Electron Microscopy with Applications in Materials Science**  
David Flannigan (University of Minnesota)
- **Modeling the Mechanics of Triple Shape Memory Polymers**  
Swapnil Moon (New Jersey Institute of Technology), I.J. Rao ()
- **Melting of aluminum nanoparticles within alumina shell at high heating rates**  
YONG SEOK HWANG (Iowa State University), Valery Levitas (Iowa State University)

### **Synthesis, Characterization, and Modeling of Low-Dimensional Nanomaterials Salomon 202**

Session Chairs Yujie Wei (Institute of Mechanics, Chinese Academy of Sciences), Jianliang Xiao (University of Colorado Boulder)

- **Mechanics of rolling of graphene nanoribbon on tube and sphere**  
Xinghua Shi (), Qifang Yin ()
- **Edge scattering effects on Joule heating and wind force in graphene nanoribbon**  
Yanbiao Chu (University at Buffalo), Cemal Basaran (University at Buffalo)
- **The nature of strength enhancement and weakening by pentagon heptagon defects in graphene**  
Yujie Wei (Institute of Mechanics, Chinese Academy of Sciences), Jiangtao Wu (), Hanqing Yin (), Xinghua Shi (), Ronggui Yang (), Mildred Dresselhaus ()

## **MECHANICS OF SOLIDS AND STRUCTURES**

### **Advances in Nanocomposites for Thermal and Structural Applications Barus-Holley 165**

Session Chairs Xianqiao Wang (University of Georgia), Nima Rahbar (Worcester Polytechnic Institute)

- **Tough Composites Inspired by Mineralized Natural Materials: Computation, 3D printing and Testing**  
Markus Buehler (MIT), Leon Dimas (MIT)
- **A hierarchical multiscale modeling approach towards the estimation of the elastic properties of CNT-polymer nanocomposites with damaged CNTs**  
Gustavo Domínguez Rodríguez (Centro de Investigación Científica de Yucatán, Unidad de Materiales), Gary Seidel (Virginia Polytechnic Institute and State University), Jorge Tapia González (Universidad Autónoma de Yucatán), Francis Avilés Cetina (Centro de Investigación Científica de Yucatán, Unidad de Materiales)
- **Programmable Graphene Architectures by Hydrogenation**  
Liuyang Zhang (), Xianqiao Wang (University of Georgia)
- **Nano-Scale mechanics of Hydrogels: from all-atoms to coarse-grained molecular dynamics**  
Nima Rahbar (Worcester Polytechnic Institute), Hossein Salahshoor (WPI)
- **Nano-scale Adhesion between Polymers and Hydroxyapatite**  
Sina Youssefian (Worcester Polytechnic Institute), Jie Song (), Pingsheng Liu (), Nima Rahbar (Worcester Polytechnic Institute)

**Contact Mechanics**  
**Barus-Holley 161**

Session Chairs Hamed Ghaednia (Auburn University), David Hills (University of Oxford)

- **Contact analysis for composite materials**  
Daniel NELIAS (INSA Lyon), Julien Leroux ()
- **Contact Analysis of A Photonic Crystal with Periodic Nanostructures Indented by A Rigid Sphere**  
Longqiu Li (Harbin Institute of Technology)
- **Eliminating peel stress from adhesive lap joints**  
Hamed Abdi (Northeastern University), Jim papadopoulos (Northeastern University), Ashkan Vaziri ()
- **Quantifying delamination of a diamond-like-carbon coating on a magnetic recording head using molecular dynamics**  
Michael Price (University of Utah), Andrey Ovcharenko (Western Digital Corporation), Raj Thangaraj (Western Digital Corporation), Bart Raeymaekers (University of Utah)

**Crack initiation and growth: methods, applications, and challenges**  
**Sayles Auditorium**

Session Chairs Blaise Bourdin (Lsu), Athanasios Tzavaras (University of Crete)

- **CATHODIC DELAMINATION AT POLYMER/METAL INTERFACES**  
Kenneth Liechti (), Thomas Mauchien (UT Austin)
- **Mechanisms Associated With Damage Tolerance in Ti Alloys**  
Shmuel Osovski (University of North Texas), Ankit Srivastava (University of North Texas), Alan Needleman (University of North Texas), James Williams (University of North Texas)
- **Mixed-Mode I/II Crack and Electrical Resistance Behaviors of Carbon Nanotube/Polymer Composites**  
Yasuhide Shindo (Tohoku University), Tomo Takeda (), Fumitsugu Naraoka (), Yu Kuronuma (), Fumio Narita (Tohoku University)

**Discrete Dislocation Plasticity**  
**RI Hall 108**

Session Chairs Vikram Deshpande (Cambridge University)

- **Taper Effects on Micropillar Compression: A Discrete Dislocation Dynamics Study**  
Babak Kondori (Texas A&M University), A. Amine Benzerga (Texas A&M University)
- **Mechanical response of Al-TiN nanolayered composites: 3D discrete dislocation dynamics analysis**  
Caizhi Zhou (Missouri S&T)
- **Size Effects in Micro-Cantilever Bending**  
Ed Tarleton (University of Oxford), Daniel Balint (Imperial College London), Jicheng Gong (University of Oxford), Angus Wilkinson (University of Oxford)
- **Emergence of enhanced strengths and Bauschinger effect in conformally passivated copper nanopillars as revealed by dislocation dynamics**  
Seok-Woo Lee (CalTech), Andrew Jennings (California institute of Technology), Julia Greer (Caltech)
- **Dislocation Dynamics simulations investigating deformation heterogeneity in Zirconium**  
Prita Pant (IIT Bombay)

**Instability in Solids and Structures**  
**Barus-Holley 190**

Session Chairs Alyssa Skulborstad (University of Michigan), Craig Maloney (Carnegie Mellon University)

- **Buckling of an elastic wire inside an elastic matrix**  
Tianxiang Su (Harvard University), Denis Terwagne (Massachusetts Institute of Technology), Jia Liu (Harvard University), Pedro Reis (MIT), Katia Bertoldi (Harvard University)
- **Bifurcation instability in substrate-supported metal layers under biaxial loading**  
Zheng Jia (University of Maryland), Teng Li (University of Maryland)
- **Effects of Transverse Shear deformation on thermo-mechanical instabilities in patched structures with edge damage**  
PEINAN GE (Rutgers University), William Bottega (Rutgers University)

- **Investigation and evaluation of buckling instability during woven structure tension**  
Jovita Dargiene (Kaunas University of Technolog), Paule Bekampiene (Textile Institute), Jurgita Domskiene (Kaunas University of Technology)

### **Dynamic Behavior of Materials** **Salomon 101**

*Session Chairs* Stefano Gonella (University of Minnesota), Bernard Bonello (Paris University and CNRS)

- **Initial Velocities of Fragments from A Cylinder Structure**  
Mafa Wang (College of Science, National U), fangyun Lu (), Chen R (NUDT China), banghai Jiang ()
- **Focusing of flexural Lamb waves through gradient index phononic crystals**  
Bernard Bonello (Paris University and CNRS), Jinfeng Zhao (INSP - University Paris 6), Olga Boyko (INSP - University Paris 6), Remi Marchal (INSP - University Paris 6)
- **Dark Breathers in Granular Crystals**  
Christopher Chong (UMass, Amherst)
- **On the signature of nonlinearity in the wave characteristics of anharmonic chains**  
Ganesh Ramakrishnan (University of Minnesota), Stefano Gonella (University of Minnesota)

### **Mechanics and Dynamics of Periodic Structures** **Salomon 101**

*Session Chairs* Stefano Gonella (University of Minnesota), Bernard Bonello (Paris University and CNRS)

- **Initial Velocities of Fragments from A Cylinder Structure**  
Mafa Wang (College of Science, National U), fangyun Lu (), Chen R (NUDT China), banghai Jiang ()
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Ganesh Ramakrishnan (University of Minnesota), Stefano Gonella (University of Minnesota)

### **Mechanics of Thin Films and Multilayered Structures** **Salomon 203**

*Session Chairs* Ashwin Ramasubramaniam (University of Massachusetts Amherst), Pranav Shrotriya (Iowa State University)

- **Epidermal differential impedance sensor for conformal skin hydration monitoring**  
Huanyu CHENG (Northwestern University), Yonggang Huang (Northwestern University)
- **Unveiling the Mechanical and Electrical Properties of Organic Single Crystals using the Wrinkling Instability**  
Marcos Reyes-Martinez (University of Massachusetts), Ashwin Ramasubramaniam (University of Massachusetts Amherst), Alejandro Briseno (University of Massachusetts Amherst), Alfred Crosby (University of Massachusetts Amherst)
- **Mechanics of Graded Wrinkling**  
Shabnam Raayai (MIT), Mary Boyce (Massachusetts Institute of Technology)

### **Soft Materials and Structures** **Barus-Holley 158**

*Session Chairs* Stephan Rudykh (Massachusetts Institute of Technology), David Henann (Brown University)

- **Elastoswellability: Will it bend or will it crease?**  
Anupam Pandey (Virginia Tech), Douglas Holmes (Virginia Tech)
- **Modeling of elasto-capillary phenomena**  
David Henann (Brown University), Katia Bertoldi (Harvard University)
- **Magnetorheological Elastomers in Finite Deformations: Micromechanics and Instabilities**



- Stephan Rudykh (Massachusetts Institute of Technology), Katia Bertoldi (Harvard University)
- Stretchable and Flexible Ferroelectrics for Non-Volatile Memory  
Xue Feng (Tsinghua University), John Rogers (University of Illinois), Jiangyu Li (University of Washington), Yonggang Huang (Northwestern University)

**Wednesday 8:00 - 8:50 Salomon 101 Eringen Medal Lecture**  
**Session Chairs: Weinong Chen (Purdue)**  
**Mechanics of Cell-Matrix Interactions in Three Dimensions**  
**G. Ravichandran (Caltech)**

**Wednesday 9:00 - 10:30**

**AWARDS SYMPOSIA**

*Eringen Medal Symposium in honor of G. Ravichandran*  
*Salomon 001*

*Session Chairs: Christopher Kovalchick (Becton, Dickinson and Company), Laurence Bodelot (Ecole Polytechnique)*

- Dynamic damage and fracture of ductile materials  
Alain Molinari (University of Lorraine), Jacques Nicolas (), Sebastien Mercier ()
- Dynamic Failure of Composite Panels Subjected to Underwater Impulsive Loads  
Horacio Espinosa (Northwestern University), Xiaoding Wei ()
- Recent Studies on Hydrostatic and Shock Initiated Implosions Occurring within a Confining Tube  
Sachin Gupta (University of Rhode Island), James LeBlanc (Naval Undersea Warfare Center (Division Newport), Newport, RI 02841), Christopher Shillings (University of Rhode Island), Arun Shukla (University of Rhode Island)

*Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials*  
*MacMillan 117*

*Session Chairs: Jianmin Qu (Northwestern University), Huiming Yin (Columbia University)*

- Ductile vs Brittle Fracture Behaviors in Metallic Glasses  
Huajian Gao (Brown University)
- A mathematical framework of high-order surface stresses in three-dimensional configurations  
Tungyang Chen (National Cheng Kung University), Min-Sen Chiu (National Cheng Kung University)
- A differential approach to microstructure-dependent energy bounds for multiphase heterogeneous media  
Liping Liu (Rutgers)
- Strain Gradient Elasticity-Based Method for Homogenization of Multiphase Composites  
Hemei Ma (Zodiac Aerospace Corporation), Xin-Lin Gao (University of Texas at Dallas)

*SES Medal Symposium in honor of D.J. Steigmann*



**MacMillan 115**

Session Chairs Cheng Luo (The University of Texas at Arl), Kumbakonam Rajagopal (Texas A&M University)

- **On the geometry of continuous and singular distributions of defects**  
Reuven Segev (Ben-Gurion University), Marcelo Epstein (University of Calgary)
- **LOCALIZED BUCKLING OF A Laterally Constrained Microtubule**  
Mingzhao Jin (University of Alberta), Chongqing Ru ()
- **Spatial resolution of wrinkle patterns in thin elastic sheets at finite strains**  
Michael Taylor (Harvard University), Katia Bertoldi (Harvard University), David Steigmann (U.C. Berkeley)
- **The Linear Elasticity Tensor of Incompressible Materials**  
Salvatore Federico (The University of Calgary), Alfio Grillo (Polytechnic of Torino), Shoji Imatani (Kyoto University, Japan)

**MECHANICS OF FLUIDS AND THERMAL SYSTEMS****Complex Fluids: Suspensions, Emulsions, and Gels  
Barus-Holley 160**

Session Chairs Roseanna Zia (Cornell University), Randy Ewoldt (UIUC)

- **Lubrication by Confined Polymers**  
Michael Rubinstein (University of North Carolina), Aykut Erbas (University of North Carolina), Ekaterina Zhulina (University of North Carolina)
- **Low-dimensional amplitude-intrinsic material functions for nonlinear viscoelasticity**  
N. Ashwin Bharadwaj (UIUC), Randy Ewoldt (UIUC)
- **Scaling Behavior of Colloidal Gel Elasticity in the Context of Dispersant Surface Activity**  
Fatemeh Khalkhal (Yale University), Chinedum Osuji (Yale University)
- **Coarse-grained Molecular Dynamics Study on Block Copolymer Micelle/Nanoparticle Solutions Under Shear**  
Bryan Rolfe (Cornell University), Jaehun Chun (Pacific Northwest National Laboratory), Yong Joo (Cornell University)

**MECHANICS OF BIOLOGICAL AND SOFT MATERIALS****Mechanics and Physics of Biological Cells  
Barus-Holley 141**

Session Chairs Tae-Yeon Kim (McGill University), Tanmay Lele (University of Florida)

- **Mechanical Characterization of Mouse Oocytes**  
Xinyu Liu (McGill University), Jiayi Shi (Northeastern University), Yu Sun (University of Toronto), Kai-Tak Wan (Northeastern University)
- **Regulation of motor force in skeletal muscle contraction**  
Bin Chen (Zhejiang univ.), Huajian Gao (Brown University)
- **On the mechanism of durotaxis in motile cells**  
Sylvain Gabriele (University of Mons)
- **A mechanobiological feedback model for the oscillations of myosin II and cell shape in epithelia**  
Tianzhi Luo (Johns Hopkins School of Medicine), Douglas Robinson (Johns Hopkins School of Medicine)

**MECHANICS IN MATERIALS SCIENCE****From Atomistics to Reality: Spanning Scales in Simulations and Experiments  
CIT 165**

Session Chairs Douglas Spearot (University of Arkansas), Edward Kober (Los Alamos National Laboratory)

- **Strain Functionals for Characterizing Atomistic Geometries**  
Edward Kober (Los Alamos National Laboratory)
- **Transferability of Empirical Interatomic Potentials and the Knowledgebase of Interatomic Models**  
Daniel Karls (University of Minnesota), Ellad Tadmor (University of Minnesota), Ryan Elliott (University of Minnesota)

- **Linking between Atomistic Simulation and Experiment via Virtual Diffraction Computation**  
Douglas Spearot (University of Arkansas), Shawn Coleman (University of Arkansas)
- **Parameter identification for non-Fourier heat transfer in atomistic systems**  
Amit Singh (University of Minnesota), Ellad Tadmor (University of Minnesota)

***Lithium ion batteries: When Chemistry meets Mechanics***  
**Salomon 003**

*Session Chairs* Joost Vlassak (Harvard University), Vijay Sethuraman (Brown University)

- **Mechanical Degradation in LiMn<sub>1.95</sub>Al<sub>0.05</sub>O<sub>4</sub> Electrodes**  
Di Chen (), Zungsun Choi (Karlsruhe Institute of Technology), Dominik Kramer (Helmholtz Institute Ulm), Reiner Moenig (Karlsruhe Institute of Technol)
- **In-situ stress evolution in Li<sub>x</sub>CoO<sub>2</sub> cathode during electrochemical cycling**  
Naba Karan (Brown University), Insun Yoon (Brown University), Siva Nadimpalli (Brown University), Daniel Abraham (Argonne National Laboratory), Allan Bower (Brown University), Pradeep Guduru (Brown University)
- **Models for lithium-ion battery performance and damage**  
Robert McMeeking (UCSB)
- **Probing local electrochemistry at the nanoscale by electrochemical strain microscopy**  
Jiangyu Li (University of Washington)

***Mechanics of Phase Transforming and Multifunctional Materials***  
**CIT 219**

*Session Chairs* Doron Shilo (Technion, Israel Institute of Technology), Hsin-Yi Kuo (National Chiao Tung University)

- **On the propagation and manipulation of waves in soft electroactive tubes**  
Gal Shmuel (CalTech), Gal deBotton (BGU)
- **Application of a bi-stable chain model for the analysis of jerky twin boundary motion in NiMnGa**  
Itamar Benichou (Technion - IIT), Eilon Faran (Technion - IIT), Doron Shilo (Technion - IIT), Sefi Givli (Technion - IIT)
- **Melting/solidification of nanoparticles: new scale effects, thermally activated surface nucleation and bi-stable states**  
Kamran Samani (Iowa State University), Valery Levitas (Iowa State University)
- **Complex ferroelastic domain patterns in free-standing nanoferroelectrics**  
Nathaniel Ng (Inst. of High Perf. Computing), Rajeev Ahluwalia (IHPC), David Srolovitz (University of Pennsylvania)

***Synthesis, Characterization, and Modeling of Low-Dimensional Nanomaterials***  
**Salomon 202**

*Session Chairs* Jeong Ho You (Southern Methodist University), Scott Bunch (University of Colorado)

- **Graphene Adhesion**  
J Scott Bunch (University of Colorado)
- **Strain-engineered artificial atom as a broad-spectrum solar energy funnel**  
Ju Li (MIT)
- **Tunable Transport Dimensionality of Electrons in Mott- and Band-insulator LaTiO<sub>3</sub>/SrTiO<sub>3</sub> Superlattices**  
Jeong Ho You (Southern Methodist University), Jun Hee Lee (Department of Physics and Astronomy, Rutgers University)
- **Influence of phonon-phonon interactions on the Joule heating of metallic single walled carbon nanotubes**  
Pierre Gautreau (University at Buffalo), Yanbiao Chu (University at Buffalo), Cemal Basaran (University at Buffalo)

**MECHANICS OF SOLIDS AND STRUCTURES**

***Computational Materials Design via Multi-scale Modeling***  
**Barus-Holley 190**

Session Chairs William Curtin (EPFL), Yue Qi (General Motors R&D)

- **Making Nanomechanics Simulations Physical ♦ Response EAM Potentials**  
Hanchen Huang (University of Connecticut)
- **Stable storage of Helium in nanoscale platelets at semicoherent interfaces**  
Abishek Kashinath (MIT), Michael Demkowicz (MIT)
- **Half-metallicity in a BiFeO<sub>3</sub>/La<sub>2</sub>/3Sr<sub>1</sub>/3MnO<sub>3</sub> heterostructure: A first-principles study**  
Jiwuer Jilili (King Abdullah University of Sc)
- **Understanding Li-ion batteries failure from first-principles calculations: The effect of lithiation on the Si/Cu interface in Si anodes**  
Maria Stournara (Brown univ), priya Johari (Brown University), Yue Qi (General Motors R&D), vivek shenoy (upenn)

### **Crack initiation and growth: methods, applications, and challenges** **Barus-Holley 161**

Session Chairs Robert Lipton (LSU)

- **Experimental Examination of the Effect of Cavity in Shear Failure of Ductile Materials**  
Ali Ghahremaninezhad (University of Miami), K Ravi-Chandar (University of Texas at Austin)
- **Creating a failure criteria for aluminum alloys from 3D finite element modeling of void growth and coalescence**  
Geoffrey Bomarito (Cornell University), Derek Warner (Cornell University)
- **Effect of Nonproportional Loadings on Ductile Fracture: Experiments and analysis**  
Shamik Basu (Texas A&M University), Amine Benzerga (Texas A&M University)
- **Effect of Inclusion Distribution on Ductile Fracture Toughness and Fracture Surface Roughness**  
Ankit Srivastava (University of North Texas), Shmuel Osovski (University of North Texas), Laurent Ponson (Institut Jean Le Rond d'Alembert Universit ♦ Pierre et Marie Curie), Viggo Tvergaard (Technical University of Denmark), Elisabeth Bouchaud (CEA-Saclay and ESPCI Paris Tech), Alan Needleman (University of North Texas)

### **Engineering Mechanics and Materials in the Oilfield** **CIT 227**

Session Chairs Agathe Robisson (Schlumberger), Nicola Ferralis (MIT)

- **Numerical Modeling of Hydraulic Fracturing using the XFEM**  
Safdar Abbas (Schlumberger), Elizaveta Gordeliy (University of British Columbia), Brice Lecampion (Schlumberger), Anthony Peirce (University of British Columbia)
- **Modeling the Interaction and Growth of Multiple Non-planar Hydraulic Fractures**  
Stephen Castonguay (University of Texas at Austin), Mark Mear (Department ASE/EM, University of Texas at Austin), Rick Dean (ConocoPhillips), Joseph Schmidt (ConocoPhillips)
- **Capillary fracturing in granular media**  
Ruben Juanes (MIT), Michael Szulczewski (MIT), Mathias Trojer (MIT), Ran Holtzman (Hebrew University)
- **Improved criterion of hydraulic fracture propagation across natural discontinuities sensitive to fluid pumping**  
Dimitry Chuprakov (Schlumberger), Olga Melchaeva (GazPromNefit), Romain Prioul (Schlumberger)

### **Mechanics and Dynamics of Periodic Structures** **Salomon 101**

Session Chairs Jinkyu Yang (University of South Carolina), Laurent Ponson (Institut Jean Le Rond d'Alembert Universit ♦ Pierre et Marie Curie)

- **Nonlinear Metamaterials: Amplitude-Dependent Dispersion, Group Velocity, Bandgaps, and Device Implications**  
Michael Leamy (Georgia Institute of Technolog)
- **Nonlinear Pulse Propagation through Ordered Granular Networks**  
Andrea Leonard (ET Z ♦ rich), Laurent Ponson (Institut Jean Le Rond d'Alembert Universit ♦ Pierre et Marie Curie), Chiara Daraio (ET Z ♦ rich)
- **Modulation of solitary waves in woodpile phononic crystals made of stacked cylindrical elements**

Eunho Kim (University of South Carolina), Jinkyu Yang (University of South Carolina)

- **Characteristics of Waves in Media with Periodic Resonant Microstructures**  
Hsin-Haou Huang (National Taiwan University)

***Mechanics of Thin Films and Multilayered Structures***  
**Salomon 203**

*Session Chairs* Kenneth Liechti (), Peter Liaw ()

- **Large Area Adhesion Measurements for Graphene Interactions**  
Kenneth Liechti (), Seung Na (UT Austin), Ji Suk (UT Austin), Rodney Ruoff (UT Austin), Rui Huang (University of Texas at Austin)
- **Thin film metallic glasses for substrate fatigue property improvements**  
Haoling Jia (University of Tennessee), Fengxiao Liu (University of Tennessee), Zhinan An (University of Tennessee), Weidong Li (University of Tennessee), Gongyao Wang (University of Tennessee), Jinn Chu (Nat'l Taiwan Univ. of Sci.Tech), Jason Jang (National Central University), Yanfei Gao (University of Tennessee), Peter Liaw ()
- **In-situ SEM with micro-heater for mechanical testing of thin films at elevated temperatures**  
Gi-Dong Sim (Harvard University), Joost Vlassak (Harvard University)
- **Interfacial failure and adhesion between a suspended microscopic polymeric film and its metallic substrate**  
Wanliang Shan (Carnegie Mellon University), Jing Du (MAE, Princeton University), Wole Soboyejo (MAE, Princeton University)

***Soft Materials and Structures***  
**Barus-Holley 158**

*Session Chairs* Catalin Picu (Rensselaer Polytechnic Institu), Thao Nguyen (Johns Hopkins University)

- **Molecular Dynamic Study of the Mechanical Behavior of Silly Putty**  
Dibakar Datta (Brown University)
- **Constitutive modeling of polymeric gels**  
Shawn Chester (New Jersey Institute of Tech)
- **A New Strain Energy Function for Hyper-Elastic Constitutive Model**  
Lixiang Yang (Ohio State University), Sheng-tao John Yu (The Ohio State University)
- **Direction Dependent Mullins Model for Transversely Isotropic Soft Tissues**  
MHBM Shariff (Khalifa University)

# Wednesday 10:45 - 12:15

## AWARDS SYMPOSIA

***Eringen Medal Symposium in honor of G. Ravichandran***  
**Salomon 001**

*Session Chairs* Horacio Espinosa (Northwestern University), Min Zhou (Georgia Institute of Technology)

- **Use of shock tube to determine the dynamic fracture behavior of engineering materials**  
Addis Kidane (University of South Carolina), Silas Mallon ()
- **Fracture and impact energy absorption characteristics of PMMA-PU transparent interpenetrating polymer networks**  
Hareesh Tippur (Auburn University), Kailash Jajam (Auburn University)
- **Strain Rate and Temperature Dependent Mechanical Behavior of Nanocrystalline Au Films**  
Nikhil Karanjaokar (California Institute of Tech.), Ioannis Chasiotis (University of Illinois at Urbana-Champaign)
- **Monitoring Microstructural Evolution in Opaque Specimens under Kolsky Bar Loading**  
Weinong Chen (Purdue)

**Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials**  
**MacMillan 117**

Session Chairs *Xin-Lin Gao (University of Texas at Dallas), Liping Liu (Rutgers)*

- **The grain size-dependent solute concentration in nanograined materials**  
Tongyi Zhang (Hong Kong University of Science)
- **Broken Dynamic Symmetry and Phase Transition Precursor**  
Yongmei Jin (Michigan Tech), Yu Wang (Michigan Tech), Yang Ren (Argonne National Lab)
- **Phase field approach to structural changes at the nanoscale**  
Valery Levitas (Iowa State University)
- **Multiscale Modeling of Three-Dimensional Random Fiber Structures using a Random Walk Approach**  
Assimina Pelegri (Rutgers University), Stephen Recchia (Rutgers University)
- **Modeling cracks and inclusions beneath surfaces under contact loading**  
Kun Zhou (Nanyang Technological Univ.), Wei Rongbing ( )

**SES Medal Symposium in honor of D.J. Steigmann**  
**MacMillan 115**

Session Chairs *Salvatore Federico (The University of Calgary), Reuven Segev (Ben-Gurion University)*

- **An Angle Inequality for Judging the Transition from Cassie-Baxter to Wenzel States when a Water Drop Contacts Bottoms of Grooves between Microstructures**  
Cheng Luo (The University of Texas at Arl)
- **On Fluids and Solids Described by Implicit Constitutive Theories**  
Kumbakonam Rajagopal (Texas A&M University)

**MECHANICS OF FLUIDS AND THERMAL SYSTEMS**

**Complex Fluids: Suspensions, Emulsions, and Gels**  
**Barus-Holley 160**

Session Chairs *Roseanna Zia (Cornell University), Michael Rubinstein (University of North Carolina)*

- **Engineering Entropy and Order in Colloidal Suspensions via Molecular Simulation**  
Fernando Escobedo (Cornell University)
- **Stresses and particle dynamics in hard sphere crystals under oscillatory shear**  
George Petekidis (FORTH)
- **Micropolar Theory and its Application to Nematic Liquid Crystal**  
James Lee (George Washington University), Jiaoyan Li (The George Washington University)
- **Static and Dynamic properties of elemental liquid Ni, Co and Hg: An orbital free ab-initio molecular dynamic study**  
Abu Zafur Ziauddin Ahmed (University of Dhaka), Mohammad Riazuddin Molla (University of Dhaka), Golam Mohammad Bhuiyan (University of Dhaka)

**MECHANICS OF BIOLOGICAL AND SOFT MATERIALS**

**Mechanics and Physics of Biological Cells**  
**Barus-Holley 141**

Session Chairs *Jinghong Fan (Alfred University), Jin Qian (Zhejiang University)*

- **Effects of dynein on microtubule mechanics and centrosome positioning**  
Tanmay Lele (University of Florida), Richard Dickinson (University of Florida), Anthony Ladd ( ), Jun Wu ( ), Gaurav Misra ( )
- **Navigating the molecular landscape of mechanosensing by the cell cortex**  
Tianzhi Luo (Johns Hopkins School of Medicine), Douglas Robinson (Johns Hopkins School of Medicine)
- **The Molecular Landscape of Mechanosensing by the Cell Cortex**  
Tianzhi Luo (Johns Hopkins University), Douglas Robinson (Johns Hopkins School of Medicine)

## MECHANICS IN MATERIALS SCIENCE

***From Atomistics to Reality: Spanning Scales in Simulations and Experiments  
CIT 165***

*Session Chairs* Timothy Rupert (UC Irvine), Changqing Chen (Tsinghua University)

- ***Shear Localization in Nanocrystalline Metals: A Combined Atomistic and Experimental Study***  
Amirhossein Khalajhedayati (UC Irvine), Timothy Rupert (UC Irvine)
- ***Atomistic simulation of the inelastic yield and flow behavior of nanocrystalline Cu under multiaxial stress states***  
Shreevant Tiwari (Georgia Inst of Technology), David McDowell (Georgia Tech)
- ***Atomistic Mechanisms of Fatigue in Nanotwinned Copper***  
Xiaoling Zhou (Tsinghua University), Xiaoyan Li (Tsinghua University), Changqing Chen (Tsinghua University)

***Lithium ion batteries: When Chemistry meets Mechanics  
Salomon 003***

*Session Chairs* Joost Vlassak (Harvard University), Kejie Zhao (MIT)

- ***Measurement and modeling of the mechanical and electrochemical response of amorphous Si thin film electrodes during cyclic lithiation***  
Giovanna Bucci (Brown University), Siva Nadimpalli (Brown University), Vijay Sethuraman (Brown University), Allan Bower (Brown University), Pradeep Guduru (Brown University)
- ***An Investigation of Stress Evolution and Progressive Phase Transformations in Tin during Electrochemical Lithiation Cycling***  
Chun-Hao Chen (Brown University), Eric Chason (School of Engineering, Brown University), Pradeep Guduru (Brown University)
- ***In-situ observation of cracking and self healing in Li-ion battery electrodes***  
Oya Okman (Beckman Institute), Elizabeth Jones (), Scott White (Department of Aerospace Engineering, University of Illinois), Nancy Sottos (Dept. of Materials Science and Eng., Univ. of Illinois at Urbana-Champaign)
- ***Enhanced Li capacity in Defective Graphene and its Allotropes.***  
Dibakar Datta (Brown University), Junwen Li (University of Pennsylvania), Vivek Shenoy (The University of Pennsylvania)

***Mechanics of Phase Transforming and Multifunctional Materials  
CIT 219***

*Session Chairs* Rajeev Ahluwalia (IHPC), Hsin-Yi Kuo (National Chiao Tung University)

- ***Magnetolectricity in piezoelectric-piezomagnetic fibrous composites with imperfect interface***  
Hsin-Yi Kuo (National Chiao Tung University)
- ***Grain Size Effects in Nanocrystalline Shape Memory Alloys***  
Rajeev Ahluwalia (IHPC), SiuSin Quek (IHPC), David Wu (IHPC)
- ***Isogeometric Analysis of Cubic-to-Tetragonal Martensitic Transformations in Shape Memory Alloy 3D Domains Under Mechanical And Thermal Loads***  
Rakesh Dhote (University of Toronto), Hector Gomez (University of A Coruna, Spain), Roderick Melnik (Wilfred-Laurier University, Waterloo, Canada), Jean Au (University of Toronto, Canada)
- ***Transformation Induced Toughening in Pure Nanocrystalline Aluminum***  
Sandeep Kumar (UC,Riverside), Aman Haque ()

***Synthesis, Characterization, and Modeling of Low-Dimensional Nanomaterials  
Salomon 202***

*Session Chairs* Yong Zhu (North Carolina State University), Jeong Ho You (Southern Methodist University)

- ***Size Effects in the Nanoindentation of Bimetallic Ni-Au Nanowires***  
Erin Wood (University of Vermont), Trevor Avant (University of Vermont), Gil-Sung Kim (Department of Semiconductor Science and Technology, Chonbuk National University), Sang-Kwon Lee (Department of Physics, Chung-Ang University), John Hughes (Department of Geology, University of Vermont), Frederic



Sansoz ( Mechanical Engineering Program, School of Engineering, University of Vermont)

- **High Mobile Two-Dimensional Electron Gas in LaAlO<sub>3</sub>/SrTiO<sub>3</sub> Band-insulator Heterointerface**  
Jeong Ho You (Southern Methodist University), Shanshan Su (Southern Methodist University)
- **Pillared Boron Nitride: mechanical and thermal properties of a new 3D nanostructure**  
Rouzbeh Shahsavari (Rice University), Navid Sakhavand (Rice University)
- **Size Effects on Mechanical Properties of Silver Nanowires**  
Yong Zhu (North Carolina State University), Qingquan Qin (), Guangming Cheng (), Feng Xu ()

## MECHANICS OF SOLIDS AND STRUCTURES

### *Computational Materials Design via Multi-scale Modeling* *Barus-Holley 190*

*Session Chairs* Louis J. Hector, Jr. (General Motors R&D), Hanchen Huang (University of Connecticut)

- **Multi-scale Computational Design of Solute Strengthened Aluminum Alloys**  
William Curtin (EPFL), Shyam Keravalarma (EPFL), Allan Bower (Brown University), Louis J. Hector, Jr. (General Motors R&D), Raj Mishra (GM Research and Development Center, Warren, Michigan, 48090)
- **GP Multiscale Computational Methods for Designing Multimodal Materials**  
Jinghong Fan (Alfred University), Ross Stewart (Alfred University)
- **A technique-synergy for the mesoscale, three-dimensional modeling and simulation of metal alloys**  
Kiran Narayanan (KAUST), Tamer El Sayed (KAUST)
- **Microscale-Calibrated Modeling of the Deformation Response of Dual-phase Steels**  
Peng Chen (Brown University), Hassan Ghassemi Armaki (Brown University), Sharvan Kumar (Brown University), Allan Bower (Brown University), Shrikant Bhat (ArcelorMittal Global R&D), Sriram Sadagopan (ArcelorMittal Global R&D)

### *Crack initiation and growth: methods, applications, and challenges* *Barus-Holley 161*

*Session Chairs* Yasuhide Shindo (Tohoku University), Herzl Chai (Tel-Aviv University)

- **Concurrent adaptive multiscale methodology for crack propagation in heterogeneous media**  
Franck Vernerey (University of Colorado Boulder), Mohamedreza Kabiri (University of Colorado Boulder)
- **Meshfree simulation of compressive damage in quasi-brittle materials**  
Rena Yu (University of Castilla-La Mancha), Gonzalo Ruiz (University of Castilla-La Mancha), Luis Saucedo (University of Castilla-La Mancha)
- **Peridynamics with unstable bonds small horizon limits and dynamic fracture mechanics**  
Robert Lipton (LSU)
- **A multi-scale material design framework for predicting fracture toughness as function of microstructure**  
Yan Li (Georgia Tech), David McDowell (Georgia Tech), Min Zhou ()

### *Engineering Mechanics and Materials in the Oilfield* *CIT 227*

*Session Chairs* Stefan Miska (University of Tulsa), Alex Arzoumanidis (Pyslotech)

- **Experiments and simulation on hydrogen assisted fracture of Nickel-base superalloys**  
Akbar Bagri (MIT), John Hanson (MIT), Jonathan Lind (CMU), Robert Suter (CMU), Peter Kenesei (Argonne National Laboratory), Michael Demkowicz (), Silvija Gradecak ()
- **Stability and Reactivity of Iron Sulfide Passive Films in Sour Environments**  
Bilge Yildiz (Massachusetts Institute of Tec)
- **Deformation and Fracture of Polymers used in Oil & Gas Seal Systems**  
Buc Slay (Weatherford)
- **Reduced Time Simulation of Rubber in Oilfield Environments**  
Alex Arzoumanidis (Pyslotech)

### *Mechanics and Dynamics of Periodic Structures* *Salomon 101*

Session Chairs Hsin-Haou Huang (National Taiwan University), Katia Bertoldi (Harvard University)

- **Emergent dynamics of dissipative acoustic metamaterials**  
Mahmoud Hussein (University of Colorado Boulder), Michael Frazier (University of Colorado Boulder)
- **Harnessing fluid-structure interactions for the design of tunable metamaterials**  
Filippo Casadei (Harvard university), Katia Bertoldi (Harvard University)
- **Switchable Locally Resonant Metamaterials**  
Pai Wang (Harvard University), Filippo Casadei (Harvard university), Katia Bertoldi (Harvard University)
- **Ultra-light, ultra-stiff mechanical metamaterials**  
Xiaoyu Zheng (Lawrence Livermore National Laboratory), Joshua Deotte (Lawrence Livermore National Laboratory), Eric Duoss (Lawrence Livermore National Laboratory), Howon Lee (MIT), Joshua Kuntz (Lawrence Livermore National Laboratory), Monika Biener (Lawrence Livermore National Laboratory), Sergei Kucheyev (Lawrence Livermore National Laboratory), Nicholas Fang (MIT), Christopher Spadaccini (Lawrence Livermore National Laboratory)

### ***Mechanics of Thin Films and Multilayered Structures***

***Salomon 203***

Session Chairs Junlan Wang (University of Washington), Xue Feng (Tsinghua University)

- **Channel cracking in inelastic film/substrate systems**  
Herzl Chai (Tel-Aviv University)
- **Buckling Modes of Stiff Thin Films Tuned by the Micro-Patterns on Soft Substrate**  
Xue Feng (Tsinghua University), Hang Chen (Tsinghua University)

### ***Soft Materials and Structures***

***Barus-Holley 158***

Session Chairs Shawn Chester (New Jersey Institute of Tech), MHBM Shariff (Khalifa University)

- **Solvent-driven shape-memory effects for amorphous networks**  
Thao Nguyen (Johns Hopkins University)
- **Mechanics of soft fibrous materials**  
Catalin Picu (Rensselaer Polytechnic Institut), Ali Shahsavari ( )
- **Time and temperature dependent wrinkling of stiff thin films on shape memory polymers**  
Jianliang Xiao (University of Colorado Boulder), Hang Qi (University of Colorado Boulder), Yu Wang (University of Colorado Boulder), Kai Yu (University of Colorado Boulder)

# Wed 1:30 - 2:50

## **AWARDS SYMPOSIA**

### ***Prager Medal Symposium in honor of George Weng: Micromechanics, Composites and Multifunctional Materials*** ***MacMillan 117***

Session Chairs Jackie Li (City University of New York), Assimina Pelegri (Rutgers University )

- **AN ENERGY MODEL ON THE ENIGMATIC PHENOMENA INDUCED BY THE FOCUSED AND UNFOCUSED INCIDENT CW LIGHT BEAM**  
Biao Wang (Sun Yat-sen University)
- **Effects of various factors on interfacial stresses in composites**  
Ajit Mal (UCLA), Jungki Lee (Hongik University, Korea)
- **Radon-Stroh formalism for three-dimensional anisotropic elasticity**  
Federico Bironi (University of Seville), Mitsunori Denda (Rutgers University)
- **A Validated Computational Model for the Flexural Response of 3D Hybrid Textile Composites**  
Dianyun Zhang (University of Michigan), Anthony Waas (University of Michigan)
- **High-k Dielectric Nanocomposites**  
Jackie Li (City University of New York)

## MECHANICS OF FLUIDS AND THERMAL SYSTEMS

### *Complex Fluids: Suspensions, Emulsions, and Gels* Barus-Holley 160

Session Chairs Susan Daniel (Cornell University), William Olbricht (Cornell University)

- **Effects of elevated hematocrit on cerebral blood flow**  
William Olbricht (Cornell University), Puifai Santisakultarm (Cornell University), Gregory Farber (Cornell University), Nozomi Nishimura (Cornell University), Chris Schaffer (Cornell University)
- **Buckling, swelling, and catastrophic rupture of porous microcapsules**  
Sujit Datta (Harvard University), Alireza Abbaspourrad (Harvard University), David Weitz (Harvard University)
- **Substrate constraints modify the Rayleigh spectrum**  
Chun-Ti Tang (Cornell University), Josh Bostwick (Cornell University), Paul Steen (Cornell University), Susan Daniel (Cornell University)
- **A Stochastic Model for High Stokes Number Particle Pair Dynamics in Isotropic Turbulence**  
Sarma Rani (Univ of Alabama in Huntsville)

## MECHANICS IN MATERIALS SCIENCE

### *From Atomistics to Reality: Spanning Scales in Simulations and Experiments* CIT 165

Session Chairs Albert To (University of Pittsburgh), Xiantao Li (Penn State University)

- **On the Validity of Hardy's Atomistic-Continuum Thermomechanical Theory**  
Albert To (University of Pittsburgh), Yao Fu (University of Pittsburgh)
- **Interatomic potential energy representation and the atomistic stress tensor**  
Nikhil Chandra Admal (University of Minnesota), Ellad Tadmor (University of Minnesota)
- **Hierarchy of coarse-graining molecular dynamics models**  
Xiantao Li (Penn State University)

### *From Atomistics to Reality: Spanning Scales in Simulations and Experiments* CIT 227

Session Chairs Shailendra Joshi (National University of Singapore), Harold S. Park (Boston University)

- **Large Scale Molecular Dynamics Simulations of Slip and Twinning in c-axis Compression of Magnesium Single Crystals**  
Yizhe Tang (Johns Hopkins University), Jaafar El-Awady (Johns Hopkins University)
- **Indentation Simulation of Single Crystal Magnesium using Crystal Plasticity and Molecular Dynamics**  
Shailendra Joshi (National University of Singapore), Balaji Selvarajou (NUS), Ramin Aghababaei (NUS)
- **A Fractal Dimension Based Approach to Decipher Grain Boundary Chemomechanics at Quantum Scale**  
You Sung Han (), Vikas Tomar (Purdue)
- **A SURFACE STACKING FAULT ENERGY APPROACH TO PREDICTING DEFECT NUCLEATION IN SURFACE-DOMINATED NANOSTRUCTURES**  
Harold S. Park (Boston University), Timon Rabczuk (), Jin-Wu Jiang (), Ken Gall (), Austin Leach ()

## MECHANICS OF SOLIDS AND STRUCTURES

### *Computational Materials Design via Multi-scale Modeling* Barus-Holley 190

Session Chairs Jinghong Fan (Alfred University), David McDowell (Georgia Tech)

- **Design of Ultra-High-Performance Fiber-Reinforced Concrete to Withstand Blast and Impact Loading**  
Brett Ellis (Georgia Institute of Tech.), David McDowell (Georgia Tech), Min Zhou ()
- **Virtual Characterization of composites with Lamination Defects for wind turbine spar cap**  
MUKUNDAN SRINIVASAN (BERGICHE UNIVERSITAT WUPPERTAL)

- **Molecular Simulation Guided Constitutive Modeling on Finite Viscoelasticity of Elastomers**  
Ying Li (Northwestern University), Shan Tang (Chongqing University), Brendan C. Abberton (Northwestern University), Martin Kroger (ETH Zurich), Wing Kam Liu (Northwestern University)
- **Phase-Field-Crystal Modeling of Polycrystalline Plasticity: A Window into Defect-Mediated Phenomena in between Particle and Discrete Dislocation Dynamics**  
Alain Karma (Northeastern University)

**Crack initiation and growth: methods, applications, and challenges**  
**Barus-Holley 161**

Session Chairs Rodica Toader (University of Udine), Rena Yu (University of Castilla-La Manc)

- **The effect cold expansion on the fatigue of aluminium alloy specimen containing fastener hole simulated using Finite Elements Method and Boundary Elements Method**  
Cedric Maranta-Sinigaglia (Glyndwr University)
- **Fatigue Behavior of Bulk-Metallic Glasses**  
Gongyao Wang (University of Tennessee), Yoshihiko Yokoyama (), Xiaoqing Jin (), Leon Keer (), Xie Xie (University of Tennessee), Peter Liaw ()
- **Ip THEORY OF FRACTURE MECHANICS FOR FATIGUE LOADING**  
VIJAY UKADGAONKER (IIT BOMBAY)
- **Ip THEORY EXTENDED TO THREE DIMENSIONS**  
VIJAY UKADGAONKER (IIT BOMBAY)

**Mechanics and Dynamics of Periodic Structures**  
**Salomon 101**

Session Chairs Lifeng Wang (Clarkson University), Huseyin Aksoy (A Teknoloji)

- **Elasto-plastic and bifurcation response of chiral, anti-chiral and hierarchical periodic structures**  
Babak Haghpanah (Northeastern University), Davood Mousanezhad (), Ashkan Vaziri ()
- **Acoustic wave propagation in viscoelastic media with embedded magnetic spheres**  
Huseyin Aksoy (A Teknoloji)
- **Multifunctional Applications of Periodic Mechanical Metamaterials**  
Lifeng Wang (Clarkson University)
- **Dynamics of an elastic chiral lattice: polarization and shielding properties**  
Michele Brun (Universit di Cagliari), Alexander Movchan (University of Liverpool), Ian Jones (Liverpool John Moores University)

**Soft Materials and Structures**  
**Barus-Holley 158**

Session Chairs Steven Cranford (Northeastern University), Gal DeBotton (Ben-Gurion Univ.)

- **Temperature Triggered Self-Unfolding Carbon Loops**  
Steven Cranford (Northeastern University)
- **Thermomechanical Properties and Deformation of Coarse-Grained Models of Hard/Soft Block Copolymers**  
Zhiwei Cui (), Catherine Brinson (Northwestern University)

# Wed 3:10 - 4:30

AWARDS SYMPOSIA

MECHANICS IN MATERIALS SCIENCE

***From Atomistics to Reality: Spanning Scales in Simulations and Experiments***  
***CIT 165***

*Session Chairs* Ping Lin (University of Dundee), Lei Zhang (Shanghai Jiao Tong University)

- **Theory-Based Benchmarking OF The Blended Force-based Quasicontinuum Method**  
Xingjie Li (Brown University), Mitchell Luskin (University of Minnesota), Christoph Ortner (University of Warwick), Alexander Shapeev (University of Minnesota)
- **Construction and analysis of consistent energy based atomistic/continuum coupling method**  
Lei Zhang (Shanghai Jiao Tong University), Christoph Ortner (University of Warwick)
- **Numerical Analysis of the Blended Quasicontinuum Method**  
Brian Van Koten (UCLA), Christoph Ortner (University of Warwick), Mitchell Luskin ()
- **Homogenization-based analysis of quasicontinuum method for complex lattices**  
Ping Lin (University of Dundee)

***From Atomistics to Reality: Spanning Scales in Simulations and Experiments***  
***CIT 227***

*Session Chairs* Patrick Onck (University of Groningen), Sumit Basu (Indian Institute of Technology)

- **Molecular simulations of sputter deposition and mechanical properties of metallic glass thin films**  
Yunche Wang (National Cheng Kung University), Chunyi Wu (National Cheng Kung University)
- **Geometrically Necessary Dislocation Density and Nanoindentation Size Effects: An Atomistic Study**  
Chi-Hua Yu (National Taiwan University), Yi-Pin Chen (National Taiwan University), Chuin-Shan Chen (National Taiwan University)
- **Understanding the Mechanics of Cracking through Molecular Dynamics Simulations**  
Sumit Basu (Indian Institute of Technology), Sudarkodi V (Indian Institute of Technology Kanpur)

**MECHANICS OF SOLIDS AND STRUCTURES**

***Mechanics and Dynamics of Periodic Structures***  
***Salomon 101***

*Session Chairs* Jinkyu Yang (University of South Carolina), Sourav Banerjee (University of South Carolina)

- **Introduction of Novel Split Ring Metamaterial for Acoustic Wave Control**  
RIAZ AHMED (University of South Carolina), Sourav Banerjee (University of South Carolina)
- **Guided Wave Propagation Showing Frequency Trapping in Periodic Structure**  
Sourav Banerjee (University of South Carolina)
- **Topological Optimization of Two-Dimensional Binary Solid Phononic Crystals Based on the FDTD Method and Multiple-Elitist Genetic Algorithm**  
Xiao-Xing Su (School of Electronic and Information Engineering, Beijing Jiaotong University), Hao-Wen Dong (), Yue-Sheng Wang (Institute of Engineering Mechanics, Beijing Jiaotong University), Chuanzeng Zhang (Department of Civil Engineering, University of Siegen)