

# Annual 2018 Technical Program

Monday, June 4, 2018

## Dynamic Behavior of Materials

### 001. Synchrotron Applications/Advanced Dynamic Imaging

**Organizer(s)** C. Meredith, Army Research Lab; J. Jordan, Los Alamos National Laboratory

**Chair Person** C. Meredith, Army Research Lab

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- 10:30 A **#184 Keynote: Examining Material Response using X-ray Phase Contrast Imaging (40-min)**  
*B Jensen, Los Alamos National Laboratory; B. Branch, Los Alamos National Laboratory; F. Cherne, Los Alamos National Laboratory; A. Mandal, Los Alamos National Laboratory; D. Montgomery, Los Alamos National Laboratory; A. Iverson, National Security Technologies; C. Carlson, National Security Technologies*
- 11:10 A **#504 Jetting Transition Behavior in Additively Manufactured Lattice Structures**  
*J Lind, Lawrence Livermore National Laboratory; A. Robinson, Lawrence Livermore National Laboratory; B. Jensen, Los Alamos National Laboratory; M. Kumar, Lawrence Livermore National Laboratory*
- 11:30 A **#556 Shock Compaction of Al Powder Examined by X-Ray Phase Contrast Imaging**  
*A Mandal, Los Alamos National Laboratory; M. Hudspeth, Sandia National Laboratories; B. Jensen, Los Alamos National Laboratory; S. Root, Sandia National Laboratories*
- 11:50 A **#612 Mechanical Behavior and Deformation Mechanisms of Mg in Shear Using In-Situ Synchrotron Radiation X-Ray Diffraction**  
*C Meredith, U.S. Army Research Laboratory; Z. Herl, University of North Texas; M. Young, University of North Texas*
- 12:10 P **#472 Microstructural Evaluation of Strain Localization on Deformed 5083-H131 Aluminum**  
*C Williams, U.S. Army Research Laboratory; K. Dannemann, Rensselaer Polytechnic Institute; J. Spencer, Southwest Research Institute; R. Bigger, Southwest Research Institute; A. Carpenter, Southwest Research Institute; N. Scott, Southwest Research Institute; S. Chocron, Southwest Research Institute*

## International Student Paper Competition

### 002. Int'l Student Paper Competition I

**Organizer(s)**

**Chair Person** J.D. Rogers, Sandia National Laboratories

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- 10:30 A **#768 Ultrasonic Imaging of Structural Damages using Acoustic Sensitivity Kernels**  
*S Sternini, University of California, San Diego*
- 10:50 A **#239 Quantifying Plastic Flow in Small-scale Indentation by Digital Image Correlation**  
*M Liu, Texas A&M University*
- 11:10 A **#372 Electro-mechanical Studies of Multi-functional Glass Fiber Reinforced Composites**  
*J O'Donnell, University of Massachusetts Dartmouth*
- 11:30 A **#602 Image-Based Inertial Impact Tests for Composite Interlaminar Tensile Properties**  
*J Van Blitterswyk, University of Southampton*
- 11:50 A **#73 Multiscale Experimental Investigation of Shape Memory Alloy Fatigue**  
*W LePage, University of Michigan*

- 12:10 P **#547 Correlation Quality Factors Improve Motion Reconstruction in Digital Image and Volume Correlation Measurements**  
*A Landauer, Brown University*

#### 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 003. Recycled Constituent Composites I

- Organizer(s)** I. Miskoiglu, Michigan technological University; E. Bayraktar, SUPMECA-Paris  
**Chair Person** I. Miskoiglu, Michigan technological University; E. Bayraktar, SUPMECA-Paris

- 10:30 A **#112 Devulcanized Recycled Rubber-Graphene-Epoxy Composite Design for "Aircraft Wing Spar" to Withstand Bending Moment**  
*A Irez, University Paris - Saclay; E. Bayraktar, Supmeca/PARIS; I. Miskoiglu, Michigan Technological University*
- 10:50 A **#171 Design of Recycled Rubber Modified Epoxy Composites Reinforced with Titanium Dioxide (TiO<sub>2</sub>) for Tribological Applications**  
*A Irez, University Paris - Saclay; E. Bayraktar, Supmeca-Paris; I. Miskoiglu, Michigan Technological University*
- 11:10 A **#549 The Influence of Crumb Rubber Reinforcement on the Mechanical Properties of Medium Density Fiber-board**  
*L K. Babu, Oklahoma State University; K. Mishra, Oklahoma State University; R. Singh, Oklahoma State University*
- 11:30 A **#333 Damping and Toughening Effect of the Reinforcements on the Epoxy Modified Recycled + Devulcanized Rubber Based Composites**  
*A Irez, University Paris-Saclay; E. Bayraktar, Supmeca-Paris; I. Miskoiglu, Michigan Technological University*
- 11:50 A **#587 Toughening Mechanisms on Recycled Rubber Modified Epoxy based Composites reinforced with Alumina Fibers**  
*A Irez, University Paris - Saclay; I. Miskoiglu, Michigan Technological University; E. Bayraktar, Supmeca-Paris*
- 12:10 P **#529 Iron Contents on Recycle Aluminum and Influence on Mechanical Properties**  
*C Alves, University of Campinas; B. Vilas Boas, University of Campinas; F. Gatamorta, University of Campinas*

#### Mechanics of Additive and Advanced Manufacturing

### 004. Fatigue & Fracture in AM Materials

- Organizer(s)**  
**Chair Person** J. Jordan, Los Alamos National Laboratory; O. Scott-Emuakpor, Air Force Research Laboratory

- 10:30 A **#440 Quantitative Relationship Between Anisotropic Fracture in Additively Manufactured Ti-6Al-4V and Grain Morphology**  
*A Beese, Pennsylvania State University*
- 10:50 A **#667 Fatigue of Solid State Additive Inconel 625**  
*D Avery, University of Alabama; O. Rivera, University of Alabama; C. Mason, University of Alabama; J. Jordon, University of Alabama; P. Allison, University of Alabama; N. Hardwick, Aeroprobe Corporation*

- 11:10 A **#794 Forced-Response Verification of Unique Additive Manufactured Vibration Suppressed Specimens**  
*O Scott-Emuakpor, Air Force Research Laboratory; T. George, Air Force Research Laboratory; B. Runyon, Air Force Research Laboratory; B. Langley, Air Force Research Laboratory; L. Sheridan, Air Force Research Laboratory; C. Holycross, Air Force Research Laboratory; R. O'Hara, Air Force Institution of Technology; P. Johnson, Universal Technology Corporation*
- 11:30 A **#729 The Effect of Powder Reuse on the Fracture Toughness of Additive Manufactured Ti-6Al-4V**  
*E Huskins-Retzlaff, United States Naval Academy; 1. Tagliavere, United States Naval Academy; S. Graham, United States Naval Academy*
- 11:50 A **#91 Fatigue Characterization of 3D-printed Maraging Steel by Infrared Thermography**  
*C Douellou, University Clermont-Auvergne; X. Balandraud, University Clermont-Auvergne; E. Duc, University Clermont-Auvergne*

## Inverse Problems/Hybrid Techniques

### 005. Inverse Problems/Hybrid Techniques I

#### Organizer(s)

**Chair Person** E.M.C. Jones, Sandia National Laboratories

- 10:30 A **#518 Micromechanical Parameter Identification from Microstructural Volume Elements using IDIC**  
*J Hoefnagels, Eindhoven University of Technology, the Netherlands; O. Rokos, Eindhoven University of Technology, the Netherlands; R. Peerlings, Eindhoven University of Technology, the Netherlands; M. Geers, Eindhoven University of Technology, the Netherlands*
- 10:50 A **#170 Joint DIC-Elasticity Imaging of Damage in the Presence of Material Inhomogeneity**  
*D Smyl, Aalto University; S. Bossuyt, Aalto University*
- 11:10 A **#673 High Rate Fracture of Human Skull**  
*C Gunnarsson, U.S. Army Research Laboratory; S. Alexander, SURVICE Engineering Company; K. Rafaels, U.S. Army Research Laboratory; T. Walter, U.S. Army Research Laboratory; T. Weerasooriya, U.S. Army Research Laboratory*
- 11:30 A **#489 Extraction of Dynamic Transfer Function in Dual-output Systems and Application to Passive Structural Health Monitoring**  
*F Lanza di Scalea, University of California San Diego; A. Liang, University of California San Diego; S. Sternini, University of California San Diego; M. Capriotti, University of California San Diego*
- 11:50 A **#216 The Fundamental Reason Why Measuring Residual Stress is a Significant Experimental Mechanics Challenge**  
*M Prime, Los Alamos National Laboratory*

## Challenges in Mechanics of Time-Dependent Materials

### 006. Environmental Effects & Extreme Environments

#### Organizer(s)

**Chair Person** T. Sakai, Saitama University; A. Amirkhizi, University of Massachusetts, Lowell

- 10:30 A **#792 Keynote: Perspectives on Residual Stresses and Dimensional Stability in Polymeric Materials, Adhesives, and Coatings (40-min)**  
*D Dillard, Virginia Tech*

- 11:10 A **#126 Temperature Dependence of Statistical Static Strengths for Unidirectional CFRP with Various Carbon Fibers**  
*Y Miyano, Kanazawa Institute of Technology; M. Nakada, Kanazawa Institute of Technology*
- 11:30 A **#777 Experimentally Validated Closed Cell Foam Packaging Simulation**  
*A Arzoumanidis, Psylotech, Inc.; A. Panahon, Psylotech, Inc.*
- 11:50 A **#137 Effect of Degradation on Viscoelasticity of Bedsore Prevention Mattress**  
*T Sakai, Saitama University; T. Uchiyama, Saitama University; K. Kageyama, Saitama University*
- 12:10 P **#698 Strain Rate Dependent FEM of Laser Shock Induced Residual Stress**  
*C Engebretsen, Air Force Institute of Technology; A. Palazotto, Air Force Institute of Technology; K. Langer, Air Force Research Lab*

## 8th International Symposium on the Mechanics of Biological Systems and Materials

### 007. Mechanics of Tissue & Bone

#### Organizer(s)

**Chair Person** M.E. Grady, University of Kentucky

- 10:30 A **#763 Keynote: Full-Field Characterization and Modeling of the Anterior Cruciate Ligament (40-min)**  
*E Arruda, University of Michigan*
- 11:10 A **#123 Mechanical and Fracture Properties of Human Cortical Bone with Simulated Diabetes**  
*K Merlo, University of Massachusetts Dartmouth; J. Aaronson, University of Massachusetts Dartmouth; J. Riordan, University of Massachusetts Dartmouth; R. Ghrandiz, University of Massachusetts Dartmouth; L. Karim, University of Massachusetts Dartmouth; A. Louhghalam, University of Massachusetts Dartmouth; V. Chalivendra, University of Massachusetts Dartmouth*
- 11:30 A **#312 Controlling Where and When Forces Are Generated During Tissue Morphogenesis**  
*K Kasza, Columbia University; R. Herrera-Perez, Columbia University*

## 19th International Symposium on Micro- and Nanomechanics

### 008. Micromechanical Testing

#### Organizer(s)

**Chair Person** F. DelRio, NIST; J. Hay, Nanomechanics, Inc.

- 10:30 A **#155 Keynote: Nanomechanics of Threshold Effects in Ultra-high Strength Distributions (40-min)**  
*R Cook, NIST; F. DelRio, NIST*
- 11:10 A **#621 Real-time Observation of Ballistic Deformation of Single CNT and Kevlar Filaments**  
*J Lee, University of Massachusetts; W. Xie, University of Massachusetts at Amherst; R. Headrick, Rice University; R. Zhang, Northeastern University; L. Taylor, Rice University; M. Pasquali, Rice University; S. Müftü, Northeastern University*
- 11:30 A **#205 A MEMS Device for Displacement-controlled Tensile Testing of One-dimensional Nanomaterials**  
*C Li, North Carolina State University; Y. Zhu, North Carolina State University*
- 11:50 A **#194 Real-time Measurement of Phase Boundary Propagation in Electrode Materials using Picosecond Ultrasonics**  
*S Rezazadeh-Kalehbasti, Brown University; L. Liu, Brown University; H. Maris, Brown University; P. Guduru, Brown University*

12:10 P **#188 Measurement of Electrolyte Dependent Elastic Modulus of Solid Electrolyte Interphase (SEI) Formed on Li Thin Film Electrodes**

*I Yoon, Brown University; S. Jurng, University of Rhode Island; D. Abraham, Argonne National Laboratory; B. Lucht, University of Rhode Island; P. Guduru, Brown University*

## Dynamic Behavior of Materials

### 009. Quantitative Visualization of Dynamic Events I

**Organizer(s)** L. Lamberson, Drexel University; T. Weerasooriya, US Army Research Laboratory

**Chair Person** L. Lamberson, Drexel University

01:50 P **#530 Particle Tracking, Digital Image Correlation, and Image Processing Techniques in Shocked Granular and Heterogeneous Materials**

*R Crum, Lawrence Livermore National Laboratory; J. Lind, Lawrence Livermore National Laboratory; E. Herbold, Lawrence Livermore National Laboratory; R. Hurley, Lawrence Livermore National Laboratory; D. Miller, Lawrence Livermore National Laboratory; M. Homel, Lawrence Livermore National Laboratory; M. Akin, Lawrence Livermore National Laboratory*

02:10 P **#640 Quantitative Visualization of Sub-micron Deformations and Stresses at Sub-microsecond Intervals in Soda-lime Glass Plates**

*C Miao, Auburn University; H. Tippur, Auburn University*

02:30 P **#465 An Image-Based Approach for Measuring Dynamic Fracture Toughness**

*L Fletcher, University of Southampton; L. Lamberson, Drexel University; F. Pierron, University of Southampton*

02:50 P **#400 Inertial Microcavitation as a Neural Cell Damage Mechanism in an in vitro Model of Traumatic Brain Injury**

*J Estrada, Brown University/University of Michigan; H. Cramer, III., Brown University; M. Scimone, Brown University; C. Franck, Brown University*

03:10 P **#800 Application of High-speed DIC to Study Damage of Thin Membranes under Blast**

*P Razavi, Worcester Polytechnic Institute; H. Tang, Worcester Polytechnic Institute; K. Pooladvand, Worcester Polytechnic Institute; M. Ravicz, Massachusetts Eye and Ear Infirmary; J. Rosowski, Massachusetts Eye and Ear Infirmary; A. Remenschneider, Massachusetts Eye and Ear Infirmary; T. Cheng, Massachusetts Eye and Ear Infirmary; C. Furlong, Worcester Polytechnic Institute*

## International Student Paper Competition

### 010. Int'l Student paper Competition II

**Organizer(s)**

**Chair Person** J.D. Rogers, Sandia National Laboratories

01:50 P **#652 Constitutive Model for Agarose Gel Based on Primary Deformation Modes**

*K Upadhyay, University of Florida*

02:10 P **#610 Identification of Anisotropic Properties of Metals using the Virtual Fields Method**

*A Marek, University of Southampton*

02:30 P **#305 Semi-quantitative De-convolution of the Measured Interphase in Particle-matrix Polymer Nanocomposites**

*D Collinson, Northwestern University*

- 02:50 P **#709 A Dynamic Scanning Indentation Technique for Quantitative Viscoelastic Property Mapping**  
*M Eaton, Northwestern Univeristy*
- 03:10 P **#443 UV Radiation Effects on the Blast Response of Composite Structures**  
*C Javier, University of Rhode Island; A. Shukla, University of Rhode Island; J. LeBlanc, Naval Undersea Warfare Center*

#### 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 011. Nanocomposites

**Organizer(s)** F. Gardea, U.S. Army Research Laboratory; P. Thakre, frank.gardea4.civ@mail.mil

**Chair Person** F. Gardea, U.S. Army Research Laboratory; P. Thakre, frank.gardea4.civ@mail.mil

- 01:50 P **#141 AlSi10Mg Nanocomposites Prepared by DMLS Using in-situ CVD Growth of CNTs: Process Effects and Mechanical Characterization**  
*P Thompson, NAVAIR; R. Poveda, NAVAIR; I. Bezsonov, NAVAIR; M. Rossini, NAVAIR; D. Orthner, NAVAIR; B. Leng, CarboMet; Z. Iqbal, CarboMet*
- 02:10 P **#79 Stimulus-responsive Interfacial Chemistry in CNT/Polymer Nanocomposites**  
*F Gardea, U.S. Army Research Laboratory; Z. Huang, University of Maryland; B. Glaz, U.S. Army Research Laboratory; S. Karna, U.S. Army Research Laboratory; X. Cheng, University of Maryland; Z. Peng, University of Maryland; Y. Wang, University of Maryland*
- 02:30 P **#429 Electro-Mechanical Response of Polymer Bonded Energetic Materials with CNT Sensing Networks for Structural Health Monitoring**  
*N Shirodkar, Virginia Polytechnic Institute and State University; S. Rocker, Virginia Polytechnic Institute and State University; T. McCoy, Virginia Polytechnic Institute and State University; G. Seidel, Virginia Polytechnic Institute and State University*
- 02:50 P **#476 Strength and Energy Absorption Capability of Porous Magnesium Composites Reinforced by Carbon Nanofibers**  
*H Xu, Washington State University; Q. Li, Washington State University*
- 03:10 P **#779 Influence of Nanoscale Phase Behavior on Ballistic Performance of Epoxy Networks**  
*K Masser, U.S. Army Research Laboratory; E. Bain, U.S. Army Research Laboratory; T. Long, Army Research Laboratory; F. Beyer, U.S. Army Research Laboratory; A. Savage, U.S. Army Research Laboratory; J. Yu, Army Research Laboratory; J. Lenhart, U.S. Army Research Laboratory*

#### Advancement of Optical Methods in Experimental Mechanics

### 012. New Developments in Optical Methods & Fringe Pattern Analysis I

**Organizer(s)**

**Chair Person** C. Furlong, WPI-ME/CHSLT; M.T. Lin, National Chung Hsing University

- 01:50 P **#532 Computing DSPI Fringe Pattern with Location from Recorded Video Streamlines**  
*C Hwang, Instrument Technology Research Center; W. Wang, National Tsing Hua University*
- 02:10 P **#383 Accurate Reconstruction of High-gradient Strain Field in Digital Image Correlation: A Local Hermite Scheme**  
*X Li, Tsinghua University; J. Zhao, Tsinghua University; J. Shuai, Tsinghua University; Z. Zhang, Tsinghua University; X. Wu, Tsinghua University*
- 02:30 P **#101 A New Method of Fringe Pattern Analysis**  
*C Sciammarella, Illinois Institute of Technology; L. Lamberti, Politecnico di Bari*



- 02:50 P **#168 Speckles and DIC or Checkerboards and LSA?**  
*M Grédiac, Université Clermont Auvergne; B. Blaysat, Université Clermont Auvergne; F. Sur, Université de Lorraine*
- 03:10 P **#167 Speckle Image Rendering for DIC Performance Assessment**  
*F Sur, Université de Lorraine; B. Blaysat, Université Clermont Auvergne; M. Grédiac, Université Clermont Auvergne*

## Symposium on the Role of Digital Image Correlation in Experimental Mechanics in Honor of Prof. Michael Sutton

### 013. High Rate Loading I

#### Organizer(s)

**Chair Person** A. Shukla, University of Rhode Island; G. Ravichandran, Caltech

- 01:50 P **#166 X-Ray based Digital Image Correlation for Fluid-Structure Interactions**  
*E Quintana, Sandia National Laboratories; E. Jones, Sandia National Laboratories; P. Reu, Sandia National Laboratories; J. Wagner, Sandia National Laboratories*
- 02:10 P **#536 High-speed Visualization of Deformation Field inside Opaque Materials**  
*N Kerschen, Purdue University; J. Chu, Purdue University; N. Kadir, Purdue University; W. Chen, Purdue University; K. Fezzaa, Argonne National Lab; T. Sun, Argonne National Lab*
- 02:30 P **#373 Characterization of the Constitutive Behavior of Polymeric Gels Using DIC**  
*K Upadhyay, University of Florida; G. Subhash, University of Florida; D. Spearot, University of Florida*
- 02:50 P **#798 Measuring the Taylor-Quinney Coefficient**  
*D Rittel, Technion - Israel Institute of Technology*
- 03:10 P **#176 The Use of Digital Image Correlation in Split Hopkinson (Kolsky) Bar Experiments**  
*A Gilat, The Ohio State University; J. Seidt, The Ohio State University*

## Challenges in Mechanics of Time-Dependent Materials

### 014. Soft Materials

#### Organizer(s)

**Chair Person** M. Silberstein, Cornell University; Y. Hu, University of Illinois

- 01:50 P **#100 Modified Hyper-viscoelastic Constitutive Model for Elastomeric Materials**  
*K Harban, University of Washington; M. Tuttle, University of Washington*
- 02:10 P **#419 Modeling Dynamics of Pattern Formation in Hydrogel Membranes in Temperature Gradients**  
*Y Xiong, Clemson University; O. Kuksenok, Clemson University*
- 02:30 P **#316 The Development of Time Dependent Constitutive Laws of Jujube Flesh**  
*Q Pham, Southern Taiwan University of Science and Technology; N. Liou, Southern Taiwan University of Science and Technology*
- 02:50 P **#567 Theory for 3D Magnetic Rotational Spectroscopy of Complex Fluids**  
*V Palkar, Clemson University; P. Aprelev, Clemson University; B. McKinney, Clemson University; O. Kuksenok, Clemson University; K. Kornev, Clemson University*
- 03:10 P **#507 Comparison of Porcine Brain Tissue with Surrogate Materials in Quasi-Static Compression and Dynamic Mechanical Analysis**  
*D Singh, University of Waterloo; S. Boakye-Yiadom, York University; D. Cronin, University of Waterloo*

## 8th International Symposium on the Mechanics of Biological Systems and Materials

**015. Biotribology & Collagen****Organizer(s)****Chair Person** J. Notbohm, University of Wisconsin-Madison

01:50 P **#358 Modeling of Atomic Force Microscope Contact Experiments on Escherichia Coli Bacteria Cellular Systems**

*D Biggs, California Institute of Technology; H. Liu, California Institute of Technology; D. Tirrell, Caltech; G. Ravichandran, California Institute of Technology*

02:10 P **#418 Strain Rate Experiments on the Mechanical Behavior of Collagen Fibrils**

*F Yang, University of Illinois at Urbana-Champaign; I. Chasiotis, University of Illinois at Urbana-Champaign*

02:30 P **#319 Nonaffine Displacements in Fibrous Biological Materials from Digital Image Correlation**

*B Burkel, University of Wisconsin-Madison; M. Proestaki, University of Wisconsin-Madison; J. Notbohm, University of Wisconsin-Madison*

## 19th International Symposium on Micro- and Nanomechanics

**016. Adhesion & Fracture****Organizer(s)****Chair Person** R. Cook, NIST; G. Raiser, Medtronic

01:50 P **#651 Influence of Adhesion on the Mechanical Response of Granular Composites**

*S Bhavanam, Worcester Polytechnic Institute; N. Karanjaokar, Worcester Polytechnic Institute*

02:10 P **#593 Direct Measurements of the Mechanical Strength of Carbon Nanotube-Metal Interfaces**

*C Yi, State University of New York at Binghamton; C. Dmuchowski, State University of New York at Binghamton; F. Gou, State University of New York at Binghamton; X. Chen, Xi'an Jiaotong University; C. Ke, State University of New York at Binghamton*

02:30 P **#204 Development of Femtosecond Laser Based Microscale Fracture Methods**

*D Magagnosc, U.S. Army Research Laboratory; B. Schuster, U.S. Army Research Laboratory*

02:50 P **#203 Tensile Response of Ceramics at the Microscale**

*D Magagnosc, U.S. Army Research Laboratory; B. Schuster, U.S. Army Research Laboratory*

03:10 P **#635 Measurements of Adhesion between Polymeric Nanofibers**

*D Das, University of Illinois at Urbana-Champaign; I. Chasiotis, University of Illinois at Urbana-Champaign*

## Dynamic Behavior of Materials

**017. Quantitative Visualization of Dynamic Events II****Organizer(s)** L. Lamberson, Drexel University; T. Weerasooriya, US Army Research Laboratory**Chair Person** T. Weerasooriya, US Army Research Laboratory; S. Koumlis, Drexel University



- 04:30 P **#601 High-Strain Rate Interlaminar Shear Testing of Fibre-Reinforced Composites Using an Image-Based Inertial Impact Test**  
*J Van Blitterswyk, University of Southampton; L. Fletcher, University of Southampton; F. Pierron, University of Southampton*
- 04:50 P **#625 IBI Test for High Strain Rate Tensile Testing of Adhesives**  
*A Guigue, University of Southampton; L. Fletcher, University of Southampton; R. Seghir, University of Southampton; F. Pierron, University of Southampton*
- 05:10 P **#328 Optimization of an Image-based Experimental Setup for the Dynamic Behaviour Characterization of Materials**  
*P Bouda, French Aerospace Research Center (ONERA); D. Notta-Cuvier, Université de Valenciennes; B. Langrand, French Aerospace Research Center (ONERA); E. Markiewicz, Université de Valenciennes; F. Pierron, University of Southampton*
- 05:30 P **#722 The Utility of 3D Digital Image Correlation for Characterizing High-Rate Deformation**  
*P Jannotti, U.S. Army Research Laboratory*
- 05:50 P **#546 High-Speed Microscopic Imaging of Initiation and Propagation of Adiabatic Shear Bands**  
*P Malhotra, Brown University; Y. Liu, Brown University; P. Guduru, Brown University*

## International Student Paper Competition

### 018. Int'l Student Paper Competition III

#### Organizer(s)

**Chair Person** J.D. Rogers, Sandia National Laboratories

- 04:30 P **#144 Electrical Response of Carbon Nanotube and Carbon Fiber Reinforced Jute/Epoxy Composites Under Shear Loading**  
*S Yang, University of Massachusetts Dartmouth*
- 04:50 P **#147 Mechanical and Fracture Characterization of Cortical Bone in Simulated Diabetic Condition**  
*K Merlo, University of Massachusetts Dartmouth*
- 05:10 P **#666 Experimental Challenges in Explosively Loaded Ring Fragmentation**  
*S Ward, University of Cambridge*
- 05:30 P **#714 Dynamic Failure of Brittle Heterogeneous Materials**  
*C Loeffler, Southern Methodist University*
- 05:50 P **#687 Probing Deeper with Thermography: New Approaches for Rapid Defect Identification in Laminated Fibre Reinforced Polymers**  
*G Olafsson, University of Southampton*

## 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 019. Mechanics of Composites

**Organizer(s)** B. Werner, Sandia National Laboratories; R. Singh, Oklahoma State University

**Chair Person** B. Werner, Sandia National Laboratories; R. Singh, Oklahoma State University

- 04:30 P **#648 Determination of Stress Free Temperature in Composite Laminates**  
*B Werner, Sandia National Laboratories; H. Jin, Sandia National Laboratories; T. Briggs, Sandia National Laboratories*

- 04:50 P **#650 Calibration of a Simple Rate Dependent Elastic-Plastic Constitutive Model for a Toughened Carbon Epoxy Composite System**  
*B Werner, Sandia National Laboratories; J. Schaefer, The Boeing Company*
- 05:10 P **#210 Testing the 2-3 Shear Strength of Unidirectional Composite**  
*J Fenner, Northwestern University; I. Daniel, Northwestern University*
- 05:30 P **#495 Damage Detection and Visco-Elastic Property Characterization of Composite Aerospace Panels Using Ultrasonic Guided Waves**  
*F Lanza di Scalea, University of California San Diego; M. Capriotti, University of California San Diego; R. Cui, University of California San Diego*
- 05:50 P **#341 Dynamic Mechanical Response of T800/F3900 Composite under Tensile and Compressive Loading**  
*Y Deshpande, The Ohio State University; P. Yang, The Ohio State University; J. Seidt, The Ohio State University; A. Gilat, The Ohio State University*

## Advancement of Optical Methods in Experimental Mechanics

### 020. New Developments in Optical Methods & Fringe Pattern Analysis II

#### Organizer(s)

**Chair Person** L. Lamberti, Politecnico di Bari; C. Furlong, WPI-ME/CHSLT

- 04:30 P **#161 Fast Adaptive Global Digital Image Correlation**  
*J Yang, California Institute of Technology; K. Bhattacharya, California Institute of Technology*
- 04:50 P **#265 Fast, Sub-Pixel Accurate Digital Image Correlation Algorithm Powered by Heterogeneous (CPU-GPU) Framework**  
*M Thiagu, Indian Institute of Technology-Madras; S. Subramanian, Indian Institute of Technology-Madras; R. Nasre, Indian Institute of Technology-Madras*
- 05:10 P **#365 Development of Optimal Multiscale Patterns for Digital Image Correlation via Local Grayscale Variation**  
*G Bomarito, National Aeronautics and Space Administration; J. Hochhalter, National Aeronautics and Space Administration; T. Ruggles, National Institute of Aerospace*
- 05:30 P **#457 The Effect of Chamber Temperature on Residual Stresses of FDM Parts**  
*C Casavola, Politecnico di Bari; A. Cazzato, Politecnico di Bari; D. Karalekas, University of Piraeus; V. Moramarco, Politecnico di Bari; G. Pappalettera, Politecnico di Bari*

## Symposium on the Role of Digital Image Correlation in Experimental Mechanics in Honor of Prof. Michael Sutton

### 021. High Rate Loading II

#### Organizer(s)

**Chair Person** W. Fourney, University of Maryland; P. Reu, Sandia national Laboratories

- 04:30 P **#219 DIC Under Extreme Loading Conditions**  
*A Shukla, University of Rhode Island*
- 04:50 P **#208 Using X-ray Tomography and DVC to Study Damage Evolution in Syntactic Foam**  
*H Jin, Sandia National Laboratories; B. Mills, Sandia National Laboratories; B. Croom, University of Virginia; X. Li, University of Virginia; J. Carroll, Sandia National Laboratories*
- 05:10 P **#324 Ultra-High Speed Imaging for DIC Measurements in Kolsky Bar Experiments**  
*P Moy, U.S. Army Research Laboratory; T. Walter, U.S. Army Research Laboratory*

- 05:30 P **#728 Meso-Macro Scale Digital Image Based Experiments to Understand the Response of Materials Subjected to Extreme Conditions**  
*A Kidane, University of South Carolina*

## Challenges in Mechanics of Time-Dependent Materials

### 022. Inhomogeneities and Interfaces

#### Organizer(s)

**Chair Person** Y. Zhu, NC State University; H. Lu, The University of Texas at Dallas

- 04:30 P **#568 Multiscale Characterization of Time Dependent Properties of Carbon Nanotube Grafted Fiber-reinforced Polymer Composites**  
*A Krishnamurthy, National Institute of Standards and Technology; R. Tao, National Institute of Standards and Technology; E. Senses, National Institute of Standards and Technology; S. Doshi, University of Delaware; E. Thostenson, University of Delaware; A. Faraone, National Institute of Standards and Technology; A. Forster, National Institute of Standards and Technology*
- 04:50 P **#469 Visualizing Nanoscale Deformation of Polymers by Atomic Force Microscopy and Digital Image Correlation**  
*R Savage, ExxonMobil Chemical Company; J. Furmanski, ExxonMobil Research & Engineering Company; J. Hobbs, University of Sheffield*
- 05:10 P **#201 Dissipative Damage Theory for Strongly Time-Dependent Composite Materials**  
*R Hall, Air Force Research Laboratory; R. Brockman, University of Dayton Research Institute*
- 05:30 P **#564 Novel Experiments to Capture Local Viscoelastic Mechanical Property Distributions in Soft Heterogeneous Materials**  
*P Kolluru, Northwestern University; M. Eaton, Northwestern University; D. Collinson, Northwestern University; D. Delgado, Northwestern University; K. Shull, Northwestern University; L. Brinson, Duke University*
- 05:50 P **#801 Effect of Moisture Silicon/Epoxy Interactions**  
*D Ferreira, University of Texas at Austin; C. Wu, Missouri University of Science & Technology; R. Huang, University of Texas at Austin; K. Liechti, University of Texas at Austin*

## 8th International Symposium on the Mechanics of Biological Systems and Materials

### 023. Cell Mechanics & Traumatic Brain Injury

#### Organizer(s)

**Chair Person** K. Kasza, Columbia University

- 04:30 P **#633 Experimental Study of the Mechanics of Blast-induced Traumatic Brain Injury**  
*J Kerwin, Michigan State University; F. Masoomi, Michigan State University; S. Vidhate, Michigan State University; A. Willis, San Antonio Military Medical Center; M. Tartis, New Mexico Institute of Mining and Technology; R. Mejia-Alvarez, Michigan State University*
- 04:50 P **#84 DVC Measurement of Invasive Deformation Field of ECM Generated by Tumor Cell Induced EMT**  
*Y Morita, Nagoya University; T. Yamauchi, Nagoya University; Y. Toku, Nagoya University; Y. Ju, Nagoya University*
- 05:10 P **#138 Valsartan Abates Epinephrine-induced ICAM-4 Activation on Normal, Sickle Cell Trait and Sickle Cell Disease Red Blood Cells**  
*J Zhang, University of Connecticut; S. Jones, University of Connecticut, UCONN Health; G. Lykotrafitis, University of Connecticut; B. Andemariam, University of Connecticut, UCONN Health*

05:30 P **#646 Development of Biofilm-Surface Adhesion Technique via Laser-induced Stress Waves**

*J Boyd, University of Kentucky; S. Ross, University of Kentucky; M. Grady, University of Kentucky*

## 19th International Symposium on Micro- and Nanomechanics

### 024. MEMS Devices & Technology

#### Organizer(s)

**Chair Person** J. Walton, Wright-Patterson AFB; T. Berfield, University of Louisville

04:30 P **#451 Post Processed Foundry MEMS Actuators for Large Deflection Optical Scanning**

*L Starman, U.S. Air Force Research Laboratory; D. Torres, U.S. Air Force Research Laboratory; H. Hall, U.S. Air Force Research Laboratory; J. Walton, U.S. Air Force Research Laboratory; R. Lake, U.S. Air Force Institute of Technology*

04:50 P **#642 A MEMS-scale Nonlinear Vibration Energy Harvester Based on Coupled Component Structures and Bi-stable States**

*M Derakhshani, University of Louisville; B. Allgeier, University of Louisville; T. Berfield, University of Louisville*

05:10 P **#228 Modelling & Simulation of Post Processed Foundry Fabricated Large, Out-of-Plane MEMS Energy Harvester**

*J Walton, Air Force Research Laboratory; L. Starman, Air Force Research Laboratory; D. Torres, Air Force Research Laboratory*

05:30 P **#227 Programming Vanadium Dioxide based MEMS Mirror**

*D Torres, Air Force Research Laboratory; S. Dooley, Air Force Research Laboratory; L. Starman, Air Force Research Laboratory; N. Sepúlveda, Michigan State University*

05:50 P **#452 Torsional Structures to Enable Large Angle Deflections**

*L Starman, U.S. Air Force Research Laboratory; D. Torres, U.S. Air Force Research Laboratory; J. Walton, U.S. Air Force Research Laboratory*

## Dynamic Behavior of Materials

### 025. Novel Experimental Techniques

**Organizer(s)** T. Walter, US Army Research Lab; O. Kingstedt, University of Utah

**Chair Person** T. Walter, US Army Research Lab

09:00 A **#153 Heterodyne Diffracted Beam Photonic Doppler Velocimeter (DPDV) for Pressure-Shear Shock Experiments**

*M Mello, California Institute of Technology; C. Kettenbeil, California Institute of Technology; M. Bischann, California Institute of Technology; Z. Lovinger, California Institute of Technology; G. Ravichandran, California Institute of Technology*

09:20 A **#636 Modified Digital Gradient Sensors with Higher Measurement Sensitivity for Evaluating Stress Gradients in Transparent Solids**

*C Miao, Auburn University; H. Tippur, Auburn University*

09:40 A **#753 Under-microscope Pulse Test System with Controlled Force Amplitude and Pulse Duration**

*U Heller, Technion; E. Faran, Technion; D. Shilo, Technion*

10:00 A **#237 Microstructure Characterization of Electrodeposited Nickel Tested at High Strain Rates**

*J Ligda, U.S. Army Research Laboratory; D. Casem, U.S. Army Research Laboratory; H. Murdoch, U.S. Army Research Laboratory*

- 10:20 A **#715 Influence of High Strain Rate Transverse Compression on the Tensile Strength of Polyethylene Ballistic Single Fibers**  
*F Thomas, University of South Carolina; D. Casem, U.S. Army Research Laboratory; T. Weerasooriya, U.S. Army Research Laboratory; S. Sockalingam, University of South Carolina; J. Gillespie Jr., University of Delaware*

## Highlights

### 026. Technology Applications

**Organizer(s)** J. Normandin, SEM

**Chair Person**

- 09:00 A **#95 Recent Enhancements in Stereo Calibration Methods for Single and Multiple Stereo Digital Image Correlation Systems**  
*A Tofts, Correlated Solutions, Inc.; H. Schreier, Correlated Solutions, Inc.; M. Simonsen, Correlated Solutions, Inc.; A. Balabokhin, Correlated Solutions, Inc.*
- 09:15 A **#211 MatchID 's Performance Analysis: An Automated Approach to Determine the Optimum DIC user Settings**  
*P Lava, MatchID - Metrology Beyond Colors; L. Wittevrongel, MatchID - Metrology Beyond Colors*
- 09:30 A **#90 High-speed 2D Polarization to Visualize Birefringence in Transparent Materials**  
*A Bridges, Photron*

## 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 027. Fracture & Fatigue of Composites

**Organizer(s)** V. Chalivendra, University of Massachusetts Dartmouth; B. Mukherjee, The Dow Chemical Company

**Chair Person** V. Chalivendra, University of Massachusetts Dartmouth; B. Mukherjee, The Dow Chemical Company

- 09:00 A **#426 2D Microscale Observations of Transverse Fracture in Carbon/Epoxy Composites**  
*A Smith, University of Utah; C. Arndt, University of Utah; M. Czabaj, University of Utah; D. Benson, University of Utah*
- 09:20 A **#117 Characterization of Through Thickness Reinforced Curved Carbon Fiber/Epoxy Composites**  
*N Bach, University of Massachusetts Dartmouth; V. Chalivendra, University of Massachusetts Dartmouth; J. Li, University of Massachusetts Dartmouth; Y. Kim, University of Massachusetts Dartmouth*
- 09:40 A **#702 Effect of Process Induced Residual Stress on Interlaminar Fracture Toughness of Hybrid Composites**  
*B Werner, Sandia National Laboratories; K. Nelson, Sandia National Laboratories; C. Nelson, Sandia National Laboratories*
- 10:00 A **#645 Investigating Intralaminar Crack Growth in Biaxially Stressed Composites for Extreme Aerospace Applications**  
*J French, University of Utah; J. Christensen, University of Utah; M. Czabaj, University of Utah*
- 10:20 A **#268 Mode II Crack Initiation and Propagation of Carbon Fiber Epoxy under Extreme Conditions**  
*R Chavez, University of California San Diego*

## Advancement of Optical Methods in Experimental Mechanics

### 028. New Developments in Optical Methods & Fringe Pattern Analysis III

#### Organizer(s)

**Chair Person** C.A. Sciammarella, Illinois Institute of Technology; C. Furlong, WPI-ME/CHSLT

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- 09:00 A **#246 Eliminating Air Refraction Issues in DIC by Conducting Experiments in Vacuum**  
*P Reu, Sandia National Laboratories; E. Jones, Sandia National Laboratories*
- 09:20 A **#273 DIC Image on FIB Ring-Core Analysis of Depth Sensing Residual Stress Measurement of Thin Films**  
*W Pan, National Chung Hsing University; A. Tsai, National Chung Hsing University; T. Chen, National Cheng Kung University; F. Cherng, National Cheng Kung University; M. Lin, National Chung Hsing University*
- 09:40 A **#385 Development of a New Normalization Technique for Twelve- Fringe Photoelasticity (TFP)**  
*A Pandey, Indian Institute of Technology Madras; K. Ramesh, Indian Institute of Technology Madras*
- 10:00 A **#626 Deflectometry on Curved Surfaces**  
*Y Surrel, University of Southampton; F. Pierron, University of Southampton*
- 10:20 A **#748 Simulation of 3D Reconstruction of Conical Calibration Targets**  
*W Wang, National Tsing Hua University; C. Hwang, Instrument Technology Research Center, NARL; Y. Chen, Instrument Technology Research Center, NARL*

## Symposium on the Role of Digital Image Correlation in Experimental Mechanics in Honor of Prof. Michael Sutton

### 029. Biomechanics

#### Organizer(s)

**Chair Person** J. Dally, University of Maryland; P.G. Ifju, University of Florida

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- 09:00 A **#72 Combined Digital Volume Correlation and Confocal Microscopy for studying Cell-Matrix Interactions**  
*J Notbohm, University of Wisconsin-Madison; C. Franck, Brown University; G. Ravichandran, Caltech*
- 09:20 A **#251 Identification of Deformation Mechanism in Biomaterials Through AFM and Digital Image Correlation**  
*H Espinosa, Northwestern University*
- 09:40 A **#96 Beyond the Airbrush: Applications of Digital Image Correlation in Vascular Biomechanics**  
*S Lessner, University of South Carolina; J. Eberth, University of South Carolina*
- 10:00 A **#278 Measurement of Local Strain Distribution and Its Variation Near Eyes During Blink Using Digital Image Correlation**  
*K Sakai, Aoyama Gakuin University; Y. Zhang, Aoyama Gakuin University; S. Yoneyama, Aoyama Gakuin University; Y. Miyazaki, Kao Corporation; Y. Nagai, Kao Corporation; T. Igarashi, Kao Corporation*

## Challenges in Mechanics of Time-Dependent Materials

### 030. Damage, Fatigue, Fracture

#### Organizer(s)

**Chair Person** J. Furmanski, Exxon Mobil; B. Antoun, Sandia National Laboratories



- 09:00 A **#559 Experimental Investigation of Dynamic Strain Aging in 304L Stainless Steel**  
*B Antoun, Sandia National Laboratories; C. Alleman, Sandia National Laboratories; K. De La Trinidad, Sandia National Laboratories*
- 09:20 A **#527 Modeling of Cavitation Erosion Resistance in Polymeric Materials Based on Strain Accumulation**  
*V Alizadeh, University of Massachusetts, Lowell; A. Amirkhizi, University of Massachusetts, Lowell*
- 09:40 A **#762 Bond Strength in Non-woven Mechanics**  
*N Chen, Cornell University; M. Silberstein, Cornell University*
- 10:00 A **#516 Direct Extraction of Traction-Separation Relationship for Polymer-Modified Bitumen Under Mode I Loading**  
*S Rajan Kattil, University of South Carolina; M. Sutton, University of South Carolina; F. Ryan, University of South Carolina; A. Kidane, University of South Carolina; Y. Farzana, University of South Carolina*
- 10:20 A **#274 Understanding Creep-Fatigue Interaction in Fe-25Ni-20Cr (wt.%) Austenitic Stainless Steel**  
*N Kumar, North Carolina State University; A. Alomari, North Carolina State University; K. Murty, North Carolina State University*

### Inverse Problems/Hybrid Techniques

## 031. Inverse Problems/Hybrid Techniques II

#### Organizer(s)

**Chair Person** S. Bossuyt, Aalto University

- 09:00 A **#346 Experimentally Enhanced Computations: Calibration Methodology for an Anisotropic Metal, Part I – Traditional Approach**  
*E Corona, Sandia National Laboratories; S. Kramer, Sandia National Laboratories; A. Jones, Sandia National Laboratories*
- 09:20 A **#367 Experimentally Enhanced Computations: Calibration Methodology for an Anisotropic Metal, Part II – Novel Approach/ Validation**  
*S Kramer, Sandia National Laboratories; A. Jones, Sandia National Laboratories; B. Lester, Sandia National Laboratories; E. Corona, Sandia National Laboratories*
- 09:40 A **#742 Optimal Mechanical Testing for Constitutive Parameter Identification**  
*D Seidl, Sandia National Laboratories; D. Turner, Sandia National Laboratories; E. Jones, Sandia National Laboratories; K. Karlson, Sandia National Laboratories; S. Kramer, Sandia National Laboratories; J. Carroll, Sandia National Laboratories; P. Reu, Sandia National Laboratories*
- 10:00 A **#585 Image-based Stress Field Reconstruction in Complex Media**  
*R Seghir, Université de Nantes; F. Pierron, University of Southampton; L. Fletcher, University of Southampton*
- 10:20 A **#136 Inverse Identification of the Loading Applied by a Tire on a Landing Gear Wheel**  
*K Cosseron, LMT, ENS Paris-Saclay/Safran Group, Safran Landing Systems; R. Gras, LMT, ENS Paris-Saclay/EikoSim; D. Mellé, Safran Group, Safran Landing Systems; J. Diebold, Safran Group, Safran Landing Systems; F. Hild, LMT, ENS Paris-Saclay; S. Roux, LMT, ENS Paris-Saclay*

### 19th International Symposium on Micro- and Nanomechanics

## 032. Nano-scale Deformation Mechanisms

#### Organizer(s)

**Chair Person** M. Linne, University of Michigan; N. Karanjgaokar, Worcester Polytechnic Institute

- 09:00 A **#582 Keynote: Investigating Small-Scale Deformation Mechanisms and Microstructure-Mechanical Property Relationships using SEM-DIC**  
*S Daly, University of California, Santa Barbara*
- 09:40 A **#178 Investigation of Deformation Mechanisms in Columnar Aluminum**  
*S Daly, University of California, Santa Barbara; S. Daly, University of California, Santa Barbara; M. Sangid, Purdue University; S. Daly, University of California, Santa Barbara*
- 10:00 A **#99 Superstrength through Icosahedral Bonding**  
*C Kunka, University of Florida; G. Subhash, University of Florida*
- 10:20 A **#569 Temperature and Microstructural Dependence of Dwell Fatigue in Dual-Phase Titanium Alloys**  
*M Harr, University of Michigan; A. Pilchak, Air Force Research Laboratory; S. Daly, University of California, Santa Barbara*

## Dynamic Behavior of Materials

### 033. Dynamic Behavior of Geomaterials I

**Organizer(s)** B. Martin, Air Force Research Laboratory; X. Nie, Southern Methodist University

**Chair Person** X. Nie, Southern Methodist University; B. Williams, US Army ERDC

- 01:50 P **#148 Dynamic Damage Evolution in High-Strength Concrete**  
*C Loeffler, Southern Methodist University; Y. Qiu, Southern Methodist University; B. Martin, Air Force Research Laboratory; W. Heard, U.S. Army Engineer Research and Development Center; B. Williams, U.S. Army Engineer Research and Development Center; X. Nie, Southern Methodist University*
- 02:10 P **#446 Residual Structural Capacity of a High-Performance Concrete**  
*G Vankirk, U.S. Army Engineer Research and Development Center; W. Heard, U.S. Army Engineer Research and Development Center; A. Frank, U.S. Army Engineer Research and Development Center; M. Hammons, U.S. Army Engineer Research and Development Center; J. Roth, U.S. Army Engineer Research and Development Center*
- 02:30 P **#301 Revisit of Dynamic Brazilian Tests of Geomaterials**  
*B Sanborn, Sandia National Laboratories; E. Jones, Sandia National Laboratories; M. Hudspeth, Sandia National Laboratories; B. Song, Sandia National Laboratories; S. Broome, Sandia National Laboratories*
- 02:50 P **#76 Effect of the Ratio of Charge Mass to Target Mass on Measured Impulse**  
*L Taylor, University of Maryland, College Park; W. Szymczak, Naval Research Laboratory; U. Leiste, University of Maryland, College Park; W. Fourney, University of Maryland*
- 03:10 P **#805 High Strain Rate Multi-Axial Loading Behavior of Granular Phase Boron Carbide**  
*X Sun, Johns Hopkins University; A. Tonge, U.S. Army Research Laboratory; K. Ramesh, Johns Hopkins University; J. LaSalvia, U.S. Army Research Laboratory*

## 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 035. Multifunctional Materials

**Organizer(s)** P. Thakre, The Dow Chemical Company; L. Bodelot, Ecole Polytechnique - LMS

**Chair Person** P. Thakre, The Dow Chemical Company; L. Bodelot, Ecole Polytechnique - LMS

- 01:50 P **#409 Layered Jamming Multifunctional Actuators**  
*R Acevedo, University of Maryland; L. Johnson, University of Maryland; S. Gupta, University of Maryland; H. Bruck, University of Maryland; J. Rohwerder, University of Maryland*

- 02:10 P **#513 Mechanical Properties of Magnetic Microcapsules**  
*A Vancuren, University of Tulsa; M. Keller, University of Tulsa*
- 02:30 P **#212 Experimental Characterization of Magneto-Rheological Elastomers for Constitutive Model Parameters Identification**  
*L Bodelot, Ecole Polytechnique; J. Voropaieff, Ecole Polytechnique*

## Advancement of Optical Methods in Experimental Mechanics

### 036. DIC Applications for Challenging Environments I

**Organizer(s)** H. Jin, Sandia National Laboratories; E.M.C. Jones, Sandia National Laboratories  
**Chair Person** H. Jin, Sandia National Laboratories; E.M.C. Jones, Sandia National Laboratories

- 01:50 P **#483 DIC of Foam Materials at Cryogenic Temperatures**  
*S Quinn, University of Southampton; W. Bailey, University of Southampton; D. Crump, University of Southampton; J. Dulieu-Barton, University of Southampton; T. Bostock, University of Southampton; A. Robinson, University of Southampton*
- 02:10 P **#109 Measuring Spallation Strength of Epoxy by Laser Spallation Technique**  
*S Singh, Indian Institute of Technology; R. Kitey, Indian Institute of Technology*
- 02:30 P **#234 Strain Rate Effects on Stainless Steel Laser Welds**  
*H Jin, Sandia National Laboratories; K. Nelson, Sandia National Laboratories*
- 02:50 P **#694 Measurement on a Sample of Fuel Cell at High Temperature**  
*N Li, University of South Carolina; N. Xu, University of South Carolina; M. Sutton, University of South Carolina; K. Huang, University of South Carolina*
- 03:10 P **#331 Application of Digital Image Correlation to Structures in Fire**  
*C Smith, Berkshire Hathaway Specialty Insurance; M. Hoehler, National Institute of Standards and Technology*

## Symposium on the Role of Digital Image Correlation in Experimental Mechanics in Honor of Prof. Michael Sutton

### 037. Soft Materials/ Heterogeneous Materials

**Organizer(s)**  
**Chair Person** D. Dawicke,

- 01:50 P **#501 A Method to Study Volumes Changes in Elastomers Using DIC**  
*F Davis, University of Southampton; F. Pierron, University of Southampton*
- 02:10 P **#471 Full-field Deformation Measurements Within a Granular Micro-hydrogel Support Medium During 3D Printing of Soft Matter**  
*P Ifju, University of Florida; A. McGhee, University of Florida; D. Nguyen, University of Florida; J. Famiglietti, University of Florida*
- 02:30 P **#94 qDIC-based Experimental Characterization of Hyperelastic, Highly Compressible Elastomeric Foams**  
*C Franck, Brown University; A. Landauer, Brown University; X. Li, Brown University; D. Henann, Brown University*
- 02:50 P **#581 Understanding Deformation Mechanisms through the Use of in-SEM DIC and Large Data Analysis: Advances and Challenges**  
*S Daly, University of California, Santa Barbara*
- 03:10 P **#310 Use of DIC for Elucidation of Local Constitutive Laws in Heterogeneous Materials**  
*A Reynolds, University of South Carolina*

## Challenges in Mechanics of Time-Dependent Materials

### 038. Viscoelasticity

#### Organizer(s)

**Chair Person** A. Amirkhizi, University of Massachusetts, Lowell; A. Arzoumanidis, Psylotech, Inc.

- 01:50 P **#157 Time-Temperature Mechanical Response of a PVA Dual Cross-Link Self-Healing Hydrogel**  
*M Liu, Cornell University; J. Guo, Cornell University; C. Hui, Cornell University; A. Zehnder, Cornell University*
- 02:10 P **#314 Measurement of the Visco-Elastic Properties of the Chinchilla Tympanic Membrane**  
*J Liang, University of Texas at Dallas; R. Gan, University of Oklahoma; H. Lu, University of Texas at Dallas*
- 02:30 P **#356 Time-Temperature Dependent Creep and Recovery behavior of MWCNTs-Polypropylene Nanocomposites**  
*V Khare, IIT Kanpur; D. Kumar, IIT Kanpur; G. Kamath, IIT Kanpur; S. Kamle, IIT Kanpur*
- 02:50 P **#822 Some Results on the Mechanics of Inverse Freezing Gels**  
*Y Rotbaum, Technion; G. Parvari, Technion; Y. Eichen, Technion; D. Rittel, Technion*

## Fracture & Fatigue

### 039. Novel Experimental Methods

**Organizer(s)** A. Kontsos, Drexel University; O. Scott-Emuakpor, Air Force Research Laboratory

**Chair Person** A. Kontsos, Drexel University; O. Scott-Emuakpor, Air Force Research Laboratory

- 01:50 P **#789 DIC at Long Working Distances: The Effects of Diffraction Limits**  
*K Burn, Utah State University; E. Nickerson, Utah State University; R. Hansen, Utah State University; R. Berke, Utah State University*
- 02:10 P **#78 Demonstration of Hybrid Crack Kinking Criterion**  
*S Grutzik, Sandia National Laboratories; E. Reedy, Sandia National Laboratories*
- 02:30 P **#611 Experimental Control Volume Analysis of Strain Energy Density for Fatigue Crack Growth of Ti-6Al-4V**  
*C Holycross, Air Force Research Laboratory; L. Sheridan, Wright State University; O. Scott-Emuakpor, Air Force Research Laboratory*
- 02:50 P **#404 Modification of Benthem Solution for Mode I Fracture of Cylinder with Spiral Crack Subjected to Torsion**  
*A Fahem, University of South Carolina; A. Kidane, University of South Carolina*

## 19th International Symposium on Micro- and Nanomechanics

### 040. 1D & 2D Materials

#### Organizer(s)

**Chair Person** C. DiMarco, Columbia University; C. Ke, State University of New York at Binghamton

- 01:50 P **#420 An Investigation into the Effect of Surface Pores on Mechanical Behavior of Hollow Carbon Fibers and Nanofibers**  
*Y Chen, Texas A&M University; J. Cai, Texas A&M University; J. Boyd, Texas A&M University; M. Naraghi, Texas A&M University*
- 02:10 P **#662 A Probability Density Function for Polycrystalline Two-dimensional Materials**  
*C DiMarco, Columbia University; J. Hone, Columbia University; J. Kysar, Columbia University*
- 02:30 P **#594 Structural and Mechanical Properties of Boron Nitride Nanotubes in High Temperature Environment**  
*X Chen, Xi'an Jiaotong University; C. Dmuchowski, State University of New York at Binghamton; C. Park, NASA Langley Research Center; C. Fay, NASA Langley Research Center; C. Ke, State University of New York at Binghamton*
- 02:50 P **#245 Effect of Thermo-mechanical Processing On Microstructural Evolution and Mechanics of Electrospun Carbon Nanofiber**  
*J Cai, Texas A&M University; M. Naraghi, Texas A&M University*
- 03:10 P **#499 In situ Electrochemical Nanoindentation for Lithium Ion Battery Research**  
*Y Wang, University of Kentucky; Y. Cheng, University of Kentucky*
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## Dynamic Behavior of Materials

### 041. Dynamic Behavior of Geomaterials II

- Organizer(s)** B. Martin, Air Force Research Laboratory; X. Nie, Southern Methodist University  
**Chair Person** B. Martin, Air Force Research Laboratory; W. Heard, U.S. Army Corps of Engineers
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- 04:10 P **#150 Mechanical Response and Damage Evolution of High-Strength Concrete under Triaxial Loading**  
*B Williams, U.S. Army Engineer Research and Development Center; W. Heard, U.S. Army Engineer Research and Development Center; S. Graham, U.S. Army Engineer Research and Development Center; B. Martin, Air Force Research Laboratory; C. Loeffler, Southern Methodist University; X. Nie, Southern Methodist University*
- 04:30 P **#366 Ballistic and Material Tests and Simulations on Ultra-High Performance Concrete**  
*S Chocron, Southwest Research Institute; A. Carpenter, Southwest Research Institute; N. Scott, Southwest Research Institute; O. Spector, Rafael; A. Malka-Markovitz, Rafael; Z. Lovinger, Rafael; D. Havazelet, Israel Ministry of Defence*
- 04:50 P **#670 In situ Visualization of the Dynamic Failure of Geomaterials Using Phase Contrast X-ray Imaging**  
*A Leong, Johns Hopkins University; E. Asare, Johns Hopkins University; R. Rex, Johns Hopkins University; N. Sinclair, Argonne National Laboratory; K. Fezzaa, Argonne National Laboratory; T. Sun, fezzaa@aps.anl.gov; X. Xiao, Argonne National Laboratory; B. Schuster, U.S. Army Research Laboratory; D. Casem, U.S. Army Research Laboratory; P. Lambert, Johns Hopkins University; V. Kannan, Johns Hopkins University; Y. Sun, Johns Hopkins University; H. Sheng, Johns Hopkins University; K. Ramesh, Johns Hopkins University; T. Hufnagel, Johns Hopkins University*
- 05:10 P **#680 Effects of Liquid Viscosity on Wave Propagation Through Submerged Granular Media**  
*H Kocharyan, Worcester Polytechnic Institute; N. Karanjgaokar, Worcester Polytechnic Institute*
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## Mechanics of Additive and Advanced Manufacturing

### 042. Additive Manufacturing of Polymers and Composites

- Organizer(s)**  
**Chair Person** E.N. Brown, Los Alamos National Laboratory
-

- 04:10 P **#410 Experimental Homogenized Elastic Properties of Computer-generated 3D-printed Random Porous Materials**  
*O Zerhouni, Ecole Polytechnique; G. Tarantino, Ecole Polytechnique; K. Danas, Ecole Polytechnique*
- 04:30 P **#202 Mechanical Structure-Property Relationships for 2D Polymers Comprised of Nodes and Bridge Units**  
*E Sandoz-Rosado, U.S. Army Research Laboratory; E. Wetzel, U.S. Army Research Laboratory*
- 04:50 P **#454 Shrinkage Analysis of Resin-Based Dental Composite Filled with PA Microcapsules**  
*D Kafagy, George Mason University*
- 05:10 P **#804 Computational and Experimental Characterization of 3D Printed Components by Fused Deposition Modeling**  
*K Pooladvand, Worcester Polytechnic Institute; C. Furlong, Worcester Polytechnic Institute*

#### 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 043. Damage Detection & Non-destructive Evaluation

**Organizer(s)** A.-D. Celestine, Harvard University; P. Thakre, The Dow Chemical Company

**Chair Person** A.-D. Celestine, Auburn University; P. Thakre, The Dow Chemical Company

- 04:10 P **#115 Damage Sensing in Multi-functional Natural Fiber Composites Under Shear Loading**  
*S Yang, University of Massachusetts Dartmouth; J. Zulu, University of Massachusetts Dartmouth; V. Chalivendra, University of Massachusetts Dartmouth; Y. Kim, University of Massachusetts Dartmouth*
- 04:30 P **#368 Impact and Post-impact Behaviour of Composite Laminates Reinforced by Z-pins**  
*L Francesconi, Santa Clara University; F. Aymerich, University of Cagliari*
- 04:50 P **#437 Multimodal Damage Detection in Fiber-reinforced Composite Materials Using Magnetic Nanoparticles**  
*M Crall, University of Tulsa; S. Laney, University of Tulsa; M. Keller, University of Tulsa*
- 05:10 P **#218 Nondestructive Damage Detection of a Magnetostrictive Composite Structure**  
*M Coatney, U.S. Army Research Laboratory; A. Hall, U.S. Army Research Laboratory; M. Haile, U.S. Army Research Laboratory; J. Yoo, U.S. Naval Systems Warfare Center; N. Bradley, U.S. Army Research Laboratory; B. Williams, Clemson University*
- 05:30 P **#473 Characterization of Composite Damage Using Magnetic Nanoparticles**  
*S Laney, University of Tulsa; M. Crall, University of Tulsa; M. Keller, University of Tulsa*
- 05:50 P **#619 Early Damage Accumulation in CMCs**  
*B Swaminathan, University of California, Santa Barbara; J. Kiser, NASA Glenn Research Center; A. Almansour, NASA Glenn Research Center; K. Sevener, University of Michigan; S. Daly, University of California, Santa Barbara*

#### Advancement of Optical Methods in Experimental Mechanics

### 044. DIC Applications (Incl. Hybrid Methods) for Challenging Environments II

**Organizer(s)** H. Jin, Sandia National Laboratories; E.M.C. Jones, Sandia National Laboratories

**Chair Person** E.M.C. Jones, Sandia National Laboratories; H. Jin, Sandia National Laboratories

- 04:10 P **#386 On Performing Spatiotemporal Stereocorrelation at Very High Temperatures**  
*M Berny, Université Paris-Saclay/SAFRAN; T. Archer, Université Paris-Saclay/SAFRAN/ONERA; F. Hild, Université Paris-Saclay; A. Mavel, Office National d'Etudes et de Recherches Aérospatiales (ONERA); P. Beauchêne, Office National d'Etudes et de Recherches Aérospatiales (ONERA); V. Herb, SAFRAN; B. Lacombe, SAFRAN*



- 04:30 P **#555 Elevated Temperature Optical Microscopy DIC**  
*K Connolly, Southern Research; W. Ralph, Southern Research*
- 04:50 P **#340 Full-Field Determination of the Taylor-Quinney Coefficient in Tension Tests of Ti-6Al-4V at Strain Rates up to 7000 s<sup>-1</sup>**  
*J Smith, The Ohio State University; J. Seidt, The Ohio State University; A. Gilat, The Ohio State University*
- 05:10 P **#165 Comparison of Material Model Calibration using Tensile Dog Bones Versus the Virtual Fields Method**  
*E Jones, Sandia National Laboratories; J. Carroll, Sandia National Laboratories; K. Karlson, Sandia National Laboratories; S. Kramer, Sandia National Laboratories; R. Lehoucq, Sandia National Laboratories; P. Reu, Sandia National Laboratories; D. Turner, Sandia National Laboratories*
- 05:30 P **#861 Measurement of Coefficient of Thermal Expansion on Full Parts using Digital Image Correlation**  
*K Hammond, Los Alamos National Laboratory; M. Steinzig, Los Alamos National Laboratory*

## Symposium on the Role of Digital Image Correlation in Experimental Mechanics in Honor of Prof. Michael Sutton

### 045. Digital Image Correlation

#### Organizer(s)

**Chair Person** H.A. Bruck, University of Maryland; H. Schreier, Correlated Solutions, Inc.

- 04:10 P **#129 Uncertainty Quantifications for Multiviewcorrelation**  
*F Hild, University Paris-Saclay; S. Roux, University Paris-Saclay*
- 04:30 P **#221 Update on the 2D-DIC Challenge: Results and Conclusions**  
*P Reu, Sandia National Laboratories; E. Toussaint, University Clermont; H. Bruck, University of Maryland; M. Iadicola, National Institute of Standards; R. Balcaen, KU Leuven; D. Turner, Sandia National Laboratories; T. Siebert, Dantec Dynamics; P. Lava, MatchID; M. Simonesen, Correlated Solutions; M. Grewer, LaVision*
- 04:50 P **#415 Digital Image Correlation Beyond Experimental Mechanics: What I've Learned from Michael Sutton**  
*B Bay, Oregon State University*

## Dynamic Behavior of Materials

### 046. Metals

#### Organizer(s)

**Chair Person**

- 04:10 P **#550 The Role of Texture on the Strain-Rate Sensitivity of Mg and Mg Alloy AZ31B**  
*O Kingstedt, University of Utah; M. Bischann, California Institute of Technology; O. Kingstedt, University of Utah*
- 04:30 P **#348 Experimental Study on Dynamic Fracture Response of Al6063-T6 under High Rates of Loading**  
*A Pandouria, Indian Institute of Technology Delhi; P. Chakraborty, Indian Institute of Technology Delhi; S. Kumar, Indian Institute of Technology Delhi; V. Tiwari, Indian Institute of Technology Delhi*
- 04:50 P **#391 Mechanical Behavior of Ta at Extreme Strain-rates**  
*D Casem, U.S. Army Research Laboratory; D. Magagnosc, U.S. Army Research Laboratory; J. Ligda, U.S. Army Research Laboratory; B. Schuster, U.S. Army Research Laboratory*

- 05:10 P **#407 Phase Transformation in Single-crystal Silver Microcubes During High-velocity Impact**  
*R Thevamaran, University of Wisconsin-Madison; S. Yazdi, Rice University; M. Ponga, University of British Columbia; O. Lawal, Rice University; S. Jeon, Kumoh National Institute of Technology; E. Thomas, Rice University*
- 05:30 P **#785 The Effect of Strain Rate on the Plastic Flow and Failure of an AZ31B Magnesium Alloy**  
*V Kannan, Johns Hopkins University; N. Krywopusk, Johns Hopkins University; L. Kesckes, US Army Research Laboratory; T. Weihs, Johns Hopkins University; K. Ramesh, Johns Hopkins University*

## Fracture & Fatigue

### 047. Extreme Environments

- Organizer(s)** R. Berke, Utah State University; K. Hazeli, University of Alabama in Huntsville  
**Chair Person** R. Berke, Utah State University; K. Hazeli, University of Alabama in Huntsville

- 04:10 P **#439 Keynote: Development and Testing of Nuclear Materials (40-min)**  
*M Meyer, Idaho National Laboratory*
- 04:50 P **#538 High Resolution Digital Image Correlation Study of Damage Accumulation During Creep-Fatigue of 709 Stainless Steel Alloy**  
*R Vieira, University of Illinois at Urbana-Champaign; S. Ravi, University of Illinois at Urbana-Champaign; H. Sehitoglu, University of Illinois at Urbana-Champaign; J. Lambros, University of Illinois at Urbana-Champaign*
- 05:10 P **#790 Speckle Pattern Inversion in DIC at Extreme Temperatures**  
*T Thai, Utah State University; A. Smith, Utah State University; A. Dabb, Utah State University; R. Berke, Utah State University*
- 05:30 P **#330 Crack Tip Stress Measurement at High Temperature in IN-617 Using Nano-indentation and Nano-mechanical Raman Spectroscopy**  
*Y Zhang, Purdue University; C. Prakash, Purdue University; V. Tomar, Purdue University*

## 19th International Symposium on Micro- and Nanomechanics

### 048. Tribology & Wear

- Organizer(s)**  
**Chair Person** D. Magagnosc, US Army Research Laboratory; G.A. Shaw, III, NIST

- 04:10 P **#643 Full Assessment of Micromachine Friction within the Rate-state Framework**  
*S Shroff, Carnegie Mellon University; M. de Boer, Carnegie Mellon University*
- 04:30 P **#701 Measuring and Modeling Capillary Bridge Dynamics and Crack Healing between Surfaces of Nanoscale Roughness**  
*E Soylemez, Marmara University, Istanbul, Turkey; M. de Boer, Carnegie Mellon University*
- 04:50 P **#500 Mechanical Properties of Thermal Barrier Coatings at Small Length Scale**  
*S Patibanda, Indian Institute of Technology Bombay; V. Nagda, Indian Institute of Technology Bombay; S. G, Center for Engineered Coatings; R. Abrahams, Monash University; K. Jonnalagadda, Indian Institute of Technology Bombay*
- 05:10 P **#736 Contact Reliability of Pt- and TiN-coated Microswitches in Different Environments**  
*C Oh, Carnegie Mellon University; M. de Boer, Carnegie Mellon University*
- 05:30 P **#302 Dynamic Tribology of Hard Coatings**  
*J Hay, Nanomechanics, Inc.*

## Dynamic Behavior of Materials

**049. Dynamic Response of Low-Impedance Materials I****Organizer(s)** P. Moy, Army Research Lab; J. Jordan, Los Alamos National Laboratory**Chair Person** P. Moy, Army Research Lab

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- 10:30 A **#110 Experimental and Computational Investigation of Mode I Fracture of Hydrogels**  
*A Knapp, University of Florida; G. Subhash, University of Florida; D. Spearot, University of Florida*
- 10:50 A **#299 Quasi-static and Dynamic Poisson's Ratio Evolution of Hyperelastic Foams**  
*B Sanborn, Sandia National Laboratories; B. Song, Sandia National Laboratories*
- 11:10 A **#175 Radial Inertia Effect on Dynamic Compressive Response of Polymeric Foam Materials**  
*B Song, Sandia National Laboratories; B. Sanborn, Sandia National Laboratories; W. Lu, Sandia National Laboratories*
- 11:30 A **#704 Dynamic Characterization and Damping Capacity of Polyurethane Foams**  
*S Koumlis, Drexel University; A. Kelbaugh, Drexel University; L. Lamberson, Drexel University*
- 11:50 A **#197 Dynamic Shear Response of Soft Tissue Materials**  
*W Liang, National Kaohsiung University of Science and Technology; L. Tsai, National Kaohsiung University of Science and Technology*
- 12:10 P **#436 Energy Absorption Characteristics of Graded Foams Subjected to High Velocity Loading**  
*A Wohlford, University of South Carolina; S. Ravindran, University of South Carolina; A. Kidane, University of South Carolina*
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## Dynamic Behavior of Materials

**050. Dynamic Failure & Fragmentation I****Organizer(s)** B. Aydelotte, U.S. Army Research Laboratory; P. Jannotti, US Army Research Laboratory**Chair Person** S. Koumlis, Drexel University; B. Aydelotte, U.S. Army Research Laboratory

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- 10:30 A **#288 Proton Radiography of Reverse Ballistic Impacts**  
*B Aydelotte, U.S. Army Research Laboratory; M. Golt, U.S. Army Research Laboratory; B. Schuster, U.S. Army Research Laboratory; J. Allison, Los Alamos National Laboratory; F. Cherne, Los Alamos National Laboratory; M. Freeman, Los Alamos National Laboratory; J. Goett, III, Los Alamos National Laboratory; B. Hollander, Los Alamos National Laboratory; B. Jensen, Los Alamos National Laboratory; J. Lopez, Los Alamos National Laboratory; F. Mariam, Los Alamos National Laboratory; J. Medina, Los Alamos National Laboratory; C. Morris, Los Alamos National Laboratory; L. Neukirch, Los Alamos National Laboratory; A. Pacheco, Los Alamos National Laboratory; M. Sandstrom, Los Alamos National Laboratory; A. Saunders, Los Alamos National Laboratory*
- 10:50 A **#290 The Effect of ECAE on the Ballistic Response of AZ31**  
*T Sano, U.S. Army Research Laboratory; P. Jannotti, U.S. Army Research Laboratory*
- 11:10 A **#767 Dynamic Fragmentation of MAX Phase Ti<sub>3</sub>SiC<sub>2</sub> from Edge-On Impact Experiments**  
*P Forquin, University of Grenoble; L. Lamberson, Drexel University; M. Barsoum, Drexel University; N. Savino, Drexel University; M. Morais, University of Grenoble*
- 11:30 A **#663 Microstructural Effects in the High Strain Rate Ring Fragmentation of Copper**  
*S Ward, University of Cambridge; C. Braithwaite, University of Cambridge; A. Jardine, University of Cambridge*

- 11:50 A **#720 Failure and Fragmentation of Pressed W-Al Composites**  
*J Kimberley, New Mexico Institute of Mining and Technology; M. Hargather, New Mexico Institute of Mining and Technology; A. Monclova, New Mexico Institute of Mining and Technology; G. Anderson, New Mexico Institute of Mining and Technology; S. Thoma, Reactive Metals International Incorporated*
- 12:10 P **#463 An Image-Based Inertial Impact Test for the High Strain Rate Properties of Brittle Materials**  
*L Fletcher, University of Southampton; F. Pierron, University of Southampton*
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#### 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 051. Recycled Constituent Composites II

**Organizer(s)** I. Miskoiglu, Michigan technological University; E. Bayraktar, SUPMECA-Paris  
**Chair Person** I. Miskoiglu, Michigan technological University; E. Bayraktar, SUPMECA-Paris

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- 10:30 A **#718 Analysis of Interfaces in AA7075/Recycled WC Particles Composites Produced via Liquid Route**  
*M Viana, FEM/UNICAMP; M. Robert, FEM/UNICAMP*
- 10:50 A **#721 Investigation on Microstructure and Interfaces in Graded FE50007/WC Composites Produced by Casting**  
*R Leibholz, FEMAQ; H. Leibholz, FEMAQ; E. Bayraktar, Suomeca-Paris; M. Robert, FEM/UNICAMP*
- 11:10 A **#294 Recycled Ti-17 based Composite Design; Optimization Process Parameters in Wire Cut Electrical Discharge Machining (WEDM)**  
*S Ezeddini, Supmeca/Paris; M. Boujelbene, University of Tunis El Manar; E. Bayraktar, Supmeca-Paris; S. Ben Salem, University of Tunis El Manar*
- 11:30 A **#304 Alternative Composite Design from Recycled Aluminum Chips for Mechanical Pin-Joint (Knuckle) Applications**  
*D Katundi, Supmeca-Paris; A. Irez, University Paris-Saclay; E. Bayraktar, Supmeca-Paris; I. Miskioglu, Michigan Technological University*
- 11:50 A **#523 Optimization of Kerf Quality During CO2 Laser Cutting of Titanium Alloy Sheet Ti-6Al-4V and Pure Titanium Ti**  
*B El-Aoud, Supmeca/Paris; M. Boujelbene, University of Tunis El Manar; E. Bayraktar, Supmeca-Paris; S. Ben Salem, University of Tunis El Manar*
- 12:10 P **#524 A Study of The Surface Integrity of Titanium Alloy Ti-6Al-4V in The Abrasive Water Jet Machining Process**  
*M Douiri, Supmeca/Paris; M. Boujelbene, University of Tunis El Manar; E. Bayraktar, Supmeca-Paris; S. Ben Salem, University of Tunis El Manar*
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#### Advancement of Optical Methods in Experimental Mechanics

### 052. Optical Methods in SEM: History & Perspective I

**Organizer(s)** L. Lamberti, Politecnico di Bari; M.T. Lin, National Chung Hsing University  
**Chair Person** L. Lamberti, Politecnico di Bari; C. Furlong, WPI-ME/CHSLT

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- 10:30 A **#102 A Review: Optical Methods that Evaluate Displacement Information (40-min)**  
*C Sciammarella, Illinois Institute of Technology*
- 11:10 A **#845 Holographic Interferometry - Then and Now**  
*K Stetson, Karl Stetson Associates, LLC*

11:50 A **#377 Laser and White-light Speckle Techniques - A Brief Review (40-min)**  
*G Cloud, Michigan State University*

## Mechanics of Additive and Advanced Manufacturing

### 053. Additively Manufactured Metals & Structures I

#### Organizer(s)

**Chair Person** B. Branch, Los Alamos National Laboratory

- 10:30 A **#67 Keynote: Structure/Property Behavior of Additively Manufactured (AM) Materials: Opportunities & Challenges (40-min)**  
*G Gray, III., Los Alamos National Laboratory; V. Livescu, Los Alamos National Laboratory; C. Knapp, Los Alamos National Laboratory; D. Jones, Los Alamos National Laboratory; S. Fensin, Los Alamos National Laboratory*
- 11:10 A **#750 Additive Manufacturing of Nanotwinned Copper by Localized Pulsed Electrodeposition**  
*S Daryadel, The University of Texas at Dallas; A. Behroozfar, The University of Texas at Dallas; S. Morsali, The University of Texas at Dallas; R. Bernal, The University of Texas at Dallas; M. Minary-Jolandan, The University of Texas at Dallas*
- 11:30 A **#215 Mechanical Behavior of Additively Manufactured Ti-6Al-4V Following a New Heat Treatment**  
*J Ligda, U.S. Army Research Laboratory; N. Saenz, CQL; J. Paramore, U.S. Army Research Laboratory; B. Butler, U.S. Army Research Laboratory*
- 11:50 A **#350 Correlation between Process Parameters and Mechanical Properties in Parts Printed By the Fused Deposition Modeling Process**  
*S Attoye, IUPUI (CAMRI)/Purdue School of Engineering and Technology; E. Malekipour, IUPUI (CAMRI)/Purdue School of Engineering and Technology; H. El-Mounayri, IUPUI (CAMRI)/Purdue School of Engineering and Technology*

## Research in Progress

### 054. Research in Progress I

#### Organizer(s)

**Chair Person** E. Koricho, Georgia Southern University

- 10:30 A **#325 Realization and Dynamic Studies of CNTs-PDMS Membranes for Biomimetic Flapping Wing Applications**  
*D Kumar, Indian Institute of Technology Kanpur; G. Kamath, Indian Institute of Technology Kanpur; P. Mohite, Indian Institute of Technology Kanpur; S. Kamle, Indian Institute of Technology Kanpur*
- 10:50 A **#573 Experimental Investigation of Segmental Post-tensioned Girders**  
*A Allawi, University of Bag; M. Al-Sherrawi, University of Baghdad; B. AL-Bayati, University of Baghdad; M. Al Gharawi, University of Missouri; A. El-Zohairy, University of Missouri*
- 11:10 A **#603 Novel Technique for In Situ Characterization of Glulam Timber Bridge**  
*N Bechle, USDA Forest Service Forest Products Laboratory; J. Hermanson, USDA Forest Service Forest Products Laboratory; J. Michopoulos, U.S. Naval Research Laboratory; A. Iliopoulos, U.S. Naval Research Laboratory*
- 11:30 A **#572 A Case Study to Evaluate Live Load Distributions for Pre-stressed RC Bridge**  
*A Allawi, University of Baghdad; M. Al-Sherrawi, University of Baghdad; M. Al Gharawi, University of Missouri; A. El-Zohairy, University of Missouri*

- 11:50 A **#574 Experimental and Numerical Evaluations of Live Load Distributions of Steel-Concrete Composite Bridge**  
*A Allawi, University of Baghdad; A. AlBayati, University of Baghdad; M. Al Gharawi, University of Missouri; A. El-Zohairy, University of Missouri*
- 12:10 P **#697 Assessment of Fluid Cavitation Threshold Using a Polymeric Split Hopkinson Bar-Confinement Chamber Apparatus**  
*M Bustamante, University of Waterloo; D. Cronin, University of Waterloo*
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## Fracture & Fatigue

### 055. Interfacial Fracture

**Organizer(s)** S. Grutzik, Sandia National Laboratories; C. Wu, Missouri University of Science and Technology  
**Chair Person** S. Grutzik, Sandia National Laboratories; C. Wu, Missouri University of Science and Technology

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- 10:30 A **#86 Observations of Adhesive Fracture for an Evolving Cohesive-Length Scale**  
*J Gorman, University of Michigan; M. Thouless, University of Michigan*
- 10:50 A **#447 Cohesive Zone Smoothing of Bending Stiffness Heterogeneities in Tape Peeling Experiments**  
*L Avellar, California Institute of Technology; T. Reese, California Institute of Technology; K. Bhattacharya, California Institute of Technology; G. Ravichandran, California Institute of Technology*
- 11:10 A **#260 Characterization of Transverse Deformation and Failure Initiation at the Fiber/Matrix Interface using DIC in a SEM**  
*C Montgomery, University of Illinois at Urbana-Champaign; A. Klepacki, University of Illinois at Urbana-Champaign; B. Koohbor, University of Illinois at Urbana-Champaign; P. Geubelle, University of Illinois at Urbana-Champaign; N. Sottos, University of Illinois at Urbana-Champaign*
- 11:30 A **#705 Adhesion of Silver Nanowire and Graphene Composite Film**  
*Y Li, Missouri University of Science and Technology; C. Guo, Missouri University of Science and Technology; C. Wu, Missouri University of Science and Technology*
- 11:50 A **#806 Correlating Interfacial Fracture Toughness to Surface Roughness in Polymer-based Interfaces**  
*D Yavas, Iowa State University; A. Bastawros, Iowa State University*
- 12:10 P **#733 Atomistic Modeling on Adhesion of Polyurea and Silica Aerogel Interface**  
*A Ghasemi, The University of Texas at San Antonio; Y. Li, Missouri University of Science and Technology; W. Gao, The University of Texas at San Antonio; C. Wu, Missouri University of Science and Technology*
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## Thermomechanics and Infra-red Imaging

### 056. Material Characterizations Using Thermography I

**Organizer(s)**  
**Chair Person** J. Dulieu-Barton, University of Southampton; R. Tighe, Defence Academy of the UK

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- 10:30 A **#855 Keynote: New Horizons in Thermoelastic Stress Analysis and its Application to Airframe Structural Fatigue Testing (40-min)**  
*N Rajic, Defence Science and Technology Group; C. Brooks, Monash University; S. vandervelden, Defence Science and Technology Group*
- 11:10 A **#606 Infrared Thermography for Material Characterization at Intermediate Strain Rates**  
*T Fourest, ONERA; J. Berthe, ONERA*



- 11:30 A **#545 Towards Integrating Imaging Techniques to Assess Manufacturing Features and In-service Damage in Composite Components**  
*I Jiménez-Fortunato, University of Southampton; D. Bull, University of Southampton; J. Dulieu-Barton, University of Southampton; O. Thomsen, University of Southampton*
- 11:50 A **#281 Experimental Investigation of Emissivity Influence to Obtain Thermal Field by Near Infrared Thermography**  
*C Zhang, Université de Lyon; J. Marty, Université de Lyon; A. Maynadier, Univ. Bourgogne Franche-Comté; P. Chaudet, Université de Lyon; J. Rethore, Université de Nantes; M. Baietto, Université de Lyon*

## Dynamic Behavior of Materials

### 057. Dynamic Response of Low-Impedance Materials II

**Organizer(s)** P. Moy, Army Research Lab; J. Jordan, Los Alamos National Laboratory  
**Chair Person** J. Jordan, Los Alamos National Laboratory

- 02:30 P **#479 The Effect of In-plane Properties on the Ballistic Response of Polyethylene Composites**  
*J Cline, U.S. Army Research Laboratory*
- 02:50 P **#327 Interface Chemistry Dependent Mechanical Properties in Energetic Material using Nano-scale Impact Experiment**  
*C Prakash, Purdue University; A. Olokun, Purdue University; I. Gunduz, Purdue University; V. Tomar, Purdue University*
- 03:10 P **#432 On the Response of Polymer Bonded Explosives at Different Impact Velocities**  
*S Ravindran, University of South Carolina; A. Tessema, University of South Carolina; A. Kidane, University of South Carolina*
- 03:30 P **#491 Experimental Measurement of Time and Temperature Dependent Interfacial Strength**  
*L Lea, University of Cambridge; D. Williamson, University of Cambridge*

## Dynamic Behavior of Materials

### 058. Dynamic Failure & Fragmentation II

**Organizer(s)** B. Aydelotte, U.S. Army Research Laboratory; P. Jannotti, US Army Research Laboratory  
**Chair Person** L. Fletcher, University of Southampton; P. Jannotti, US Army Research Laboratory

- 02:30 P **#98 Comparison of Structure and Deformation Mechanisms in Boron Carbide and Boron Suboxide**  
*G Subhash, University of Florida; C. Kunka, University of Florida*
- 02:50 P **#235 Mechanical Characterization of ZrO<sub>2</sub> Rich Glass Ceramic**  
*B Sundaram, Corning Research and Development Corporation; J. Westbrook, Corning Research and Development Corporation; C. Smith, Corning Research and Development Corporation; J. Finkeldey, Corning Research and Development Corporation*
- 03:10 P **#119 Mitigation of Amorphous Effects in Boron Carbide through Grain Size Reduction and Secondary Phase Addition**  
*M DeVries, University of Florida; J. Pittari, III., U.S. Army Research Laboratory; G. Subhash, University of Florida*
- 03:30 P **#681 X-Ray Computed Tomography Characterization of Damage in Advanced Ceramics**  
*C Lo, University of Alberta; B. Koch, University of Alberta; T. Walter, U.S. Army Research Laboratory; T. Sano, U.S. Army Research Laboratory; J. Hogan, University of Alberta*

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## 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 059. Composites for Wind Energy & Aerospace Applications

**Organizer(s)** M. Eydani Asl, University of Massachusetts Lowell; R. Singh, Oklahoma State University

**Chair Person** M. Eydani Asl, University of Massachusetts Lowell; R. Singh, Oklahoma State University

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- 02:30 P **#458 A new Approach for Assessing the Load Response and Failure of Wind Turbine Blade Substructures**  
*J Callaghan, University of Southampton; J. Dulieu-Barton, University of Southampton; O. Thomsen, University of Southampton; S. Laustsen, Siemens Gamesa Renewable Energy; C. Burchardt, Siemens Gamesa Renewable Energy*
- 02:50 P **#580 Sub-Components of Wind Turbine Blades - Proof of a Novel Trailing Edge Testing Concept**  
*M Rosemeier, Fraunhofer Institute for Wind Energy Systems; A. Antoniou, Fraunhofer Institute for Wind Energy Systems; C. Lester, Fraunhofer Institute for Wind Energy Systems*
- 03:10 P **#441 Fatigue Life Assessment of Recyclable Bio-Based Resins for Wind Turbine Blades**  
*M Asl, University of Massachusetts Lowell; C. Niezrecki, University of Massachusetts Lowell; J. Sherwood, University of Massachusetts Lowell; P. Avaitabile, University of Massachusetts Lowell*
- 03:30 P **#487 High-fidelity Testing and Integrated Modelling of Composite Structures and Components**  
*D Bull, University of Southampton; J. Dulieu-Barton, University of Southampton; O. Thomsen, University of Southampton*
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## Advancement of Optical Methods in Experimental Mechanics

### 060. Optical Methods in SEM: History & Perspective II

**Organizer(s)** L. Lamberti, Politecnico di Bari; M.T. Lin, National Chung Hsing University

**Chair Person** M.T. Lin, National Chung Hsing University; L. Lamberti, Politecnico di Bari

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- 02:30 P **#430 Recent Digital Image Correlation Measurements and Observations for Civil Engineering Structures and Materials**  
*M Sutton, Department of Mechanical Engineering, University of South Carolina; S. Rajan, Department of Mechanical Engineering, University of South Carolina; A. Kidane, Department of Mechanical Engineering, University of South Carolina; R. Fuerte, Department of Mechanical Engineering, University of South Carolina; J. Seidt, Department of Mechanical and Aerospace Engineering, Ohio State University; A. Gilat, Department of Mechanical and Aerospace Engineering, Ohio State University*
- 03:00 P **#757 Recent Advancements and Perspective about Digital Holography: A Super-tool in Biomedical and Bioengineering Fields**  
*F Merola, Institute of Applied Sciences & Intelligent Systems (ISASI-CNR); B. Mandracchia, CNR-ISASI; P. Memmolo, CNR-ISASI; L. Miccio, CNR-ISASI; M. Mugnano, CNR-ISASI; M. Villone, University of Naples Federico II; P. Maffettone, University of Naples Federico II; E. Di Maio, University of Naples Federico II; V. Ferraro, University of Naples Federico II; Z. Wang, CNR-ISASI; V. Pagliarulo, CNR-ISASI; P. Ferraro, Institute of Applied Sciences & Intelligent Systems (ISASI-CNR)*
- 03:30 P **#816 Recent Advances in the Development of Optical Metrology for the Hearing and Speech Sciences**  
*C Furlong, WPI-ME/CHSLT; R. Franco, MEEI/Harvard Medical School; J. Cheng, MEEI/Harvard Medical School; J. Rosowski, MEEI/Harvard Medical School*

## Mechanics of Additive and Advanced Manufacturing

### 061. Additively Manufactured Metals & Structures II

#### Organizer(s)

**Chair Person** J. Carroll, Sandia National Laboratories

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- 02:30 P **#674 Multiscale Digital Image Correlation Study of Additively Manufactured Ti-6Al-4V**  
*D Foehring, University of Illinois Urbana-Champaign; R. VanSickle, University of Illinois Urbana-Champaign; H. Chew, University of Illinois Urbana-Champaign; J. Lambros, University of Illinois Urbana-Champaign*
- 02:50 P **#686 Microstructure and Deformation Mechanisms of Stainless Steel 316L Made by Selective Laser Melting**  
*T Voisin, Lawrence Livermore National Laboratory; J. McKeown, Lawrence Livermore National Laboratory; J. Ye, Lawrence Livermore National Laboratory; N. Calt, Lawrence Livermore National Laboratory; Z. Li, Lawrence Livermore National Laboratory; W. Chen, Lawrence Livermore National Laboratory; T. Roehling, Lawrence Livermore National Laboratory; M. Santala, Oregon State University; Y. Wang, Lawrence Livermore National Laboratory*
- 03:10 P **#688 Deformation Mechanics of Ti-6Al-4V Alloys Made by Selective Laser Melting**  
*T Voisin, Lawrence Livermore National Laboratory; N. Calt, Lawrence Livermore National Laboratory; J. Ye, Lawrence Livermore National Laboratory; R. Cunningham, Carnegie Mellon University; A. Rollett, Carnegie Mellon University; Y. Wang, Lawrence Livermore National Laboratory*
- 03:30 P **#424 A Novel Auxetic Structure with Enhanced Impact Performances by Means Of Periodic Tessellation with Variable Poisson's Ratio**  
*M Taylor, Santa Clara University; L. Francesconi, Santa Clara University; A. Baldi, University of Cagliari; X. Liang, Santa Clara University; F. Aymerich, University of Cagliari*

## Research in Progress

### 062. Research in Progress II

#### Organizer(s)

**Chair Person** A. Kidane, University of South Carolina

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- 02:30 P **#672 A Progression on the Determination of Dynamic Fracture Initiation Toughness using Spiral Crack**  
*A Fahem, University of South Carolina; A. Kidane, University of south Carolina*
- 02:50 P **#392 Selection of Shear Sample Test Geometry for Bulk Adhesive Characterization**  
*B Watson, University of Waterloo; M. Worswick, University of Waterloo; D. Cronin, University of Waterloo*
- 03:10 P **#422 An Investigation of Stress Concentration, Crack Nucleation, and Fatigue Life of Thin Low Porosity Metallic Auxetic Structures**  
*L Francesconi, Santa Clara University; M. Taylor, Santa Clara University; A. Baldi, Università degli Studi di Cagliari*
- 03:30 P **#131 Investigating Dynamic Fracture Parameters for Al7075-T651 using Modified Hopkinson Pressure bar (MHPB)**  
*S Kumar, Delhi Technological University; A. Pandouria, Indian Institute of Technology; V. Tiwari, Indian Institute of Technology*

## Fracture &amp; Fatigue

**063. Integration of Models & Experiments I****Organizer(s)** J. Carroll, Sandia National Laboratories; S. Grutzik, Sandia National Laboratories**Chair Person** J. Carroll, Sandia National Laboratories; S. Grutzik, Sandia National Laboratories02:30 P **#209 Keynote: The Sandia Fracture Challenge: How Ductile Failure Predictions Fair (40-min)***S Kramer, Sandia National Laboratories; B. Boyce, Sandia National Laboratories; A. Jones, Sandia National Laboratories; J. Gearhart, Sandia National Laboratories; B. Salzbrenner, Sandia National Laboratories*03:10 P **#146 Failure Testing Under In-Plane Biaxial Tension and Out-of-Plane Compression***N Spulak, The Ohio State University; R. Lowe, University of Dayton; J. Seidt, The Ohio State University; A. Gilat, The Ohio State University*03:30 P **#571 Experimental Study on Fatigue Performance of Steel-concrete Composite Girders***A El-Zohairy, University of Missouri; H. Salim, University of Missouri; A. Saucier, University of Missouri*

## Thermomechanics and Infra-red Imaging

**064. Thermoelastic Stress Analysis****Organizer(s)****Chair Person** B. Boyce, Stress Photonics Inc.; S. Quinn, University of Southampton02:30 P **#668 Thermographic Assessment of Sub-surface Damage in Composite Overwrapped Pressure Vessels***R Tighe, Defence Academy of the UK; D. Crump, University of Southampton; T. Allen, University of Southampton; N. Sathon, University of Southampton; P. Reed, University of Southampton; J. Dulieu-Barton, University of Southampton*02:50 P **#765 Thermoelastic Measurement Techniques Enabled by Self-Reference***B Boyce, Stress Photonics Inc; J. Lesniak, Stress Photonics Inc.*03:10 P **#657 Thermoelastic Stress Field Investigation of a Multiply-Loaded Disk***M Yousefi, Rochester Institute of Technology; X. Balandraud, Université Clermont-Auvergne; W. Samad, Rochester Institute of Technology*03:30 P **#230 Experimentally Determined Stresses in a Deep-Notched Aluminum Tensile Plate***Y Ro, University of Wisconsin-Madison; A. Alshaya, Kuwait University; B. Yang, University of Wisconsin-Madison; S. Kurunthottikkal Philip, Cummins Inc.; J. Freire, Pontifical Catholic University; R. Rowlands, University of Wisconsin-Madison*

## Dynamic Behavior of Materials

**065. Dynamic Response of Low-Impedance Materials III****Organizer(s)** P. Moy, Army Research Lab; J. Jordan, Los Alamos National Laboratory**Chair Person** J. Jordan, Los Alamos National Laboratory04:20 P **#477 A Tensile Split Hopkinson Pressure Bar for Low Impedance Materials***D Williamson, University of Cambridge*

- 04:40 P **#401 Investigating the Mechanical and Thermal Relationship for Epoxy Blends**  
*M Harr, U.S. Army Research Laboratory, ORISE; P. Moy, U.S. Army Research Laboratory; T. Walter, U.S. Army Research Laboratory; K. Masser, U.S. Army Research Laboratory*
- 05:00 P **#542 Effects of Pressure and Strain Rate on the Mechanical Behavior of Glassy Polymers**  
*A Wohlford, University of South Carolina; T. Walter, U.S. Army Research Laboratory; D. Casem, U.S. Army Research Laboratory; P. Moy, U.S. Army Research Laboratory; A. Kidane, University of South Carolina*
- 05:20 P **#345 Experimental Investigation of Rate Sensitive Mechanical Response of Polyurea**  
*S Kasimahanthi, Indian Institute of Technology Madras, Chennai; L. Rao C, Indian Institute of Technology Madras, Chennai; V. Parameswaran, Indian Institute of Technology Kanpur, Kanpur*
- 05:40 P **#448 Dynamic Mode II Fracture Response of PMMA Within an Aquatic Environment**  
*V Gomez, University of California, San Diego; I. Delaney, University of California, San Diego; R. Chavez, University of California, San Diego; V. Eliasson, University of California, San Diego*
- 06:00 P **#498 Storage and Loss Moduli of Low-impedance Materials at kHz Frequencies**  
*W Nantasetphong, SCG Chemicals Co., Ltd.; Z. Jia, University of Connecticut; M. Hasan, University of California, San Diego; A. Amirkhizi, University of Massachusetts, Lowell; S. Nemat-Nasser, University of California, San Diego*

## Dynamic Behavior of Materials

### 066. Dynamic Failure & Fragmentation III

**Organizer(s)** B. Aydelotte, U.S. Army Research Laboratory; P. Jannotti, US Army Research Laboratory  
**Chair Person** L. Fletcher, University of Southampton; C. Meredith, Army Research Lab

- 04:20 P **#107 Compression Strength of Ceramics**  
*J Swab, Army Research Laboratory; C. Meredith, Army Research Laboratory; G. Bobby, Bowhead; J. Pittari, III, Oak Ridge Institute for Science and Engineering*
- 04:40 P **#106 Comparison of Pressure-Sensitive Strength Models for Ceramics under Ultrahigh Confinement**  
*S Bavdekar, University of Florida; G. Subhash, University of Florida*
- 05:00 P **#87 Fracture and Failure Characterization of Transparent Acrylic based graft Interpenetrating Polymer Networks (graft-IPNs)**  
*B Sundaram, Auburn University; R. Mendez, Auburn University; H. Tippur, Auburn University; M. Auad, Auburn University*
- 05:20 P **#88 Dynamic Crack Branching in Soda-lime Glass: An Optical Investigation using Digital Gradient Sensing**  
*B Sundaram, Auburn University; H. Tippur, Auburn University*
- 05:40 P **#66 Ballistic Impact Experiments and Quantitative Assessments of Mesoscale Damage Modes in a Single-layer Woven Composite**  
*C Meyer, U.S. Army Research Laboratory/University of Delaware; B. Haque, University of Delaware; D. O'Brien, U.S. Army Research Laboratory; J. Gillespie, Jr., University of Delaware; E. Bonyi, Morgan State University; K. Aslan, Morgan State University*

## 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 067. Computed Tomography of Composites

**Organizer(s)** P. Thakre, The Dow Chemical Company; H. Truong, The Dow Chemical Company  
**Chair Person** P. Thakre, The Dow Chemical Company; H. Truong, The Dow Chemical Company

- 04:20 P **#272 Quantitative Relationships between Composite Microstructure and Mechanics by Digital Volume Correlation**  
*B Croom, University of Virginia; X. Li, University of Virginia*
- 04:40 P **#306 3D Characterisation of Fibre-orientation and Voids at the Microscale in Ceramic Matrix Composites**  
*W Christian, University of Liverpool; K. Dvurecenska, University of Liverpool; E. Patterson, University of Liverpool; C. Przybyla, Air Force Research Laboratory*
- 05:00 P **#754 In-situ Imaging of Flexure-induced Fracture in Fiber-reinforced Composites Using High-resolution X-ray Computed Tomography**  
*B Wingate, University of Utah; M. Czabaj, University of Utah*
- 05:20 P **#653 Imaging the Life-Cycle of CMCs using High-Resolution X-ray Computed Tomography**  
*P Creveling, University of Utah; N. LeBaron, University of Utah; M. Czabaj, The University of Utah*
- 05:40 P **#481 Mechanical Characterization of Open Cell Aluminum Foams Using X-ray Computed Tomography**  
*K Matheson, University of Utah; M. Czabaj, University of Utah*
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**Advancement of Optical Methods in Experimental Mechanics**

**068. Optical Methods in SEM: History & Perspective III**

**Organizer(s)** L. Lamberti, Politecnico di Bari; M.T. Lin, National Chung Hsing University  
**Chair Person** C. Furlong, WPI-ME/CHSLT; M.T. Lin, National Chung Hsing University

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- 04:20 P **#379 Advanced Applications of Polarized Light- Mueller Matrix Polarimetry/Ellipsometry**  
*Y Lo, National Cheng Kung University*
- 04:50 P **#128 A Stress Measurement Method by Analyzing Spectroscopy of White Light Photoelasticity**  
*W Wang, National Tsing Hua University; P. Sung, National Tsing Hua University*
- 05:20 P **#269 Vibration Modal Analysis by High-Speed and Accurate Shape Measurement using One-Pitch Phase Analysis Method**  
*Y Morimoto, 4D Sensor Inc.; A. Takagi, 4D Sensor Inc.; M. Ueki, 4D Sensor Inc.; L. Pirsig, 4D Sensor Inc.*
- 05:50 P **#470 Evaluation of Residual Stress with Optical Methods**  
*C Pappalettere, Politecnico di Bari*
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**Mechanics of Additive and Advanced Manufacturing**

**069. AM Process Acharacterization**

**Organizer(s)**  
**Chair Person** S.L.B. Kramer, Sandia National Laboratories

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- 04:20 P **#179 Real Time Monitoring of Additive Manufacturing Processes using High-speed Synchrotron X-ray Imaging**  
*N Parab, Advanced Photon Source; C. Zhao, Advanced Photon Source; K. Fezzaa, Advanced Photon Source; T. Sun, Advanced Photon Source*
- 04:40 P **#191 Buckling of Prepreg Slit Tape during Automated Fiber Placement Process: A DIC Based Study**  
*S Rajan Kattil, University of South Carolina; M. Sutton, University of South Carolina; R. Wehbe, University of South Carolina; B. Tatting, University of South Carolina; Z. Gurdal, University of South Carolina*
- 05:00 P **#369 Tribomechanics of Ultrasonic Additive Manufacturing**  
*A Ward, Rice University; Y. Zhang, Rice University; Z. Cordero, Rice University*



- 05:20 P **#488 Residual Stresses Involved in the 3D Printing of Biomaterials in a Granular Microgel**  
*A Mcghee, University of Florida; D. Nguyen, University of Florida; P. Ifju, University of Florida*
- 05:40 P **#744 A Framework for Estimating of Mold Performance Using Experimental and Numerical Analysis of Injection Mold Tooling Prototypes**  
*S Jahan, Purdue University; H. El-Mounayri, IUPUI; A. Tovar, IUPUI; Y. Shin, Purdue University*
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## Fracture & Fatigue

### 071. Mechanics of Energy & Energetic Materials

**Organizer(s)** S. Xia, Georgia Institute of Technology; S. Nadimpalli, NJIT

**Chair Person** S. Xia, Georgia Institute of Technology; S. Nadimpalli, NJIT

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- 04:20 P **#82 In-Situ Strain Measurement in Solid-State Li-ion Batteries**  
*B Koochbor, University of Illinois; L. Sang, University of Illinois; O. Capraz, University of Illinois; A. Gewirth, University of Illinois; S. White, University of Illinois; N. Sottos, University of Illinois*
- 04:40 P **#566 Characterization of Stress-Diffusion Coupling in Lithiated and Sodiated Germanium by Dynamic Nanoindentation**  
*M Papakyriakou, Georgia Institute of Technology; X. Wang, Georgia Institute of Technology; S. Xia, Georgia Institute of Technology*
- 05:00 P **#613 An Improved Diffusion Coefficient Measurement Method for Li-ion anode Materials**  
*R Tripuraneni, New Jersey Institute of Technology; S. Rakshit, New Jersey Institute of Technology; S. Nadimpalli, New Jersey Institute of Technology*
- 05:20 P **#614 Structural Changes and Associated Stress Evolution in Na-ion Battery Electrodes during Sodiation/De-sodiation Cycling**  
*S Rakshit, New Jersey Institute of Technology; S. Nadimpalli, New Jersey Institute of Technology; E. Detsi, University of Pennsylvania*
- 05:40 P **#521 In-Situ Characterizations of Mechanical Degradation in All-Solid-State Rechargeable Batteries**  
*M Lu, Georgia Institute of Technology; S. Xia, Georgia Institute of Technology*
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## Thermomechanics and Infra-red Imaging

### 072. Fatigue & Damage Evaluation Using Infrared Thermography

**Organizer(s)**

**Chair Person** J.L.F. Freire, Pontifical Catholic University of Rio de Janeiro; X. Balandraud, University Clermont-Auvergne Sigma-Clermont

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- 04:20 P **#92 Comparison between 0D and 1D Heat Source Reconstruction for Fatigue Characterization**  
*P Jongchansitto, Chiang Mai University; C. Douellou, University Clermont-Auvergne; I. Preechawuttipong, Chiang Mai University; X. Balandraud, University Clermont-Auvergne*
- 04:40 P **#158 Fatigue Properties Assessment of API 5L Gr. B Pipeline Steel using Infrared Thermography**  
*V Paiva, PUC-Rio; R. Vieira, PU-Rio; J. Freire, PUC-Rio*
- 05:00 P **#655 Evaluation of Fatigue Damage in Short Carbon Fiber Reinforced Plastics Based on Thermoelastic Stress and Phase Analysis**  
*T Sakagami, Kobe University; D. Shiozawa, Kobe University; Y. Nakamura, Kobe University; S. Nonaka, DIC Corporation; K. Hamada, DIC Corporation*

## Dynamic Behavior of Materials

**073. Hybrid Experimental/Computational Studies****Organizer(s)** T. Weerasooriya, US Army Research Laboratory; S. Sockalingam, University of South Carolina**Chair Person** S. Sockalingam, University of South Carolina

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- 09:00 A **#104 A Hybrid Experimental-Numerical Study of Crack Initiation and Growth in Transparent Bilayers Across a Weak Interface**  
*S Dondeti, Auburn University; H. Tippur, Auburn University*
- 09:20 A **#226 Full-Scale Testing and Numerical Modeling of Adhesively Bonded Hot Stamped Ultra-High Strength Steel Hat Sections**  
*Y Liu, University of Waterloo; D. Cronin, University of Waterloo; M. Worswick, University of Waterloo*
- 09:40 A **#334 High Strain Rate Response of Adhesively Bonded Fiber-Reinforced Composite Joints – A Computational Study to Guide Experimental Design**  
*S Ravindran, University of South Carolina; S. Sockalingam, University of South Carolina; A. Kidane, University of South Carolina; M. Sutton, University of South Carolina*
- 10:00 A **#565 A Combined Experimental and Computational Approach for the Observation of Rayleigh Waves and Impact Surface Motion in Glass**  
*J McDonald, U.S. Army Research Laboratory; S. Satapathy, U.S. Army Research Laboratory; M. Pena, NSTech; M. Trabia, University of Nevada; B. O'toole, University of Nevada*
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## Dynamic Behavior of Materials

**074. Novel Experimental Techniques II****Organizer(s)** T. Walter, US Army Research Lab; O. Kingstedt, University of Utah**Chair Person** O. Kingstedt, University of Utah

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- 09:00 A **#160 An Optimization Based Approach to Design a Complex Loading Pattern Using a Modified Split Hopkinson Pressure Bar**  
*S Vidhate, Michigan State University; A. Yucesoy, Michigan State University; R. Mejia-Alvarez, Michigan State University; A. Willis, San Antonio Military Medical Center; T. Pence, Michigan State University*
- 09:20 A **#174 Development of “Dropkinson” Bar for Intermediate Strain-rate Testing**  
*B Song, Sandia National Laboratories; B. Sanborn, Sandia National Laboratories; J. Heister, Sandia National Laboratories; R. Everett, Sandia National Laboratories; T. Martinez, Sandia National Laboratories; G. Groves, Sandia National Laboratories; E. Johnson, Sandia National Laboratories; D. Kenney, Sandia National Laboratories; M. Knight, Sandia National Laboratories; M. Spletzer, Sandia National Laboratories*
- 09:40 A **#395 Constitutive Modeling of Polyamide Split Hopkinson Pressure Bars for the Design of a Pre-stretched Apparatus**  
*A Bracq, University of Valenciennes; G. Haugou, University of Valenciennes; H. Morvan, University of Valenciennes*
- 10:00 A **#435 Meso-scale Dynamic Behavior of Cast Magnesium at High Strain Rate Loading**  
*P Malchow, University of South Carolina; S. Ravindran, University of South Carolina; A. Kidane, University of South Carolina*

## 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 075. Multifunctional Materials II

**Organizer(s)** P. Thakre, The Dow Chemical Company; L. Bodelot, Ecole Polytechnique - LMS

**Chair Person** P. Thakre, The Dow Chemical Company; L. Bodelot, Ecole Polytechnique - LMS

09:00 A **#118 Characterization of Multi-functional Glass Fiber/Epoxy Reinforced Composites**

*J O'Donnell, University of Massachusetts Dartmouth; A. Hall, U.S. Army Research Laboratory; M. Haile, U.S. Army Research Laboratory; L. Nataraj, U.S. Army Research Laboratory; V. Chalivendra, University of Massachusetts Dartmouth; Y. Kim, University of Massachusetts Dartmouth*

09:20 A **#121 Multi-functional Carbon Fiber/Epoxy Reinforced Composites**

*R Sherman, University of Massachusetts Dartmouth; A. Hall, U.S. Army Research Laboratory; M. Haile, U.S. Army Research Laboratory; L. Nataraj, U.S. Army Research Laboratory; V. Chalivendra, University of Massachusetts Dartmouth; Y. Kim, University of Massachusetts Dartmouth*

09:40 A **#689 Mechanical Behavior of Electromagnetically Detectable Polyethylene**

*L Waldman, The University of Tulsa; A. Evans, The University of Tulsa; P. Hawrylak, The University of Tulsa; M. Keller, The University of Tulsa*

10:00 A **#116 Electro-Mechanical Response of Multi-functional Natural Fiber Composites under Inter-laminar Fracture Loading**

*S Yang, University of Massachusetts Dartmouth; J. Zulu, University of Massachusetts Dartmouth; V. Chalivendra, University of Massachusetts Dartmouth; Y. Kim, University of Massachusetts Dartmouth*

## Advancement of Optical Methods in Experimental Mechanics

### 076. Mechanical Characterization of Materials & Structures with Optical Methods I

**Organizer(s)** H. Jin, Sandia National Laboratories

**Chair Person** P.L. Reu, Sandia National Laboratories

09:00 A **#669 Digital Volume Correlation and Cohesive Zone Modeling Study of Interfacial Debonding in Particulate Composites**

*M Martinez, University of Illinois Urbana-Champaign; J. Li-Mayer, Imperial College of Science Technology and Medicine; M. Charalambides, Imperial College of Science Technology and Medicine; J. Lambros, University of Illinois at Urbana-Champaign*

09:20 A **#271 Role of Anisotropic Microstructural Features on Accuracy of Digital Volume Correlation**

*B Croom, University of Virginia; H. Jin, Sandia National Laboratories; B. Mills, Sandia National Laboratories; J. Carroll, Sandia National Laboratories; X. Li, University of Virginia*

09:40 A **#510 Determining a Relationship between Digital Volume Correlation and Digital Image Correlation for Polyurethane Foams**

*J Gearhart, Sandia National Laboratories; E. Quintana, Sandia National Laboratories; A. Jones, Sandia National Laboratories; P. Reu, Sandia National Laboratories; S. Kramer, Sandia National Laboratories*

10:00 A **#620 A Digital Laser Speckle Technique for Generating Slope Contours of Bent Plate**

*A Giordano, Stony Brook University; F. Chiang, Stony Brook University*

## Mechanics of Additive and Advanced Manufacturing

### 077. Processing & Mechanical Behavior of AM Materials

#### Organizer(s)

**Chair Person** H. Jin, Sandia National Laboratories

- 09:00 A **#813 Keynote: Linking Thermal History to Mechanical Behavior in Directed Energy Deposited Materials (40-min)**  
*J Cao, Northwestern University*
- 09:40 A **#739 High Stiffness-to-weight Ratio Zero Coefficient of Thermal Expansion Lattices Fabricated by Additive Manufacturing Methods**  
*M de Boer, Carnegie Mellon University; S. Sun, University of Wisconsin; M. Miller, Carnegie Mellon University; J. Beuth, Carnegie Mellon University*
- 10:00 A **#749 Effect of Processing Parameters on Interlayer Fracture Toughness of Fused Filament Fabrication Thermoplastic Materials**  
*D Young, University of Utah; C. Otten, University of Utah; M. Czabaj, University of Utah*

## Applications

### 078. Applications I

#### Organizer(s)

**Chair Person** P. Reynolds, University of Exeter

- 09:00 A **#289 Dynamic Response of Thermally Stressed Plates with Reinforced Edges**  
*A Santos Silva, University of Liverpool; J. Lambros, University of Illinois at Urbana-Champaign; E. Patterson, University of Liverpool*
- 09:20 A **#343 Experimental and Theoretical Study on the Robustification of Acoustic Emission Inspection with Recurrent Neural Networks**  
*C Hsu, U.S. Army Research Laboratory; M. Haile, U.S. Army Research Laboratory; N. Epps-Bradley, U.S. Army Research Laboratory; J. Chen, U.S. Army Research Laboratory*
- 09:40 A **#474 Mode I Delamination Behaviour of Fused Deposition Modelling Parts**  
*C Barile, Politecnico di Bari; C. Casavola, Politecnico di Bari; A. Cazzato, Politecnico di Bari*
- 10:00 A **#575 Effect of Crack Tip Radius on Cutting Strength in Elastomers**  
*B Zhang, University of Illinois at Urbana-Champaign*

## Fracture & Fatigue

### 079. Integration of Models & Experiments II

**Organizer(s)** J. Carroll, Sandia National Laboratories; S. Grutzik, Sandia National Laboratories

**Chair Person** S. Grutzik, Sandia National Laboratories; J. Carroll, Sandia National Laboratories

- 09:00 A **#241 Low Modulus Composite Patched Aluminum Center Crack Tension Specimen DIC Surface Displacements Compared with Predictions**  
*D Hart, Naval Surface Warfare Center Carderock Division; H. Bruck, University of Maryland, College Park*

- 09:20 A **#659 Numerical Modeling of Charpy Impact Test to Determine the Fracture Characteristics of Aluminium Alloy 6061**  
*W Samad, Rochester Institute of Technology; W. Samad, Rochester Institute of Technology; K. Ram, BITS Pilani - Dubai Campus; W. Samad, Rochester Institute of Technology*
- 09:40 A **#706 Combined Modelling and Experimental Approach to Improve Mechanical Impact Survivability of GaN Power FET**  
*J Ferguson, U.S. Air Force Research Laboratory; S. Sihn, University of Dayton Research Institute; A. Hilton, U.S. Air Force Research Laboratory; C. McKinion, U.S. Air Force Research Laboratory; S. Dooley, U.S. Air Force Research Laboratory; A. Roy, U.S. Air Force Research Laboratory; A. Schrand, U.S. Air Force Research Laboratory; E. Heller, U.S. Air Force Research Laboratory*
- 10:00 A **#127 Crack-tip Plastic Zone Size and Shape via DIC**  
*G Gonzáles, PUC-Rio; J. González, PUC-Rio; V. Paiva, PUC-Rio; J. Freire, PUC-Rio*

## Thermomechanics and Infra-red Imaging

### 080. Integration of Infrared Thermography & DIC

#### Organizer(s)

**Chair Person** R. Tighe, Defence Academy of the UK; W. Samad, Rochester Institute of Technology

- 09:00 A **#321 Experimental Validation of the Energy Balance Equation in the Presence of Acoustic Emission**  
*N Bradley, U.S. Army Research Laboratory; M. Haile, U.S. Army Research Laboratory; B. Northington, Tennessee state University; M. Coatney, U.S. Army Research Laboratory; A. Eure, Frostburg University*
- 09:20 A **#459 Understanding Heterogeneity in Discontinuous Compression Composite Materials for High-volume Applications**  
*D Bull, University of Southampton; J. Dulieu-Barton, University of Southampton; O. Thomsen, University of Southampton*
- 09:40 A **#389 Multi-instrumentation of Very High Temperature Tests**  
*T Archer, ONERA; P. Beauchêne, ONERA; C. Huchette, ONERA; M. Berny, LMT; F. Hild, LMT*

## Dynamic Behavior of Materials

### 081. Advances in Material Modeling I

**Organizer(s)** P. Allison, University of Alabama

**Chair Person** P. Allison, University of Alabama; B. Meenakshi Sundaram, Corning Inc.

- 10:50 A **#597 Modeling of the Temperature Influence on the Dynamic Behavior of AFS Additive Manufactured Inconel 625**  
*O Rodriguez, NASA-MSFC; C. Mason, University of Alabama; P. Allison, University of Alabama; J. Jordon, University of Alabama*
- 11:10 A **#609 Internal State Variable Plasticity Modeling of Temperature Influence on Dynamically Loaded PBF EBM AM Ti6Al4V**  
*O Rodriguez, NASA; P. Allison, The University of Alabama; W. Whittington, Mississippi State University; S. Mates, NIST*
- 11:30 A **#629 Plasticity and Damage Modeling of Stress Asymmetry and Dynamic Behavior of AFS Additive Manufactured Aluminum Alloy 2219**  
*O Rivera, Sikorsky Aircraft Corporation; P. Allison, University of Alabama; J. Jordon, University of Alabama; W. Whittington, Mississippi State University; L. Brewer, University of Alabama; O. Rodriguez, NASA; R. Martens, University of Alabama; N. Hardwick, Aeroprope Corporation*

- 11:50 A **#616 Developing an Alternative to Roma Plastilina #1 as a Ballistic Backing Material for Body Armor Evaluation**  
*R Mrozek, U.S. Army Research Laboratory; T. Edwards, U.S. Army Research Laboratory; E. Bain, U.S. Army Research Laboratory; S. Cole, U.S. Army Research Laboratory; E. Napadensky, U.S. Army Research Laboratory; R. Freeney, Aberdeen Test Center*

## Dynamic Behavior of Materials

### 082. Novel Experimental Techniques III

**Organizer(s)** T. Walter, US Army Research Lab; O. Kingstedt, University of Utah  
**Chair Person** J. Ligda, Air Force Research Lab

- 10:50 A **#292 Development of an Interferometer and Schlieren-based Measurement Technique for Resolving Cavitation Pressure Fields**  
*S Buyukozturk, Brown University; A. Landauer, Brown University; C. Franck, Brown University*
- 11:10 A **#399 Novel Inertial Impact Tests to Characterize the Plastic Properties of Metals**  
*F Davis, University of Southampton; L. Fletcher, University of Southampton; F. Pierron, University of Southampton*
- 11:30 A **#740 Dynamic Spherical Indentation of Single Crystal Quartz with Compression and Torsion**  
*K Andes, Johns Hopkins University; K. Ramesh, Johns Hopkins University*
- 11:50 A **#149 Back Face Deformation Reconstruction of Soft Body Armor During Ballistic Impact Using Fiber Bragg Gratings**  
*D Hackney, North Carolina State University; F. Seng, Brigham Young University; A. Noevere, North Carolina State University; T. Goode, North Carolina State University; G. Shoemaker, Naval Undersea Warfare Center; M. Pankow, North Carolina State University; S. Schultz, Brigham Young University; K. Peters, North Carolina State University*

## 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 083. Manufacturing & Joining of Composites

**Organizer(s)** G. Miller, The Boeing Company ; C. Degen, South Dakota School of Mines & Technology  
**Chair Person** G. Miller, The Boeing Company ; C. Degen, South Dakota School of Mines & Technology

- 10:50 A **#492 Crack-Growth Rates of Interfacial Cracks in Bonded Composite Repairs**  
*I Alnaser, The University of Tulsa; M. Keller, The University of Tulsa*
- 11:10 A **#270 Thermo-mechanical Properties of Thermoset Polymers and Composites Fabricated by Frontal Polymerization**  
*M Yourdkhani, University of Illinois at Urbana-Champaign; B. Koohbor, University of Illinois at Urbana-Champaign; D. Ivanoff, University of Illinois at Urbana-Champaign; L. Dean, University of Illinois at Urbana-Champaign; C. Lamuta, University of Illinois at Urbana-Champaign; P. Centellas, University of Illinois at Urbana-Champaign; I. Robertson, University of Illinois at Urbana-Champaign; S. White, University of Illinois at Urbana-Champaign; N. Sottos, University of Illinois at Urbana-Champaign*
- 11:30 A **#162 Optimization of Surface Integrity of Titanium-Aluminum Intermetallic Composite Machined by Wire EDM**  
*S Ezeddini, Supmecca-Paris; E. Bayraktar, Supmecca-Paris; M. Boujelbene, University of Hail; S. Ben Salem, University of Tunis El Manar*



- 11:50 A **#548 Experimental comparison of the microstructure and Surface roughness in CO2 laser cutting of the Titanium alloy Ti-6Al-4V and the Pure Titanium Ti**  
*B El-Aoud, Supmecca-Paris; M. Boujelbene, University of Tunis El Manar; E. Bayraktar, Supmecca-Paris; S. Ben Salem, University of Tunis El Manar*

## Advancement of Optical Methods in Experimental Mechanics

### 084. Mechanical Characterization of Materials & Structures with Optical Methods II

#### Organizer(s)

**Chair Person** H. Jin, Sandia National Laboratories

- 10:50 A **#296 Investigating Fatigue Striation Morphology in Crystallisable Elastomers by using a Phase Extraction Algorithm**  
*B Ruellan, Cooper Standard; E. Robin, University of Rennes; J. Le Cam, University of Rennes; I. Jeanneau, Cooper Standard; F. Canévet, Cooper Standard; D. Loison, University of Rennes; G. Mauvoisin, University of Rennes*
- 11:10 A **#461 A Combined High-Resolution Full-Field Imaging and Metallography approach to Assess the Local Properties of FSW (Cu-SS) Joints**  
*S Ramachandran, University of Southampton; J. Dulieu-Barton, University of Southampton; P. Reed, University of Southampton; A. Lakshminarayanan, SSN College of Engineering*
- 11:30 A **#533 Effect of Heat Treatment Processing on the Dynamic Performance of Alpha+Beta and Metastable-Beta Titanium Alloys**  
*S Mujahid, Mississippi State University; C. Krivanec, Mississippi State University; A. Oppedal, Mississippi State University; W. Whittington, Mississippi State University; P. Allison, University of Alabama; A. Booztani, Mississippi State University; J. Bhattacharya, University of Virginia; S. Agnew, University of Virginia; H. ElKadiri, Mississippi State university*
- 11:50 A **#460 Compression Tests on CFRP Analyzed by Digital Image Correlation**  
*C Barile, Politecnico di Bari; C. Casavola, Politecnico di Bari; G. Pappalettera, Politecnico di Bari*

## Mechanics of Additive and Advanced Manufacturing

### 085. Dynamic Response of AM Materials

#### Organizer(s)

**Chair Person** A. Beese, Pennsylvania State University

- 10:50 A **#552 Shock Propagation and Deformation of Additively-Manufactured Polymer Foams with Engineered Porosity**  
*J Spowart, Air Force Research Laboratory; D. Lacina, University Of Dayton Research Institute; K. Neel, Air Force Research Laboratory; G. Frank, University of Dayton Research Institute; A. Abbott, University of Dayton Research Institute; B. Branch, Los Alamos National Laboratory*
- 11:10 A **#114 Quasi-Static and Dynamic Fracture of Additively Printed ABS Studied using DIC: Role of Build Architecture and Loading Rate**  
*J Isaac, Auburn university; H. Tippur, Auburn university*
- 11:30 A **#511 Mechanical Behaviors of new Developed PDMS-based Inks for Additive Manufacturing**  
*S Crum, Los Alamos National Laboratory; J. Dumont, Los Alamos National Laboratory; C. Park, Gyeongnam National University of Science and Technology; A. Labouriau, Los Alamos National Laboratory; K. Lee, Los Alamos National Laboratory*

## Applications

**086. Applications II****Organizer(s)****Chair Person** J. Helm, Lafayette College

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- 10:50 A **#713 Ultrasonic Imaging of Rail Flaws using Transducer Wedge and GPU Processing**  
*S Sternini, University of California, San Diego; A. Liang, University of California, San Diego; F. Lanza di Scalea, University of California, San Diego; R. Wilson, U.S. Federal Railroad Administration*
- 11:10 A **#618 Finite Element Model Updating using Digital Image Correlation Data**  
*M Mathew, Drexel University; A. Ellenberg, Drexel University; S. Ye, Drexel University; I. Bartoli, Drexel University; A. Kotsos, Drexel University*
- 11:30 A **#428 A Design of Experiments Approach for Determining Sensitivities of Forming Limit Analyses to Experimental Parameters**  
*M Iadicola, National Institute of Standards and Technology; D. Banerjee, National Institute of Standards and Technology*
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## Fracture &amp; Fatigue

**087. In Situ Techniques for Fatigue & Fracture I****Organizer(s)** G. Pataky, Clemson University; R. Berke, Utah State University**Chair Person** G. Pataky, Clemson University; R. Berke, Utah State University

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- 10:50 A **#699 Damage Evolution and Local Strain Redistribution in Composite Laminate with Various Fiber Arrangements**  
*A Tessema, University of South Carolina; S. Ravindran, University of South Carolina; A. Kidane, University of South Carolina*
- 11:10 A **#180 An Experimental Method to Induce and Measure Crack Propagation in Brittle Polymers with Heterogeneities**  
*K Mac Donald, California Institute of Technology; G. Ravichandran, California Institute of Technology*
- 11:30 A **#707 Effect of Adhesion on Graphene-Optical Fiber Sensor in Corrosion Detection**  
*Y Li, Missouri University of Science and Technology; C. Guo, Missouri University of Science and Technology; C. Wu, Missouri University of Science and Technology*
- 11:30 A **#791 Full-Field Vibration Fatigue Strains at Extreme Temperatures**  
*M Nelson, Utah State University; J. Matsen, Utah State University; S. Burton, Utah State University; R. Berke, Utah State University*
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## Thermomechanics and Infra-red Imaging

**088. Materials Characterizations Using Thermography II****Organizer(s)****Chair Person** X. Balandraud, University Clermont-Auvergne Sigma-Clermont; S. Quinn, University of Southampton

- 10:50 A **#93 Analysis of the Thermomechanical Response of Granular Materials by Infrared Thermography**  
*P Jongchansitto, Chiang Mai University; X. Balandraud, University Clermont-Auvergne; I. Preechawuttipong, Chiang Mai University; J. Le Cam, University of Rennes 1; P. Garnier, PCM Technologies S.A.S.*
- 11:10 A **#361 Measuring Strain-induced Crystallinity in Rubbers from IR Thermography**  
*J Le Cam, University of Rennes*

## Dynamic Behavior of Materials

### 089. Advances in Material Modeling II

**Organizer(s)** P. Allison, University of Alabama

**Chair Person** P. Allison, University of Alabama; J. Kimberley, New Mexico Institute of Mining and Technology

- 01:20 P **#632 Additive Friction Stir Simulations by Smoothed Particle Hydrodynamics of Additive Manufactured Aluminum Alloy 6061**  
*G Stubblefield, University of Alabama; K. Fraser, National Research Council Canada; P. Allison, University of Alabama; B. Jordon, University of Alabama*
- 01:40 P **#732 Material Modeling of Al-Li Alloys**  
*A Cisko, University of Alabama; J. Jordon, University of Alabama*
- 02:00 P **#751 Meshfree Simulation of Oxide Dispersion in Additive Friction Stir Deposition of Aluminum Alloy 5083**  
*R Escobar, Jr., The University of Alabama; K. Fraser, National Research Council Canada; J. Jordon, The University of Alabama; P. Allison, The University of Alabama*
- 02:20 P **#683 Numerical Study of the Failure Mechanism of Ceramics during Low Velocity Impact Used In Protective Systems**  
*C Fountzoulas, U.S. Army Research Laboratory; R. Brennan, U.S. Army Research Laboratory*
- 02:40 P **#725 Investigating Anisotropic Failure response in Rolled AZ31B Under Dynamic Tensile Loading**  
*A Matejunas, New Mexico Institute of Mining and Technology; J. Lloyd, Army Research Laboratory; M. Priddy, Mississippi State University; T. Walter, Army Research Laboratory; J. Kimberley, New Mexico Institute of Mining and Technology*

## Dynamic Behavior of Materials

### 090. Shock & Blast I

**Organizer(s)** V. Eliasson, University of Southern California; B. Koohboor, University of Illinois at Urbana-Champaign

**Chair Person** M. Pankow, North Carolina State University

- 01:20 P **#75 A Novel Approach for Plate Impact Experiments to Obtain Properties of Materials under Extreme Conditions**  
*B Zuanetti, Case Western Reserve University; T. Wang, Case Western Reserve University; V. Prakash, Case Western Reserve University*
- 01:40 P **#65 Error Analysis for Shock Equation of State Measurements in Polymers using Manganin Gauges**  
*J Jordan, Los Alamos National Laboratory; D. Casem, U.S. Army Research Laboratory*
- 02:00 P **#97 Shock Compression of Molybdenum Single Crystals to High Stresses**  
*T Oniyama, California Institute of Technology; Y. Toyoda, Washington State University; Y. Gupta, Washington State University; G. Ravichandran, California Institute of Technology*

- 02:20 P **#140 Inelastic Behavior of Tungsten-Carbide in Pressure-Shear Shock Experiments beyond 20 GPa**  
*Z Lovinger, California Institute of Technology; C. Kettenbeil, California Institute of Technology; M. Mello, California Institute of Technology; G. Ravichandran, California Institute of Technology*
- 02:40 P **#214 Improved Richtmyer-Meshkov Instability Experiments for Very-High-Rate Strength & Application to Tantalum**  
*M Prime, Los Alamos National Laboratory; W. Buttler, Los Alamos National Laboratory; S. Fensin, Los Alamos National Laboratory; D. Jones, Los Alamos National Laboratory; R. Manzanares, Los Alamos National Laboratory; D. Martinez, Los Alamos National Laboratory; J. Martinez, Los Alamos National Laboratory; D. Schmidt, Los Alamos National Laboratory; C. Trujillo, Los Alamos National Laboratory*

#### 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 091. Nanoparticulate Based Recycled Constituent Composites III

**Organizer(s)** I. Miskoiglu, Michigan technological University; E. Bayraktar, SUPMECA-Paris

**Chair Person** I. Miskoiglu, Michigan technological University; E. Bayraktar, SUPMECA-Paris

- 01:20 P **#134 Toughening Mechanism in Epoxy Resin Modified Recycled Rubber Based Composites Reinforced with Gamma-Alumina, Graphene and CNT**  
*A Irez, University Paris-Saclay; E. Bayraktar, Supmecca-Paris; I. Miskoiglu, Michigan Technical University*
- 01:40 P **#193 Reinforcement of Recycled Rubber Based Composite with Nano-Silica and Graphene Hybrid Fillers**  
*A Irez, University Paris-Saclay; I. Miskoiglu, Michigan Technological University; E. Bayraktar, Supmecca-Paris*
- 02:00 P **#590 Toughening Mechanisms on Recycled Rubber Modified Epoxy Based Composites Reinforced with Graphene Nanoplatelets**  
*A Irez, University Paris - Saclay; I. Miskoiglu, Michigan Technological University; E. Bayraktar, Supmecca-Paris*
- 02:20 P **#282 Design of Magnetic Aluminium (AA356) Composites (AMCs) Reinforced with Nano Fe<sub>3</sub>O<sub>4</sub>, and Recycled Nickel - Copper Particles**  
*L Ferreira, Federal University of Southern and Southeastern, PA; E. Bayraktar, Supmecca-Paris; I. Miskoiglu, Michigan Technology University; M. Robert, University of Campinas*
- 02:40 P **#291 Reinforcement Effect of Nano Fe<sub>3</sub>O<sub>4</sub> and Nb<sub>2</sub>Al on the Mechanical and Physical Properties of Cu-Al Based Composites**  
*L Ferreira, Federal University of Southern and Southeastern, PA; I. Miskoiglu, Michigan Technology University; E. Bayraktar, Supmecca-Paris; D. Katundi, Sumpecca-Paris*

#### Advancement of Optical Methods in Experimental Mechanics

### 092. Bioengineering

**Organizer(s)**

**Chair Person** C. Furlong, WPI-ME/CHSLT; L. Lamberti, Politecnico di Bari

- 01:20 P **#799 High-speed Holographic Shape and Transient Response Measurements of Mammalian Tympanic Membrane**  
*P Razavi, Worcester Polytechnic Institute; H. Tang, Worcester Polytechnic Institute; N. Maftoon, Harvard Medical School; J. Cheng, Harvard Medical School; J. Rosowski, Harvard Medical School; C. Furlong, Worcester Polytechnic Institute*

- 01:40 P **#803 High-speed Digital Image Correlation for Endoscopy: a Feasibility Study**  
*H Tang, Worcester Polytechnic Institute; K. Pooladvand, Worcester Polytechnic Institute; P. Razavi, Worcester Polytechnic Institute; J. Rosowski, Massachusetts Eye and Ear Infirmary; T. Cheng, Massachusetts Eye and Ear Infirmary; C. Furlong, Worcester Polytechnic Institute*
- 02:00 P **#678 Use of Digital Image Correlation Method to Measure Bio-tissue Deformation**  
*T Chen, National Cheng Kung University; L. Chang, National Cheng Kung University*
- 02:20 P **#151 Image Analysis of Curvature Using Classical Mechanics, The Elastica**  
*C Wilson, Medtronic, Inc.; J. Dawson, Medtronic, Inc.*

## Mechanics of Additive and Advanced Manufacturing

### 093. Additively Manufactured Polymers

#### Organizer(s)

**Chair Person** B. Antoun, Sandia National Laboratories

- 01:20 P **#125 3D Printed Polymers for Enhanced Fracture Properties**  
*S Yang, University of Massachusetts Dartmouth; J. Li, University of Massachusetts Dartmouth; D. Li, University of Massachusetts Dartmouth; V. Chalivendra, University of Massachusetts Dartmouth*
- 01:40 P **#120 Compression and Shear Response of 3D Printed Foam Pads**  
*W Lu, Sandia National Laboratories*
- 02:00 P **#124 Dynamic Fracture Characterization of 3D Printed Materials**  
*M Rabbi, University of Massachusetts Dartmouth; D. Li, University of Massachusetts Dartmouth; V. Chalivendra, University of Massachusetts Dartmouth*
- 02:20 P **#712 Influence of an Extreme Environment on the Tensile Mechanical Properties of a 3D Printed Thermoplastic Polymer**  
*J Torres, St. Mary's University; O. Onwuzurike, St. Mary's University; A. McClung, St. Mary's University; J. Ocampo, St. Mary's University*

## Inverse Problems/Hybrid Techniques

### 094. Inverse Problems/Hybrid Techniques III

#### Organizer(s)

**Chair Person**

- 01:20 P **#307 Identification of Local Stiffness of Lodgepole Pine: Simulation and Example**  
*J Considine, USDA, Forest Service, Forest Products Laboratory*
- 01:40 P **#535 System Identification of Structures with Incomplete Modal Information**  
*C Lin, National Pingtung University of Science and Technology; M. Lin, National Pingtung University of Science and Technology*
- 02:00 P **#263 Determination of Constitutive Parameters in Inverse Problem using Thermoelastic Data**  
*A Alshaya, Kuwait University; J. Considine, USDA, Forest Service, Forest Products Laboratory*
- 02:20 P **#169 Identification of Plasticity Parameters and Failure Criteria of Ship-building Steel**  
*M Korgesaar, Aalto University; D. Smyl, Aalto University; S. Bossuyt, Aalto University*

## Fracture &amp; Fatigue

**095. In Situ Techniques for Fatigue & Fracture II****Organizer(s)** G. Pataky, Clemson University; R. Berke, Utah State University**Chair Person** R. Berke, Utah State University; G. Pataky, Clemson University01:20 P **#403 In Situ Observations of Cracking during Constrained Sintering***J Carazzone, Rice University; M. Bonar, Rice University; Z. Cordero, Rice University*01:40 P **#298 Injection Initiated Fracture in Soft Solids***S Yang, University of Illinois Urbana-Champaign; M. Milner, University of Illinois Urbana-Champaign; D. Bahk, University of Illinois Urbana-Champaign; A. Kataruka, University of Illinois Urbana-Champaign; S. Hutchens, University of Illinois Urbana-Champaign*02:00 P **#280 Influence of the Temperature on the Lifetime Reinforcement of a Filled NR***B Ruellan, Cooper Standard; J. Le Cam, University of Rennes; E. Robin, University of Rennes; I. Jeanneau, Cooper Standard; F. Canévet, Cooper Standard; F. Mortier, Cooper Standard*02:20 P **#807 Integrated Measurement and Modeling of Closure Stresses During Fatigue Crack Propagation***B Schiefelbein, Iowa State University; C. Giuffre, Iowa State University; S. Holland, Iowa State University; A. Bastawros, Iowa State University*02:40 P **#727 Mechanics of Materials and Fracture for High School Students***L Avellar, California Institute of Technology; K. Mac Donald, California Institute of Technology*

## Thermomechanics and Infra-red Imaging

**096. Material Characterizations Using Thermography III****Organizer(s)****Chair Person** J.-B. Le Cam, University de Rennes; J. Dulieu-Barton, University of Southampton01:20 P **#677 Dissipative Heat Source Distribution in a Laser Welded 316 L Stainless Steel***V Seelan, University of Southampton; F. Pierron, University of Southampton; J. Dulieu-Barton, University of Southampton*01:40 P **#363 Mechanical and Thermomechanical Characterization of Different Leathers***N Di Cesare, Université Bretagne Sud; G. Corvec, University of Rennes; X. Balandraud, SIGMA Clermont; J. Le Cam, University of Rennes; J. Gauffreteau, SIGMA Clermont*02:00 P **#349 Mechanical Response and Energy Stored During Deformation of Crystallizing TPU***A Lachhab, Cooper Standard; E. Robin, University of Rennes; J. Le Cam, University of Rennes; F. Mortier, Cooper Standard; Y. Tirel, Cooper Standard; F. Canévet, Cooper Standard*02:20 P **#679 Fatigue Limit Estimation for Single Bead-on-plate weld Based on Dissipated Energy Measurement***D Shiozawa, Kobe University; Y. Ogino, Kobe University; T. Washio, Kobe University; T. Sakagami, Kobe University; H. Ueda, Nippon Steel & Sumitomo Metal Corporation; T. Makino, Nippon Steel & Sumitomo Metal Corporation*



## Dynamic Behavior of Materials

**097. Industrial Applications****Organizer(s)** S. Mates, NIST**Chair Person** S. Mates, NIST

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- 03:20 P **#253 The Flow Stress of AM IN 625 Under Conditions of High Strain and Strain Rate**  
*R Ananda-Kumar, Wichita State University; H. Lopez-Hawa, Wichita State University; W. Moscoso-Kingsley, Wichita State University; V. Madhavan, Wichita State University*
- 03:40 P **#258 Dynamic Thermal Softening Behavior of Additive Materials for Hybrid Manufacturing**  
*S Mates, NIST; M. Stoudt, NIST; W. Moscoso-Kingsley, Wichita State University; V. Madhavan, Wichita State University*
- 04:00 P **#192 Historical Note: Machining, Strain Gages, and a Pulse-heated Kolsky Bar**  
*R Rhorer, National Institute of Standards and Technology; S. Mates, National Institute of Standards and Technology; E. Whitenton, National Institute of Standards and Technology; T. Burns, National Institute of Standards and Technology*
- 04:20 P **#731 Characterization of Dynamic Deformation and Failure of Novel Light Weight Steel Alloy**  
*T Walter, U.S. Army Research Laboratory; P. Moy, U.S. Army Research Laboratory; T. Sano, U.S. Army Research Laboratory; K. Limmer, U.S. Army Research Laboratory*
- 04:40 P **#133 Combining Viscoelastic Properties and Architecture to Control the Dynamic Response of Soft Materials**  
*A Forster, NIST; M. Riley, NIST*
- 05:00 P **#122 Impact Energy Absorption Characterization of Novel Energy Absorbing Materials for Sport Helmet Applications**  
*J Corriea, University of Massachusetts Dartmouth; J. Paquette, University of Massachusetts Dartmouth; V. Chalivendra, University of Massachusetts Dartmouth; Y. Kim, University of Massachusetts Dartmouth; A. Lewis, University of Massachusetts Dartmouth*
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## Dynamic Behavior of Materials

**098. Shock & Blast II****Organizer(s)** V. Eliasson, University of Southern California; B. Koohboor, University of Illinois at Urbana-Champaign**Chair Person** B. Koohboor, University of Illinois at Urbana-Champaign

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- 03:20 P **#335 Pressure-Shear Plate Impact Experiments on Soda-Lime Glass at Pressures Beyond 20 GPa**  
*C Kettenbeil, California Institute of Technology; Z. Lovinger, California Institute of Technology; M. Mello, California Institute of Technology; T. Jiao, Brown University; R. Clifton, Brown University; G. Ravichandran, California Institute of Technology*
- 03:40 P **#544 Dynamic Shearing Resistance of Constituents of a Simulant of an Active Material**  
*P Malhotra, Brown University; T. Jiao, Brown University; R. Clifton, Brown University; P. Guduru, Brown University*
- 04:00 P **#570 Compression Wave Profiles in Shock Loaded Polymer-metal Composites**  
*D Bober, Lawrence Livermore National Laboratory; Y. Toyoda, Washington State University; B. Maddox, Lawrence Livermore National Laboratory; R. Minich, Lawrence Livermore National Laboratory; E. Herbold, Lawrence Livermore National Laboratory; Y. Gupta, Washington State University; M. Kumar, Lawrence Livermore National Laboratory*

- 04:20 P **#675 Uncertainties in Low-Pressure Shock Experiments on Heterogeneous Materials**  
*T Vogler, Sandia National Laboratories; M. Hudspeth, Sandia National Laboratories; S. Root, Sandia National Laboratories*
- 04:40 P **#222 Mechanical Characterization and Numerical Material Modeling of Polyurea**  
*J LeBlanc, Naval Undersea Warfare Center; S. Bartyczak, Naval Surface Warfare Center; L. Edgerton, Naval Surface Warfare Center*
- 05:00 P **#823 Polyurea Coated Aluminum Plates for Maritime Applications**  
*O Rijensky, Technion - Israel Institute of Technology; D. Rittel, Technion - Israel Institute of Technology*

#### 4th International Symposium on the Mechanics of Composite and Multifunctional Materials

### 099. Novel Developments in Composites

**Organizer(s)** D. Sequera, Baker Hughes Inc; G. Slipher, U.S. Army Research Laboratory

**Chair Person** D. Sequera, Baker Hughes Inc; G. Slipher, U.S. Army Research Laboratory

- 03:20 P **#509 Microscale Investigation of Transverse Tensile Failure of Fiber-Reinforced Polymer Composites**  
*C Arndt, University of Utah; P. DaBell, University of Utah; M. Czabaj, University of Utah*
- 03:40 P **#130 Study of Mechanical Characteristics of Banana and Jute Fiber Reinforced Polyester Composites**  
*G Easwara Prasad, Manglore Institute of Technology and Engineering; B. Megha, Maharaja Institute of Technology; B. Keerthi Gowda, Visvesvaraya Technological University*
- 04:00 P **#644 Improvement of Mechanical Properties of Carbon Fiber Reinforced Hybrid Aluminum Matrix Composites (HAMCs)**  
*A Rahman, Pennsylvania State University*
- 04:20 P **#320 Manufacturing of Copper based Composites reinforced with Ceramics and Hard intermetallics for Applications of Electric Motor Repair Parts**  
*G Zambelis, Airbus-Helicopter; E. Bayraktar, Supmeca-Paris; D. Katundi, Supmeca-Paris; I. Miskioglu, Michigan Technological University*
- 04:40 P **#526 Optimization of the high Energy Milling Process of Chips of a Stainless Steel Using the Response Surface Modeling**  
*F Gatamorta, University of Campinas; E. Bayraktar, Supmeca-Paris; C. Mendonça, University of Itajubá; M. Silva, University of Itajubá; M. Melo, University of Itajubá; G. Silva, University of Itajubá*
- 05:00 P **#525 Process Reliability of Abrasive Water Jet to Cut Shapes of the Titanium Alloy Ti-6Al-4V**  
*M Douiri, Supmeca/Paris; M. Boujelbene, University of Tunis El Manar; E. Bayraktar, Supmeca-Paris; S. Ben Salem, University of Tunis El Manar*

#### Advancement of Optical Methods in Experimental Mechanics

### 100. Mechanical Characterization of Materials & Structures with Optical Methods III

**Organizer(s)**

**Chair Person** F. Pierron, University of Southampton

- 03:20 P **#802 An Optimization Approach for Improving Geometric Moire Resolution**  
*S Palvadi, Saint-Gobain Northboro R&D Center; K. Liechti, University of Texas at Austin*
- 03:40 P **#309 Inferring Material Parameters from Imprecise Biaxial Experiments on Soft Materials**  
*N Afsar Kazerooni, Texas A&M University; Z. Wang, Texas A&N University; A. Srinivasa, Texas A&M University*

## Mechanics of Additive and Advanced Manufacturing

### 101. Additively Manufactured Polymers & Composites

#### Organizer(s)

**Chair Person** Y. Hu, University of Illinois

03:20 P **#384 3D Free-form Printing by Frontal Polymerization**

*J Aw, University of Illinois at Urbana-Champaign; A. Nelson, University of Illinois at Urbana-Champaign; I. Robertson, University of Illinois at Urbana-Champaign; M. Yourdkhani, University of Illinois at Urbana-Champaign; R. Ewoldt, University of Illinois at Urbana-Champaign; N. Sottos, University of Illinois at Urbana-Champaign; J. Moore, University of Illinois at Urbana-Champaign; S. White, University of Illinois at Urbana-Champaign*

03:40 P **#411 Mechanical Characterization of Cellulose Nanofibril Materials made by Additive Manufacturing**

*L Mariani, University of Pennsylvania; J. Considine, USDA Forest Service; K. Turner, University of Pennsylvania*

04:00 P **#684 Mechanical Characterization of Fused Filament Fabrication Polyvinylidene Fluoride Printed (PVDF) Composites**

*N Momenzadeh, University of Louisville; T. Berfield, University of Louisville; C. Stewart, University of Louisville*

04:20 P **#515 Experimental Quantification of Path Dependencies when 3D Printing in a Granular Microgel System**

*D Nguyen, University of Florida; A. McGhee, University of Florida; P. Ifju, University of Florida*

## Fracture & Fatigue

### 103. Microscale & Microstructural Effects on Mechanical Behavior

**Organizer(s)** J. Carroll, Sandia National Laboratories; A. Beese, Pennsylvania State University

**Chair Person** A. Beese, Pennsylvania State University; J. Carroll, Sandia National Laboratories

03:20 P **#81 Microstructural Fatigue Damage on the Mechanical Properties of  $\alpha$ -Iron**

*J Indeck, The University of Alabama in Huntsville; C. Williams, U.S. Army Research Laboratory; K. Hazeli, The University of Alabama in Huntsville*

03:40 P **#85 Strain Measurement during Plastic Deformation of Polycrystalline Materials under Electron Microscopy by Heaviside-DIC**

*J Stinville, University of California Santa Barbara; F. Bourdin, Institut PPRIME; M. Echlin, University of California Santa Barbara; W. Lenthe, University of California Santa Barbara; F. Bridier, DCNS Research; J. Cormier, Institut PPRIME; P. Villechaise, Institut PPRIME; V. Valle, Institut PPRIME; T. Pollock, University of California Santa Barbara*

04:00 P **#517 Ultra-Stretchable Interconnects for High-Density Stretchable Electronics – a multi-scale experimental analysis**

*J Hoefnagels, Eindhoven University of Technology, the Netherlands; S. Shafqat, Eindhoven University of Technology, the Netherlands; S. Kleinendorst, Eindhoven University of Technology, the Netherlands; J. Neggers, Eindhoven University of Technology, the Netherlands; O. van der Sluis, Philips Research, Eindhoven, the Netherlands; A. Savov, Philips Research, Eindhoven, the Netherlands; S. Joshi, Philips Research, Eindhoven, the Netherlands; R. Dekker, Philips Research, Eindhoven, the Netherlands; M. Geers, Eindhoven University of Technology, the Netherlands*

04:20 P **#693 Investigating Microscale Deformation across Large Sample Area via Multi-tile SEM-DIC**

*Z Chen, University of California Santa Barbara; S. Daly, University of California Santa Barbara*

- 04:40 P **#355 Void Initiation in Pure Metals During Ductile Rupture**  
*P Noell, SANDIA NATIONAL LABS; J. Carroll, SANDIA NATIONAL LABS; K. Hattar, SANDIA NATIONAL LABS; B. Clark, SANDIA NATIONAL LABS; B. Boyce, SANDIA NATIONAL LABS*
- 05:00 P **#225 Developing Crystal Plasticity Models from the Basics—Single Crystal Experiments**  
*J Carroll, Sandia National Laboratories; H. Lim, Sandia National Laboratories; M. Lane, Sandia National Laboratories; C. Battaile, Sandia National Laboratories; B. Boyce, Sandia National Laboratories*
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## Thermomechanics and Infra-red Imaging

### 104. Thermographic Non Destructive Evaluation (NDE)

#### Organizer(s)

**Chair Person** T. Sakagami, Kobe University; R. Tighe, Defence Academy of the UK

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- 03:20 P **#685 Effects of Surface Coatings on Pulse Thermography Inspections of Composite Materials**  
*G Olafsson, University of Southampton; R. Tighe, Defence Academy of the UK; J. Dulieu-Barton, University of Southampton*
- 03:40 P **#322 Model Based Inversion for Pulse Thermography**  
*S Holland, Iowa State University*
- 04:00 P **#425 Detection of Damage during Quasi-Static Loading of a Single Stringer Panel using Passive Thermography and Acoustic Emission**  
*J Zalameda, NASA Langley Research Center; W. Winfree, NASA Langley Research Center; M. Horne, National Institute of Aerospace*
- 04:20 P **#703 Identification of Lightning Strike Damage using Pulse Thermography Through Integration of Thermal Data**  
*T Harrell, University of Southampton; J. Dulieu-Barton, University of Southampton; O. Thomsen, University of Southampton*