2025 Mach Conference Agenda

Sponsored by

WEDNESDAY 4/9

8:00	**Registration and Breakfast – Annapolis Atrium**			
9:00	**Welcome and Opening Remarks: Ryan Hurley – Regatta Ballroom**			
9:10	**Plenary Lecture: Brad Boyce, "Microstructural Black Swans and Deep Material Fingerprints" – Regatta Ballroom**			
10:10	**Coffee Break – Annapolis Atrium**			
10:30	**Plenary Lecture: Dan Gianola, "High-Throughput Characterization of Materials for Extreme Environments: the Challenge of Microstructure Sensitivity" – Regatta Ballroom**			
11:30	**Panel Discussion Moderated by Michael Shields (JHU) and Justin Wilkerson (TAMU) – Regatta Ballroom**			
12:00	**Lunch – Annapolis Atrium**			
	Regatta A (MS3) **Advanced Experimental Techniques for Extreme Environments (Arezoo Zare, Jacob M. Diamond)**	***Regatta B (MS10)*** **High-throughput Materials Discovery for Extreme Conditions (Michael Shields, Raymundo Arroyave, Chris Haines)**	***Regatta C (MS5)*** **Advances in automated, high-throughput, and small-scale characterization of high strain-rate phenomena (Suraj Ravindran, Debjoy Mallick, Ankit Srivastava, Justin Wilkerson)**	***Surgeon Meeting Room (MS1)*** **Hypervelocity Impact and Ultra-High Strain Rate Behavior (Justin Moreno, Matt Shaeffer, Jacob Rogers)**
1:00-1:20	A Technique for High-Temperature Dynamic Kolsky Bar Compression: Application to Ti-6Al-4V (**Emily Pittman**, Leslie Lamberson, Amy Clarke) *Invited speaker.*	Efficient Microstructure-Property Exploration with Active Learning and Gaussian Process Regression (**Ozge Ozbayram**, Tyler Ragan, Tengyuan Hao, Audrey Olivier, Min Zhou, Lori Graham-Brady)	Measurement of Strain Rate Sensitivity at High Strain Rates with Instrumented Indentation Impact Testing (**Jacob Hempel**, Brady Butler, George Pharr)	Ultra-high strain rate impact behavior in high molecular weight thermoplastics (**Jacob Rogers**, Charles Pittman, Edwin Thomas, Justin Wilkerson, Thomas Lacy)
1:20-1:40	A Custom High Speed Thermal Imager for Extreme Loading Events (**Eric Stang**, Xiaoyu Lian, Jacob Rosenstein, Pradeep Guduru)	Physics-constrained Gaussian Processes for Predicting Shockwave Hugoniot Curves (**George Pasparakis**, Himanshu Sharma, Michael Shields, Lori Graham-Brady)	Informing Cold Spray via High Strain Rate Particle Impacts Captured Using Ultra-High-Speed Videography (**Elias Timmons**, Joseph Stanzione, Mac Haas, Behrad Koohbor, Tristan Bacha)	
1:40-2:00	Micro to macro-ballistics: The Geometric Scale Dependence of Specific Energy Absorption in High-velocity Microprojectile Impact Tests (**Ramathasan Thevamaran**, Nicholas Jaegersberg, Yasara Dharmadasa, Jizhe Cai)	Virtual melting and microstructure effects in spall failure in single crystal niobium: a molecular dynamics study (**William Zummo**, Chunyu Li, Alejandro Strachan)	A High-Throughput LIPIT System for V50 Testing (**Daniel Portillo**, Michael Heim, Christopher Sorini, Sidney Chocron, Alex Lakocy, Matt Barsotti)	X-ray study of microjets from grooved tin samples: from unperturbed to highly destabilized edge jets (**Jean-René Burie**, Céline Aragoncillo do Mingo, Arnaud Sollier, Thibauld Le Révérend, Julie Auperin, Bratislav Lukic)
2:00-2:20		Spallation of SiC bicrystals with a symmetric tilt grain boundary (**Chunyu Li**, Alejandro Strachan)	Development of Laser-Driven Microscale Ballistic Test Apparatus (**Alexander Lakocy**, Matt Barsotti, Eddie O'Hare, Sidney Chocron, Daniel Portillo, Michael Heim)	Ejecta characterization during hypervelocity impacts in geomaterials (**Sohanjit Ghosh**, Jacob Kim, Elizabeth Chua, Colin Goodman, Mark Foster, Ryan Hurley)
2:20-2:40	Real-time observation of twinning, detwinning, and melting in shock-loaded AZ31B-H24 magnesium alloy (**Cyril Williams**, Debjoy Mallick, Jeff Lloyd, Jonathan Ligda, John Clayton)	Mesoscale Modeling of Microstructural Effects on Inelastic Behavior of High Entropy Alloys (**Thomas Ralph**, Manish Vasoya, Vahid Attari, Daniel Salas, Ibrahim Karaman, Dimitris Lagoudas)		Internal Deformation Measurement of an IDOX/Estane Polymer Composite Cylinder under Loading Using Digital Volume Correlation (**Hongbing Lu**, Ehsan Mehrdad, Pooyan Brandon, Yao Ren)

2:40-3:00	Characterizing dynamic failure around shock-loaded voids via high-speed x-ray imaging and digital image correlation (**Tom Pilvelait**, Srijan Neogi, David Henann, Pradeep Guduru)	Accelerated Multi-Objective Alloy Discovery through Efficient Bayesian Methods: Application to the FCC Alloy Space (**Raymundo Arroyave**, Mrinalini Mulukutla, Trevor Hastings, Ankit Srivastava, James Paramore, Ibrahim Karaman)		Bayesian Calibration for High-Velocity Impact Problems through Ensemble-Based Data Assimilation (**Rong Jin**, Guangyao Wang, KT Ramesh, Xingsheng Sun)
3:00-3 :20	**Coffee Break – Annapolis Atrium**			
	Regatta A (MS3) **Advanced Experimental Techniques for Extreme Environments (Arezoo Zare, Jacob M. Diamond)**	***Regatta B (MS8)*** **Experiments and modeling of geological and infrastructural materials in extreme environments (Mohmad Mohsin Thakur, Brett Kuwik, Lei Yang, Sohanjit Ghosh)**	***Regatta C (MS5)*** **Advances in automated, high-throughput, and small-scale characterization of high strain-rate phenomena (Suraj Ravindran, Debjoy Mallick, Ankit Srivastava, Justin Wilkerson)**	***Surgeon Meeting Room (MS1)*** **Hypervelocity Impact and Ultra-High Strain Rate Behavior (Justin Moreno, Matt Shaeffer, Jacob Rogers)**
3:20-3:40	Corrosion and Deposition in Flowing Molten Salt (**Stephen Raiman**) *Invited speaker.*	Nanoindentation-based characterization of concrete damage due to high-velocity projectile impact (**Zhifei Deng)**	Microscale direct-impact mechanics of mechanical metamaterials (**Jet Lem**, Collin DesRoberts, Samuel Figueroa, Steven Kooi, Carlos Portela)	Ballistic and shock response of UHMWPE (**Minh Lê**, Piyush Wanchoo, Jacob Diamond, Justin Moreno, Jason Parker, KT Ramesh)
3:40-4:00	Optimizing data collection and processing workflow for three-dimensional tomography of corroded nuclear structural materials using focused ion-beam microscopy (**Trishelle Copeland-Johnson**, Mario Matos, Matthew Anderson, Fei Xu, Christopher Bearcroft, Tanner Mauseth)	Effect of fatigue damage on the shock and spall behavior of α Fe and 4340 steel (**Scott Turnage**, Joseph Indeck)	Optimizing the Energy Absorption Capacity of Auxetic Mechanical Metamaterials by Density Gradation (**Matthew Heras**, Behrad Koohbor, Caitlyn Knoerzer, Nicholas Pagliocca)	Penetration and Hugoniot Experiments on Rubber (**Jacob Diamond**, Krithika Balakrishnan, Konrad Muly, Justin Moreno, Matt Shanaman, KT Ramesh)
4:00-4:20		Computational modeling of brittle rocks subjected to very high velocity impact (**Lei Yang)**	Elucidating the Molecular Basis of Strength and Damping in Polyurethane-Urea Elastomers (**Roland Goh**, Gladys Tan, Bryan Lim, Jet Lem, Carlos Portela, Daria Andreeva)	Exploring the Hugoniot Elastic Limit of Additively Manufactured SiC-based Ceramics at High Temperatures (**Lucas Rackers**, KT Ramesh, Konrad Muly, Christopher Hansen)
4:20-4:40	The Effect of Prolonged Space Travel on Mission Critical Shuttle Components (**Elijah Davis**, Khalid Hattar)	Dynamic deformation of granite under multiaxial compression (**Xingyuan Zhao**, KT Ramesh, Todd Hufnagel)	Automated Split Hopkinson Bar (**Mouliswar Kumaresan,** Suraj Ravindran, Vladimir Kornev, Pranav Kartha)	Laser Microflyer Impact Experiments on Silicon Carbide (**Konrad Muly**, Ahmad Mirzaei, KT Ramesh)
4:40-5:00	Valuable High Energy X-Ray (HEX) and High-Pressure Pair Distribution Function (PDF) Studies Under Extreme Conditions **(Xinguo Hong)**			Automated Laser-Driven Plate Impact Experiments to Evaluate Copper Spall Strength Across Grain Size, Orientation, Strain Rate, and Pressure (**Piyush Wanchoo**, Rohit Berlia, Tim Weihs, KT Ramesh)
5:00	**Poster Session / Reception – Annapolis Atrium**			
6:30	**Dinner on your own**			

THURSDAY 4/10

8:30	**Breakfast – Annapolis Atrium**		
9:00	**Plenary Lecture: Kaushik Bhattacharya, "Data-driven constitutive relations: Multiscale modeling and experimental inference" – Regatta Ballroom**		
10:00	**Coffee Break – Annapolis Atrium**		
10:30	**Plenary Lecture: Ghatu Subhash, "Machine Learning Methods for Material Discovery, Constitutive Behavior, and Defect Detection" – Regatta Ballroom**		
11:30	**Panel Discussion Moderated by Somdatta Goswami (JHU) – Regatta Ballroom**		
12:00	**Lunch – Annapolis Atrium**		
	Regatta A (MS9) **Particle-based Methods for Multiscale and Multiphysics Modeling - Recent Advances (Zhou Lei, Duan Z. Zhang)**	***Regatta B (MS11)*** **Discrete Matters (Theocharis Baxevanis, Tian [Tim] Chen, Shailendra P. Joshi)**	***Regatta C (MS4)*** **Machine Learning Applications and Innovations for Computational Material Science (Noah Wade, Ashwini Gupta, Lori Graham-Brady)**
1:00-1:20	Recent Advances of Multiscale Modeling and Evaluation of Architected Material Responses to Impact Loading (**Zhen Chen**)	Uncovering The Mechanics of Architected Materials Under Dynamic Conditions (**Carlos Portela**, Thomas Butruille, Rachel Sun, Rishi Kommalapati, Jet Lem)	Finite-element-based physics-informed neural networks (FE-PINNs): Application to boundary value problems of solid mechanics (**Manish Vasoya**, Pranav Sunil, Ryan Sills)
1:20-1:40		Nonlinear Impact Analysis of Mechanical Metamaterials with Reduced Order Models (**Alireza Amirkhizi**, Weidi Wang, Willoughby Cheney, Erdem Caliskan, Reza Abedi)	HYDRA: Symbolic feature engineering of overparameterized Eulerian hyperelasticity models for fast inference time (**Nhon Phan**, WaiChung Sun, John Clayton)
1:40-2:00	Higher order homogenization of Direct Numeric Simulation results of a mock plastic bonded explosive (**Nathan Miller**, Thomas Allard, Richard Regueiro, Fabio Di Gioacchino, Erik Jensen, Pooyan Javadzadeh)	An "effective" macro-hyperelastic description of periodic bistable auxetic surfaces (**Theocharis Baxevanis**, Emmanuel Sansusthy Tardio, Tian [Tim] Chen)	Scalable Multi-GPU Training of Neural Operators: Advancing Generalization in High-Dimensional Physical Systems (Luis Santos, **Dibakar Roy Sarkar,** Deane Roehl, Somdatta Goswami)
2:00-2:20	Data-Driven Scale Bridging for Damage in Granular Packings (Eric Bryant, **Bozo Vazic**, Kane Bennett)	Structural Materials with Engineered Meso-Scale Architectures: A Case Study on Fracture of Lamellar Materials (**Mohit Gupta**, Hiileinani Dikilato, Eric Strang, Pradeep Guduru)	Optimal metal alloy design for enhanced spall strength using AI driven optimization framework (**Ashwini Gupta**, Indrashish Saha, Tamer Zaki, Lori Graham-Brady)
2:20-2:40	The Dual-Domain Material Point Method for Triangular Meshes (**Zhou Lei**, Xiaoyu Zhang, Duan Zhang)	Squishy Granular Mechanics (**Jyoti Sonawane**, Shailendra Joshi)	
2:40 3:00	Calibration and Validation of a Material Point Method Ceramic Damage Model for Split-Hopkinson Pressure Bar Simulations (**Jay Appleton**, Michael Homel, Cameron Crook, Richard Regueiro, Henry Tufo, Gus Becker)	Exploring multi material mechanical metamaterials (Shaikeea Angkur, **Ethan Biedenstein**)	
3:00-3:20	**Coffee Break – Annapolis Atrium**		
	Regatta A (MS9) **Particle-based Methods for Multiscale and Multiphysics Modeling - Recent Advances (Zhou Lei, Duan Z. Zhang)**	***Regatta B (MS11)*** **Discrete Matters (Theocharis Baxevanis, Tian [Tim] Chen, Shailendra P. Joshi)**	***Regatta C (MS4)*** **Machine Learning Applications and Innovations for Computational Material Science (Noah Wade, Ashwini Gupta, Lori Graham-Brady)**
3:20-3:40	Size and Shape Dependence of Hydrogen-Induced Phase Transformation and Sorption Hysteresis in Palladium Nanoparticles (**Xingsheng Sun**, Rong Jin)	Flow control of hypersonic shock-wave/boundary-layer interactions using phononic metamaterials (**David Restrepo**, Juan David Navarro, David Balderas, Christopher Combs)	Automatic Differentiation in Dynamic Topology Optimization (**Kevin Korner**, Julian Andrej, Rob Rieben, Jon Belof, Will Schill)
3:40-4:00	Discrete Eshelby Inclusions in Amorphous Solids (**Evan Willmarth**, Weiwei Jin, Dong Wang, Mark Shattuck, Corey Ohern)	An Analysis of Anisotropic Material Failure under Shear and Tension (**Neha Arora**, Shailendra Joshi)	Physics-Informed Latent Neural Operator for Real-time Predictions of Complex Physical Systems (**Sharmila Karumuri**, Lori Graham-Brady, Somdatta Goswami)

4:00-4:20	Particle-based meshfree models for predicting the shock propagation through heterogeneous viscoelastic solids (**Benjamin Xu**, Thomas O'Connor)	Digital Processing of Fabrics from Programmable Knitting (**Tian [Tim] Chen**)	Non-linear Material Response Prediction Using Diffusion and Neural Operator Models (**Purna Vindhya Kota**, Meer Mehran Rashid, Somdatta Goswami, Lori Graham-Brady)
4:20-4:40	Material point methods implementable in unstructured meshes and their consistency and accuracy improvements (**Duan Zhang**, Kyle Perez, Jiajia Waters, Paul Barclay)		Development and Optimization of 4D-Printed Morphing Wings Using Shape Memory Polymer Composites (**Yingbo Zhu**, Zhangxian Yuan, Feng Zhu)
4:40-5:00			
5:10	**Reception – Annapolis Atrium**		
6:30	**Conference Banquet – Alison McManus, "In Search of New Poisons: Organophosphorus Research in WWII-Era Britain" – Regatta Ballroom**		

FRIDAY 4/11

8:30	**Breakfast – Annapolis Atrium**		
9:00	**Plenary Lecture: Elizabeth Congdon, "Materials Making an Impact: Enabling Missions in Space through Technology System Development" with Q&A Moderated by Angela Stickle (APL) – Regatta Ballroom**		
10:00	**Coffee Break– Annapolis Atrium**		
	Regatta A (MS6) **Machine Learning Methods for Structure and Damage Detection (Ghatu Subhash)**	***Regatta B (MS7)*** **Soft Tissue Mechanics in Dynamic Events: Integrating Finite Element, Multiscale, and Constitutive Modeling Approaches (Tyson Loudon, Reuben Kraft, Amy Dagro)**	***Regatta C (MS2)*** **Response of Brittle and Quasi-brittle Composites Across Length Scales (Christopher S. Meyer, Kedar Kirane, Reza Abedi)**
10:30-10:50	Real-Time Inference of Defects and Impedance Using Deep Operator Networks (**Dibakar Roy Sarkar**, Somdatta Goswami)	A method to characterize the cavitation pressure of soft matter under superimposed azimuthal shear (**Alexandria Trevino**, Jacob Rogers, Justin Wilkerson)	Developing Mixed-Mode Traction Laws for Crystalline UHMWPE Fibrils through Molecular Dynamics (**Nuwan Dewapriya**, John Gillespie Jr., Joseph Deitzel)
10:50-11:10	Probabilistic Neural Networks (PNNs) for Modeling Aleatoric Uncertainty in dynamic strength and toughness of 1D heterogeneous materials (**Reza Abedi**, Colin Furey, Farhad Pourkamali-Anaraki, Alireza Amirkhizi, Christopher Hansen)	A High-Rate, Region-Specific Material Characterization of Porcine Brain Tissue using Thin-Layer Inertial Microcavitation Rheometry (**Elizabeth Bremer-Sai**, Surya Kolluri, Anastasia Tzoumaka, David Henann, Christian Franck)	Exploring the Effects of Temperature, Transverse Pressure, and Strain Rate on the Axial Tensile Behavior of UHMWPE Crystals Using Molecular Dynamics (**Nuwan Dewapriya**, John Gillespie Jr., Joseph Deitzel)
11:10-11:30	Deep Learning for Quantitative Dynamic Fragmentation Analysis (**Erwin Cazares Gamez**, Brian Schuster)	Seamlessly Bridging Scales: AI-Driven Numerical Solver for Dynamic Tissue Mechanics (**Maryam Hakimzadeh**, Wei Wang, Haihui Ruan, Somdatta Goswami)	Microscale Model for Intergranular and Transgranular Damage and Fracture in Polycrystalline Ceramics (**Tengyuan Hao**, Tyler Ragan, Daniel Olsen, Min Zhou)
11:30-11:50		Individualized Morphing of Human Body Models for Biomechanical Analysis in High-G Environments (**Ann Reyes**, Reuben Kraft)	The length scale dependency of phase field method: and comparison with the crack band model (**Reza Abedi**, Giang Huynh, Kedar Kirane)
12:00	**Lunch – Annapolis Atrium**		
1:00	**ADJOURN**		