

Meshfree and Particle Methods: Application and Theory

September 10-12, 2018

La Fonda on the Plaza, Santa Fe, New Mexico

Sunday, September 9

- 4:00 – 6:00 pm Registration, La Terraza Foyer
6:00 – 7:00 pm Opening Reception, La Terraza

Monday, September 10

Room: Ballroom South

- 7:30 Registration
7:30 – 8:30 Continental Breakfast
8:00 – 8:10 Opening Remarks
8:10 – 8:50 **Plenary Talk: Steve Attaway**
The Future for Modeling Extreme Events: Exemplar Problems for Meshless Methods

Room: New Mexico

Session 1-1: Mathematical Theory and Method Development 1

Chair: Pavel Bochev

- 9:00 – 9:25 Siddhant Kumar*, Dennis Kochmann, Kostas Danas
Enhanced Local Maximum-entropy Approximation for Stable Meshfree Simulations
- 9:25 – 9:50 Qizhi He*, J.S. Chen
A Machine Learning Enhanced Data-driven Simulation of Solids and Structures with Noisy Database
- 9:50 – 10:15 Alexander Lukyanov*, Kees Vuik
A Stable SPH Discretization of the Elliptic Operator with Heterogeneous Coefficients

Room: Santa Fe

Session 1-2: Multi-Scale 1

Chair: Pablo Seleson

- 9:00 – 9:25 C. Armando Duarte*, Haoyang Li
A Scale-Bridging Generalized Finite Element Method for Parallel Simulations of Spot Welds in Large Structures
- 9:25 – 9:50 Frank Beckwith*, J.S. Chen
An Immersed Reproducing Kernel Particle Method for Modeling Inhomogeneous Media
- 9:50 – 10:15 Chuanqi Liu*
Multi-scale Modelling of Granular Pile Collapse by Using Material Point Method and Discrete Element Method

- 10:15 – 10:30 Break, Ballroom North

Room: New Mexico**Session 2-1: Comparison of Related Methods 1**

Chair: C.T. Wu

- 10:30 – 10:55 Michael Tupek*, David Littlewood, Jacob Koester
Meshfree Cohesive Phase-Field Peridynamics
- 10:55 – 11:20 Marco Pasetto*, Yu Leng, J.S. Chen, John T. Foster, Pablo Seleson
A Reproducing Kernel Enhanced Approach for Peridynamic Solutions
- 11:20 – 11:45 Dandan Lyu*, Shaofan Li, Bo Ren, C.T. Wu
Comparison of Molecular Dynamics (MD) with Multiscale Crystal Defect Dynamics (MCDD)

Room: Santa Fe**Session 2-2: Multi-Scale 2**

Chair: Julia Plews

- 10:30 – 10:55 Nikolai D. Petsev*, L. Gary Leal, M. Scott Shell
Multicomponent Molecular-Continuum Simulations Using Smoothed Dissipative Particle Dynamics
- 10:55 – 11:20 Nikos Gastonis*, Jun Yang
Non-Isothermal Smoothed Dissipative Particle Dynamics
- 11:20 – 11:45 Alexandre Tartakovsky*
SPH Model for Nanoscale Multiphase Flows

11:45 – 1:00 Lunch, Ballroom North

Room: Ballroom South

1:00 – 1:40

Plenary Talk: N. Sukumar*Maximum-Entropy Meshfree Approximation Scheme in Computational Mechanics***Room: New Mexico****Session 3-1: Comparison of Related Methods 2**

Chair: Michael Tupek

- 1:50 – 2:15 Joseph Bishop*
A Comparison of Mesh-free and Mesh-based Lagrangian Approximations of a Manufactured Shear-dominated Deformation Field
- 2:15 – 2:40 C.T. Wu*, Wei Hu, Youcai Wu, Huang Li
Computational Modeling of Joint Failure Using Finite Element and Meshfree Methods
- 2:40 – 3:05 Hailong Chen*
A Comparison Study on Peridynamic Models Using Irregular Non-uniform Spatial Discretizations
- 3:05 – 3:30 Austin Isner*, Duan Zhang
Improving the Integration Accuracy of the Material Point Method

Room: Santa Fe

Session 3-2: Mathematical Theory and Method Development 2

Chair: Nat Trask

1:50 – 2:15	Michael Hillman*, Guohua Zhou <i>Generalized Reproducing Kernel Peridynamics</i>
2:15 – 2:40	Joe Ward*, Francis Narcowich <i>Local Lagrange Functions and the BBO Paradigm</i>
2:40 – 3:05	Francis Narcowich*, Anat Amir, Joseph Ward <i>Meshfree Extrapolation with Application to BBO (t,k) Systems and Non-local Diffusion</i>
3:05 – 3:30	Alfredo Sanchez-Rivadeneira*, C. Armando Duarte <i>A Stable Generalized/eXtended FEM with Discontinuous Interpolant for Fracture Mechanics</i>

3:30 – 3:45 Break, Ballroom North

Room: New Mexico

Session 4-1: Damage and Fracture

Chair: David Littlewood

3:45 – 4:10	Albert Ziegenhagel*, Alexander Lukyanov, Marc Alexander Schweitzer <i>A Partition of Unity Method for Thermal Hydraulic Fracturing</i>
4:10 – 4:35	Masoud Behzadinasab*, John Foster <i>Peridynamic modeling of dynamic fracture in metallic materials</i>
4:35 – 5:00	Bo Li*, Hao Jiang <i>Micromechanical Studies of Compressive Strength in Brittle Polycrystalline Materials at High Strain Rates</i>

Room: Santa Fe

Session 4-2: Mathematical Theory and Method Development 3

Chair: TBA

3:45 – 4:10	Grady Wright* <i>Localized high-order meshfree methods for semi-Lagrangian advection on surfaces</i>
4:10 – 4:35	Nathaniel Trask*, Pavel Bochev, Mauro Perego <i>Conservative Meshfree Discretization</i>
4:35 – 5:00	Christian Rieger* <i>Kernel-based Reconstruction Methods for Uncertainty Quantification</i>

5:15 – 6:45 Poster Session, Mezzanine

Tuesday, September 11

Ballroom South

8:30 – 9:10

Plenary Talk: Jerry Brackbill

Particle Methods: A Long View

9:10- 9:25

Break, Ballroom North

Room: New Mexico

Session 5-1: Shock and Hydrodynamics

Chair: J.S. Chen

9:25 – 9:50

Zirui Mao*, G.R. Liu, Tao Lin, Xiangwei Dong

A Lagrangian Gradient Smoothing Method (L-GSM) Model for free surface flows

9:50 – 10:15

Tsung-Hui Huang*, J.S. Chen

Eulerian Reproducing Kernel Particle Method for Shock Modeling

10:15 – 10:40

Alexander Lukyanov*, Steven B. Segletes, Vladimir M. Sadovskii

Generalized Anisotropic Gruneisen Parameter: A Vector Equation of State for Anisotropic Materials

10:40 – 11:05

Mikhail Shashkov*, Wurigen Bo

Arbitrary Reconnection-based Arbitrary Lagrangian Eulerian Method – A-ReALE

11:05 – 11:30

Jonghyuk Baek*, Guohua Zhou, J.S. Chen, Michael Hillman

Coupled Shock-Plasticity-Damage Modeling of Explosive Welding by RKPM

Room: Santa Fe

Session 5-2: Multi-Scale 3

Chair: C. Armando Duarte

9:25 – 9:50

Mei Chandler*, Ruth Cheng

Applications of Discrete Element Method (DEM) in Micromechanical Modeling of Materials

9:50 – 10:15

Dennis Dusseldorf*, Marc Alexander Schweitzer

A Partition of Unity Method using Fine-Scale Enrichments

10:15 – 10:40

WaiChing Sun*, Kun Wang

Deep-reinforcement-learning-enhanced computational failure mechanics across multiple scales

10:40 – 11:05

Pablo Seleson*

Coupling Methods in Peridynamics for Effective Failure and Damage Simulation

11:05 – 11:30

Dong Qian*, Rui Zhang, Clint Nicely

A Concurrent Multiscale Approach to Coupled Peridynamic/FEM Simulation

11:30 – 12:45

Lunch, Ballroom North

Ballroom South

12:45 – 1:25

Plenary Talk: Dongdong Wang*Meshfree Methods and Isogeometric Analysis: Consistency Conditions, Reproducing Kernel Linkage and Local Refinements***Room: New Mexico****Session 6-1: Rapid Design-to-Analysis**

Chair: Joseph Bishop

1:35 – 2:00

Scott Roberts*, Dan Bolintineanu, Mark Ferraro, Jeremy Lechman, David Noble, Ishan Srivastava, Bradley Trembacki

Application of the Conformal Decomposition Finite Element Method for Rapid Turnaround Analysis of Tomographic Imaging and Particle Simulation Based Mesostructures

2:00 – 2:25

Mark Rashid*, Andrew Baldwin, Alipasha Sadri

Reimagining the CAE Workflow Via Polyhedral Finite Elements

2:25 – 2:50

Jacob Koester* J.S. Chen, Michael Tupek, Scott Mitchell, Joseph Bishop

The Conforming Reproducing Kernel Method for an Agile Design-to-Simulation Workflow

2:50 – 3:15

Mohamed Ebeida*

VoroCrust: Conforming Voronoi meshing of non-convex domains with sharp features and narrow regions

3:15 – 3:40

Julia Plews*, Matthew Mosby, *Advances in a Multiscale Generalized FEM for Large-scale Simulations***Room: Santa Fe****Session 6-2: Implementation and HPC**

Chair: Frank Beckwith

1:35 – 2:00

Paul Kuberry*, Peter Bosler

Meshless Transfer for Earth System Models via the Compadre Toolkit

2:00 – 2:25

David Littlewood*, Bart van Bloemen Waanders, Arun Hegde, Adam Cook

Computational Peridynamics with Application to Additively Manufactured Ceramics

2:25 – 2:50

Swarnava Ghosh*

A novel Real-Space Formulation of Density Functional Theory: Designing next generation magnesium alloys

2:50 – 3:15

Nathaniel Morgan*, Evan Lieberman, Konstantin Lipnikov

A high-order Lagrangian method based on material points and piecewise polynomial maps

3:15 – 3:40

Stuart Slattery*, Bob Bird, Guangye Chen, Time Germann

A Co-Designed Library for Exascale Particle Simulations

3:40 – 3:55

Break, Ballroom North

Room: New Mexico

Session 7-1: Penetration and Perforation

Chair: Michael Hillman

- 3:55 – 4:20 Bo Li*, Jiang Fan, Qinghao Yuan, Qingxuan Wei, Guangchen Bai
Optimal Transportation Meshfree Simulation of Whipple Shield under Hypervelocity Impact
- 4:20 – 4:45 David Littlefield*, Gerald Pekmezi
A Multiscale Model for Sand
- 4:45 – 5:10 Stewart Silling*
Modeling Penetration and Perforation with Peridynamics
- 5:10 – 5:35 Jesse Sherburn*, William Heard
Reproducing Kernel Particle Method Modeling of Ultra-High Performance Concrete Flyer Plate Experiments
- 5:35 – 6:00 James D. Walker*, Sidney Chocron, Stephen R. Beissel, Donald J. Grosch, Daniel D. Durda
Particle Conversion Methods for Computing Momentum Enhancement due to Hyper-velocity Impact

Room: Santa Fe

Session 7-2: Advanced Manufacturing

Chair: TBD

- 3:55 – 4:20 Hao Wang*, Bo Li
Numerical Modeling of the Hot Forming Process of Composite Materials
- 4:20 – 4:45 Zongyue Fan*, Bo Li, Hao Wang
Direct Numerical Simulation of Powder Bed Fusion Based Additive Manufacturing of Metals
- 4:45 – 5:10 Pan Xiaofei*, C. T. Wu, W. Hu, Y.C. Wu
Smoothed Particle Galerkin Method with a Momentum-Consistent Smoothing Algorithm for Explicit Coupled Thermal-Structural Analysis
- 5:10 – 5:35 Dan S. Bolintineanu*, Daniel R. Moser, Jeremy B. Lechman
Discrete element modeling of powder spreading for metal additive manufacturing
- 5:35 – 6:00 Zhen Chen*
Integrating Nonlocal Constitutive Modeling with Nonlocal MPM for Better Evaluating Multi-Physical Responses

6:30 – 7:00 Reception, La Terraza

7:00 – 9:30 Dinner, La Terraza

Wednesday, September 12

Ballroom South

8:10 – 8:50 **Plenary Talk: Sergio Idelsohn**
Particle Methods and Turbulent Flows

8:50 – 9:00 Break

Room: New Mexico

Session 8-1: Fluid-Structure Interaction and Other Coupled Problems

Chair: Duan Zhang

9:00 – 9:25 Renjie Ke*, Bo Li
A monolithic Lagrangian meshfree method for Fluid-Structure Interaction problems within the OTM framework

9:25 – 9:50 David Kamensky*, Yuri Bazilevs
Peridynamic contact modeling in i(mmer)sogeometric analysis

9:50 – 10:15 Yuri Bazilevs*
Recent Advances in IGA-Meshfree Coupling for Air-Blast FSI

Room: Santa Fe

Session 8-2: Mathematical Theory and Method Development 4

Chair: TBA

9:00 – 9:25 J.S. Chen*, Sheng-Wei Chi, Mike Hillman, Hsin-Yun Hu
Implicit Gradient for Numerical Solution of PDEs

9:25 – 9:50 Mauro Perego*, Pavel Bochev, Nathaniel Trask, Peter Bosler, Paul Kuberry, Kara Peterson
Generalized Moving Least Squares: Approximation theory and applications

9:50 – 10:15 Chad Hammerquist*, Yamina Aimene
Particle-based inelasticity vs grid-based updates in MPM

10:15 – 10:30 Break, Ballroom North

Room: New Mexico

Session 9-1: Mathematical Theory and Method Development 5

Chair: TBA

- 10:30 – 10:55 Kuan-Chung Lin*, Michael Hillman
Consistent Strong Enforcement of Essential Boundary Conditions in Meshfree Methods
- 10:55 – 11:20 Huaiqian You*, Nathaniel Trask, Yue Yu, Michael Parks
An Asymptotically Compatible Meshfree Quadrature Rule for Nonlocal Problems with Applications to Peridynamics
- 11:20 – 11:45 Duan Zhang*
Consistency Considerations for Thermodynamically Nonequilibrium Problems Simulated Using Heterogeneous Multiscale Methods
- 11:45 – 12:10 Saili Yang*, Michael Hillman
A finite volume reproducing kernel particle method

Room: Santa Fe

Session 9-2: Geoscience and Natural Disasters

Chair: Deborah Sulsky

- 10:30 – 10:55 Elizaveta Wobbes*, Matthias Moller, Cornelis Vuik, Pascal De Koster, Vahid Galavi
Reduction of numerical errors in material point method
- 10:55 – 11:20 Haoyan Wei*, J.S. Chen
A Meshfree Computational Framework for Modeling Hydro-Mechanical Damage Processes in Porous Geomaterials
- 11:20 – 11:45 Erik Jensen*, Richard Regueiro, Boning Zhang
1D MPM-DEM Hierarchical Multiscale Modeling of a Split Hopkinson Pressure Bar Experiment on Dry Colorado Mason Sand
- 11:45 – 12:10 Kara Peterson*, Adrian Turner, Andrew Roberts, Dan Bolintineanu, Dan Ibanez, Travis Davis
A Discrete Element Model for Sea Ice