

**Nonlocal Models in Mathematics,
Computation, Science, and Engineering
Oak Ridge National Laboratory
Program**

Sunday, October 25, 2015

DoubleTree Hotel, Salon C, Oak Ridge, TN

16:00 – 18:00 Registration

17:00 – 19:00 Reception

Monday, October 26, 2015

All talks will take place in JICS Auditorium; all breaks, lunches, and the poster sessions will take place in JICS Lobby

- 7:45 Bus departs from DoubleTree Hotel to ORNL
- 8:15 – 8:45 Registration
- 8:45 – 9:00 Welcoming Remarks
J. Nichols, ORNL Assoc. Lab. Director for Computing & Computational Sciences
B. Maccabe, Director, ORNL Computer Science and Mathematics Division
- 9:00 – 10:00 *S. Silling, Sandia National Laboratories. Survey Talk*
“Predictivity in Fracture Modeling”
- 10:00 – 10:30 Coffee break
- 10:30 – 11:00 *J.N. Reddy, Texas A&M University*
“On a Unified Integro-Differential Nonlocal Model for Solid Mechanics Problems”
- 11:00 – 11:30 *R. Lehoucq, Sandia National Laboratories*
“Nonlocal Constitutive Relations”
- 11:30 – 12:00 *E. Madenci, University of Arizona*
“Peridynamic Differential Operator for the Solution of Linear and Nonlinear Differential Equations”
- 12:00 – 12:30 *F. Bobaru, University of Nebraska-Lincoln*
“Dynamic Fracture in Functionally Graded Materials with Peridynamics”
- 12:30 – 14:00 Lunch
- 14:00 – 15:00 *D. del-Castillo-Negrete, Oak Ridge National Laboratory. Survey Talk*
“Nonlocal Transport: Physics Basis and Applications”
- 15:00 – 15:30 *I. Podlubny, Technical University of Kosice, Slovak Republic*
“Fractional Calculus for Applications: Some Aspects of Problem Formulation, Solution, and Interpretation”
- 15:30 – 16:00 *M. Meerschaert, Michigan State University*
“Nonlocal Diffusion on Bounded Domains”
- 16:00 – 16:30 Coffee break
- 16:30 – 17:00 *D. Turner, Sandia National Laboratories*
“Nonlocal Digital Image Correlation”
- 17:00 – 17:30 *A. Zemlyanova, Kansas State University*
“Curvature-Dependent Surface Tension in Contact Problems and Fracture Mechanics”

- 17:30 – 18:45 Poster Session A - Reception
- A.1 H. Antil, *George Mason University*
“Fractional Space-Time Optimal Control Problems: Analysis and Discretization”
- A.2 S. Bond, *Sandia National Laboratories*
“A Finite Element Method for the Weak Formulation of Nonlocal Mechanics”
- A.3 T. Costa, *Oregon State University*
“Peridynamic Multiscale Finite Element Method”
- A.4 M. D’Elia, *Sandia National Laboratories*
“A Coupling Strategy for Nonlocal and Local Diffusion Models with Mixed Volume Constraints and Boundary Conditions”
- A.5 P. Diehl, *University of Bonn, Germany*
“Simulation of Crack Tip Instabilities Using Bond-Based Peridynamics”
- A.6 Q. Guan, *Florida State University*
“ θ Schemes for Finite Element Discretization of the Space-Time Fractional Diffusion Equations”
- A.7 W. Jamieson, *University of Nebraska-Lincoln*
“Numerical and Theoretical Analysis of Nonlocal Diffusion Models”
- A.8 Q. Le, *University of Nebraska-Lincoln*
“Surface and Interface Effects in Peridynamics”
- A.9 J. Mitchell, *Sandia National Laboratories*
“Ordinary, Isotropic Constitutive Models for Peridynamics”
- A.10 J. Suzuki, *University of Campinas, Brazil*
“Fractional-Order Uniaxial Visco-Elasto-Plastic Models for Structural Analysis”
- A.11 L. White, *University of Nebraska-Lincoln*
“Energy Identity and Decay Estimates for Nonlocal Wave Equations”
- A.12 Y. Zhang, *Missouri University of Science and Technology*
“Eigenvalues and Eigenfunctions of the Fractional Laplacian and their Applications to the Fractional Quantum Mechanics”
- 19:00 Bus departs from ORNL to DoubleTree Hotel
Dinner (on your own)

Tuesday, October 27, 2015

- 8:00 Bus departs from DoubleTree Hotel to ORNL
- 8:30 – 9:00 Registration
- 9:00 – 10:00 M. Gunzburger, *Florida State University*. Survey Talk
“Integral Equation Modeling for Nonlocal Diffusion and Mechanics”
- 10:00 – 10:30 Coffee break
- 10:30 – 11:00 R. Lipton, *Louisiana State University*
“Cohesive Dynamics and Quasi-Brittle Fracture”
- 11:00 – 11:30 P. Radu, *University of Nebraska-Lincoln*
“Diffusion Phenomenon for Local and Nonlocal Models”
- 11:30 – 12:00 B. Aksoylu, *TOBB University of Economics and Technology, Turkey*
“Incorporating Local Boundary Conditions into Nonlocal Theories”
- 12:00 – 12:30 T. Mengesha, *University of Tennessee, Knoxville*
“A Nonlocal Characterization of Sobolev, BV and BD Spaces: A Unified Approach”
- 12:30 – 14:00 Lunch
- 14:00 – 14:30 Q. Du, *Columbia University*
“Robust Nonlocal Stress Analysis via Asymptotically Compatible Discretization”
- 14:30 – 15:00 H. Wang, *University of South Carolina*
“Fast Numerical Methods for Peridynamic Models”
- 15:00 – 15:30 P. Seleson, *Oak Ridge National Laboratory*
“Multiscale Coupling Methods in Peridynamics”
- 15:30 – 16:00 Coffee break
- 16:00 – 16:30 A. Salgado, *University of Tennessee, Knoxville*
“A PDE Approach to the Fractional Obstacle Problem”
- 16:30 – 17:00 G. Zhang, *Oak Ridge National Laboratory*
“Numerical Methods for a Class of Nonlocal Diffusion Problems with the Use of Backward SDEs”
- 17:00 – 18:15 Poster Session B - Reception
- B.1 B. Alali, *Kansas State University*
“Peridynamics and Material Surfaces”
- B.2 F. Han, *KAUST, Saudi Arabia*
“A Morphing Approach to Couple State-Based Peridynamics with Classical Continuum Mechanics”
- B.3 J. Jamieson, *University of Nebraska-Lincoln*
“Non-Local A-Harmonic Approximation”
- B.4 E. Otárola, *Universidad Técnica Federico Santa María, Chile*
“A PDE Approach to Space-Time Fractional Parabolic Problems”
- B.5 M. Parks, *Sandia National Laboratories*
“A Multi-Time-Step Method for Partitioned Time Integration of Peridynamics”
- B.6 Y. Tao, *Columbia University*
“Analysis and Approximation of a Nonlocal Diffusion Model with Neumann Type Constraints”
- B.7 X. Tian, *Columbia University*
“Asymptotically Compatible Schemes for Robust Discretization for Nonlocal Models”
- B.8 J. Trageser, *George Washington University*
“A Fourth Order Nonlocal Operator and Its Connection to the Biharmonic”

B.9 R. Wildman, *Army Research Laboratory*

“Hybrid Finite Difference/Peridynamics in 3D”

B.10 X. Xie, *Illinois Institute of Technology*

“Two Types of Nonlocal Diffusions and the Convergence to the Random/Normal Diffusion”

B.11 F. Xu, *Florida State University*

“Local Mesh Refinement in a Multiscale Finite Element Implementation of Nonlocal Models of Mechanics”

B.12 J. York, *University of Texas at Austin*

“A Peridynamic Model for Hydraulic Fracture”

18:30 Bus departs from ORNL to Riverside Grille in Oak Ridge

19:00 – 20:30 Banquet

20:45 Bus departs from Riverside Grille to DoubleTree Hotel

Wednesday, October 28, 2015

8:00 Bus departs from DoubleTree Hotel to ORNL

8:30 – 9:00 Registration

9:00 – 10:00 D. Littlewood, *Sandia National Laboratories*. Survey Talk
“Progress and Challenges in Computational Peridynamics”

10:00 – 10:30 Coffee break

10:30 – 11:00 J.S. Chen, *University of California, San Diego*
“Fracture to Damage Multiscale Mechanics and Modeling”

11:00 – 11:30 M. Schweitzer, *University of Bonn, Germany*
“A Partition of Unity Method Enriched with Peridynamics”

11:30 – 12:00 J. Foster, *University of Texas at Austin*
“Isogeometric Peridynamics”

12:00 – 12:30 G. Wagner, *Northwestern University*
“Meshfree Methods for Physically-Based Fractional Order Partial Differential Equations”

12:30 – 13:00 Discussion of future directions

13:00 – 14:00 Lunch

14:00 – 15:00 ORNL lab tour (optional): Spallation Neutron Source

15:00 – 16:30 ORNL lab tour (optional): Graphite Reactor and Supercomputing Center

16:30 Bus returns to DoubleTree Hotel