

# John T. Foster

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## Education

Ph.D., Purdue University, 2009.

M.S. Mechanical Engineering, Texas Tech University, 2004.

B.S. Mechanical Engineering, *Cum Laude*, Texas Tech University, 2002.

## Professional Registration

Professional Engineer, Texas, #118233

## Professional Appointments

Associate Professor, Department of Petroleum and Geosystems Engineering,  
The University of Texas at Austin,  
September 2017–Present.

Associate Professor (by courtesy), Department of Aerospace Engineering  
and Engineering Mechanics,  
The University of Texas at Austin,  
September 2017–Present.

George H. Fancher Fellowship in Petroleum Engineering,  
The University of Texas at Austin,  
September 2016–Present.

Core Faculty, Institute for Computational Engineering and Sciences,  
The University of Texas at Austin,  
November 2017–Present.

Affiliated Faculty, Institute for Computational Engineering and Sciences,  
The University of Texas at Austin,  
December 2014–October 2017.

Assistant Professor, Department of Petroleum and Geosystems Engineering,  
The University of Texas at Austin,  
August 2014–August 2017.

Assistant Professor (by courtesy), Department of Aerospace Engineering and Engineering Mechanics,  
The University of Texas at Austin,  
January 2014–August 2017.

Assistant Professor, Department of Mechanical Engineering,  
The University of Texas at San Antonio,  
August 2011–August 2014.

Adjunct Associate Professor, Department of Mechanical Engineering  
The University of New Mexico,  
September 2010–May 2011.

Senior Member of the Technical Staff, Terminal Ballistics Technology Department,  
Sandia National Laboratories  
January 2006–August 2011.

Member of the Technical Staff, Terminal Ballistics Technology Department,  
Sandia National Laboratories  
August 2004–January 2006.

## Awards & Honors

2015 SPE Petroleum Engineering Innovative Teaching Award

2013 Air Force Office of Scientific Research Young Investigator Award

2013 '40 Under 40' - San Antonio Business Journal

## Consulting

Curl, Stahl, Geis

November 2014 – February 2015

Engineering analysis and expert witness testimony at trial

## Refereed Journal Articles

### *Published*

25. .

24. H. Ouchi, A. Katiyar, **J.T. Foster**, and M. M. Sharma. A peridynamics model for the propagation of hydraulic fractures in naturally fractured reservoirs. *SPE Journal*, Preprint(SPE-173361-PA), May 2017. doi:10.2118/173361-PA.

23. H. Ouchi, **J.T. Foster**, and M.M. Sharma. Effect of reservoir heterogeneity on the vertical migration of hydraulic fractures. *Journal of Petroleum Science and Engineering*, 151:384–408, 2017. doi:10.1016/j.petrol.2016.12.034.

22. J.T. O’Grady and **J.T. Foster**. A meshfree method for bending and failure in non-ordinary peridynamic shells. *Computational Mechanics*, 57(6):921–929, June 2016. doi:10.1007/s00466-016-1269-z.
21. **J.T. Foster**. A variationally consistent approach to constrained motion. *ASME. J. Appl. Mech.*, 83(5), May 2016. doi:10.1115/1.4032856.
20. R. Rahman and **J.T. Foster**. Onto resolving spurious wave reflection problem with changing nonlocality among various length scales. *Communications in Nonlinear Science and Numerical Simulation*, 34:86–122, 2016. doi:10.1016/j.cnsns.2015.10.003.
19. R. Rahman and **J.T. Foster**. Peridynamic theory of solids from the perspective of classical statistical mechanics. *Physica-A*, 437:162–183, November 2015. doi:10.1016/j.physa.2015.05.099.
18. R. Rahman and **J.T. Foster**. A molecular dynamics based investigation of thermally vibrating graphene under different boundary conditions. *Physica E: Low-dimensional Systems and Nanostructures*, 72:25–47, August 2015. doi:10.1016/j.physe.2015.04.007.
17. H. Ouchi, A. Katiyar, J.R. York, **J.T. Foster**, and M.M. Sharma. A fully coupled porous flow and geomechanics model for fluid driven cracks: a peridynamics approach. *Computational Mechanics*, 55(3):561–576, March 2015. doi:10.1007/s00466-015-1123-8.
16. J.T. O’Grady and **J.T. Foster**. Peridynamic plates and flat shells: A non-ordinary state-based model. *International Journal of Solids and Structures*, 51(25–26):4572–4579, 2014. doi:10.1016/j.ijsolstr.2014.09.003.
15. J.T. O’Grady and **J.T. Foster**. Peridynamic beams: A non-ordinary state-based model. *International Journal of Solids and Structures*, 51(18):3177–3183, 2014. doi:10.1016/j.ijsolstr.2014.05.014.
14. M. Bessa, **J.T. Foster**, T. Belytschko, and W.K. Liu. A meshfree unification: Reproducing kernel peridynamics. *Computational Mechanics*, 53(6):1251–1264, 2014. doi:10.1007/s00466-013-0969-x.
13. M.D. Brothers, **J.T. Foster**, and H.R. Millwater. A comparison of different methods for calculating tangent-stiffness matrices in a massively parallel computational peridynamics code. *Computer Methods in Applied Mechanics and Engineering*, 279:247–267, September 2014. doi:10.1016/j.cma.2014.06.034.
12. R. Rahman and **J.T. Foster**. Bridging the length scales through nonlocal hierarchical multiscale modeling scheme. *Computational Material Science*, 92:401–415, September 2014. doi:10.1016/j.commatsci.2014.05.052.
11. R. Rahman, **J.T. Foster**, and A. Haque. A multiscale modeling scheme based on peridynamic theory. *International Journal of Multiscale Computational Engineering*, 12(3):223–248, 2014. doi:10.1615/IntJMultCompEng.2014007954.

10. R. Rahman and **J.T. Foster**. Deformation mechanism of graphene in amorphous polyethylene: A molecular dynamics based study. *Computational Material Science*, 87:232–240, May 2014. doi:10.1016/j.commatsci.2014.02.023.
9. A. Katiyar, **J.T. Foster**, H. Ouchi, and M.M. Sharma. A peridynamic formulation of pressure driven convective fluid transport in porous media. *Journal of Computational Physics*, 261:209–229, March 2014. doi:10.1016/j.jcp.2013.12.039.
8. E.E. Nishida, **J.T. Foster**, and P.E. Briseno. Constant-strain-rate testing of a G10 laminate composite through optimized Kolsky bar pulse shaping techniques. *Journal of Composite Materials*, 47(23):2895–2903, 2013. doi:10.1177/0021998312460263.
7. R. Rahman, **J.T. Foster**, and A. Haque. Molecular dynamics simulation and characterization of graphene-cellulose nanocomposites. *The Journal of Physical Chemistry A*, 117(25):5344–5353, 2013. doi:10.1021/jp402814t.
6. **J.T. Foster**. Comments on the validity of test conditions in Kolsky bar experiments of elastic-brittle materials. *Experimental Mechanics*, 52(9):1559–1563, Brief Technical Note 2012. doi:10.1007/s11340-012-9592-6.
5. **J.T. Foster**, D.J. Frew, M.J. Forrestal, E.E. Nishida, and W. Chen. Shock testing accelerometers with a Hopkinson pressure bar. *International Journal of Impact Engineering*, 46:56–61, August 2012. doi:10.1016/j.ijimpeng.2012.02.006.
4. **J.T. Foster**, S.A. Silling, and W. Chen. An energy based failure criterion for use with peridynamic states. *International Journal of Multiscale Computational Engineering*, 9(6):675–688, 2011. doi:10.1615/IntJMultCompEng.2011002407.
3. **J.T. Foster**, W. Chen, and V.K. Luk. Dynamic crack initiation toughness of 4340 steel at constant loading rates. *Engineering Fracture Mechanics*, 78(6):1264 – 1276, 2011. doi:10.1016/j.engfracmech.2011.02.019.
2. **J.T. Foster**, S.A. Silling, and W.W. Chen. Viscoplasticity using peridynamics. *International Journal for Numerical Methods in Engineering*, 81(10):1242–1258, 2010. doi:10.1002/nme.2725.
1. **J.T. Foster**, A.A. Barhorst, C.N. Wong, and M.T. Bement. Modeling Loose Joints in Elastic Structures—Experimental Results and Validation. *Journal of Vibration and Control*, 15(4):549–565, 2009. doi:10.1177/1077546307082908.

## Books Edited

1. F. Bobaru, **J.T. Foster**, P.H. Geubelle, and S.A. Silling, editors. *Handbook of Peridynamic Modeling*. Number ISBN 9781482230437 in Advances in Applied Mathematics. Chapman and Hall/CRC Press, 2016

## Book Chapters

1. **J.T. Foster**. *Handbook of Peridynamic Modeling*, chapter Constitutive Modeling in Peridynamics. Number ISBN 9781482230437 in *Advances in Applied Mathematics*. Chapman and Hall/CRC Press, 2016

## Conference Proceedings

16. M. Behzadinasab, T.J. Vogler, and **J.T. Foster**. Modeling perturbed shock wave decay in granular materials with intra-granular fracture. In *20th Biennial APS Conference on Shock Compression of Condensed Matter*, 2017.
15. H. Ouchi, S. Agrawal, **J.T. Foster**, and M.M. Sharma. Effect of small scale heterogeneity on the growth of hydraulic fractures. In *SPE Hydraulic Fracturing Technology Conference and Exhibition*. Society of Petroleum Engineers, 2017. doi:10.2118/184873-MS.
14. E.A. Lynd, **J.T. Foster**, and Q.P. Nguyen. An application of the Isogeometric Analysis Method to reservoir simulation. In *78th EAGE Conference and Exhibition*, number SPE-180110-MS. Society of Petroleum Engineers, 2016. doi:10.2118/180110-MS.
13. H. Ouchi, A. Katiyar, **J.T. Foster**, and M.M. Sharma. A Peridynamics Model for the Propagation of Hydraulic Fractures in Heterogeneous, Naturally Fractured Reservoirs. In *SPE Hydraulic Fracturing Technology Conference*, number SPE-173361-MS. Society of Petroleum Engineers, February 2015. doi:10.2118/173361-MS.
12. J.T. O’Grady and **J.T. Foster**. Peridynamic beams and plates: A non-ordinary state-based model. In *ASME 2014 International Mechanical Engineering Congress and Exposition*, number IMECE2014-39887, 2014. doi:10.1115/IMECE2014-39887.
11. J.R. York, **J.T. Foster**, E.E. Nishida, and B. Song. A novel torsional Kolsky bar for constant-strain-rate materials testing. In B. Song, D. Casem, and J. Kimberly, editors, *Dynamic Behavior of Materials, Volume 1*, Conference Proceedings of the Society for Experimental Mechanics Series. Springer New York, 2013. doi:10.1007/978-3-319-00771-7\_36.
10. **J.T. Foster** and E.E. Nishida. *A priori* pulse shaper design for constant-strain-rate tests of elastic-brittle materials. In V. Chalivendra, B. Song, and D. Casem, editors, *Dynamic Behavior of Materials, Volume 1*, Conference Proceedings of the Society for Experimental Mechanics Series, pages 379–386. Springer New York, 2013. doi:10.1007/978-1-4614-4238-7\_49.
9. **J.T. Foster**, D.J. Frew, M.J. Forrestal, E.E. Nishida, and W. Chen. Shock testing accelerometers with a Hopkinson pressure bar. *Experimental and Applied Mechanics, Volume 6*, pages 229–237, 2011. doi:10.1007/978-1-4614-0222-0\_29.
8. **J.T. Foster**, W. Chen, and V.K. Luk. Dynamic fracture initiation toughness of high strength steel alloys. In *DYMAT 2009-9th International Conference on the Mechanical and*

- Physical Behaviour of Materials under Dynamic Loading*, volume 1, pages 407–412, 2009. doi:10.1051/dymat/2009058.
7. **J.T. Foster**, S.A. Silling, and W.W. Chen. State based peridynamic modeling of dynamic fracture. In *DYMAT 2009-9th International Conference on the Mechanical and Physical Behaviour of Materials under Dynamic Loading*, volume 2, pages 1529–1535, 2009. doi:10.1051/dymat/2009216.
  6. **J.T. Foster**, S.A. Silling, and W.W. Chen. State based peridynamic modeling of dynamic fracture. In *SEM 2009 Conference on Experimental and Applied Mechanics*, number 33. SEM, 2009.
  5. **J.T. Foster**, V.K. Luk, and W. Chen. Dynamic initiation fracture toughness of high strength steel alloys. In *Proceedings of the XIth International Congress and Exposition. Orlando, Florida Society for Experimental Mechanics Inc*, volume 77, 2008.
  4. D.A. Dederman, D. Burnett, **J.T. Foster**, and J.A. Dykes. In Situ Penetration Testing of Darts with 16-Inch Mobile Gas Gun. In *Proceedings of 24th International Symposium on Ballistics*, number TB149, 2008.
  3. J.G. Averett, J.D. Cargile, **J.T. Foster**, and V.K. Luk. Oblique Perforation of Unreinforced Concrete Targets: Experiments and Numerical Simulations. In *Limited Proceedings of 77th Shock and Vibration Conference*, 2007.
  2. J.G. Averett, J.D. Cargile, **J.T. Foster**, and V.K. Luk. Projectile Deceleration Due to Perforation Through Layers of Unreinforced Concrete Targets. In *Limited Proceedings of 76th Shock and Vibration Conference*, number U-045. SAVIAC, 2006.
  1. **J.T. Foster**, A.A. Barhorst, C.N. Wong, and M.T. Bement. Modeling and Experimental Verification of Frictional Contact-Impact in Loose Bolted Joint Elastic Structures. In *Proceedings of IDETC'05*, number DETC2005-85465. IDETC, 2005.

## Technical Reports

10. Peridynamics Capabilities Review Panel. Peridynamics capabilities review panel report. SAND Report 2015-1921, Sandia National Laboratories, Albuquerque, NM and Livermore, CA, 2015.
9. J.V. Cox, G.W. Wellman, J.M. Emery, J.T. Ostien, **J.T. Foster**, T.E. Cordova, T.B. Crenshaw, A. Mota, J.E. Bishop, S.A. Silling, D.J. Littlewood, J.W. Foulk III, K.J. Dowding, K. Dion, B.L. Boyce, J.H. Robbins, and B.W. Spencer. Ductile Failure X-prize. Technical Report SAND2011-6801, Sandia National Laboratories, 2012. doi:10.2172/1029764.
8. E.E. Nishida, **J.T. Foster**, E.W. Klammerus, and D. Burnett. Dynamic behavior of shock isolation/ mitigation materials by kolsky bar experiments. Technical Report SAND2011-8266, Sandia National Laboratories, 2011.

7. **J.T. Foster**, A.E. Fortier, J.G. Averett, J.D. Cargile, V.K. Luk, and D.A. Dederman. Predictive Simulation for Perforation Through Layers of Unreinforced Concrete Targets. Technical Report SAND2008-113, Sandia National Laboratories, 2008.
6. **J.T. Foster**, A.J. Webb, A.E. Fortier, V.K. Luk, and D.A. Dederman. Penetration Code Study for Angle-of-Obliquity (AoO) Experiments into High-Strength Concrete Targets. Technical Report SAND2008-1162, Sandia National Laboratories, 2008.
5. P.D. Coleman, R.A. Bates, M.T. Buttram, S.B. Dron, **J.T. Foster**, R.J. Franco, C.O. Landron, G.M. Loubriel, J.E. Lucero, A. Mar, T.L. Martinez, F.E. Reyes, and B.J. Welch. Void Sensor for Penetrators. Technical Report SAND2007-6528, Sandia National Laboratories, 2007.
4. R.J. Fogler, J.W. Giron, J.A. Jacob, W.P. Wolfe, R.W. Greene, R.D. Tucker, A.E. Fortier, **J.T. Foster**, D.M. Van Zuiden, W.T. O'Rourke, H.D. Nguyen, E. Ollila, and J.R. Phelan. Guided miniature air-deliverable sensor dart. Technical Report SAND2007-6528, Sandia National Laboratories, 2007.
3. **J.T. Foster** and A.J. Webb. Penetration Simulations for Angle-of-Attack (AoA) Experiments into Low Strength Concrete Targets. SAND2007-5256, Sandia National Laboratories, 2007.
2. J.A. Dykes and **J.T. Foster**. Discrete-ULL 1-C Final Test Report. Technical Report SAND2007-4273, Sandia National Laboratories, 2007.
1. **J.T. Foster**. Scale Modeling of Earth Penetrators for In Situ Targets. Technical Report SAND2006-4273, Sandia National Laboratories, 2006.

## Technical Presentations

### *Invited Talks*

23. "Coupling FEM and meshfree peridynamics for the simulation of hydraulic fracturing." Ninth International Workshop Meshfree Methods for Partial Differential Equations. Bonn, Germany. September 2017.
22. "Concepts and applications of peridynamics." Babuška Forum Seminar. Institute for Computational Engineering and Science. The University of Texas at Austin. September 2017.
21. "Finite deformation constitutive models and mechanics of peridynamic mixtures." Workshop on Non-local Material Models and Concurrent Multiscale Methods. Hausdorff Research Institute for Mathematics. Bonn, Germany. April 2017.
20. "Nonlocal models for anomalous transport" Schlumberger EUREKA Fluid Mechanics Mini-Workshop. Schlumberger-Doll Research Center. July 2016.

19. "Isogeometric peridynamics." USACM Thematic Workshop on Nonlocal Models in Mathematics, Computation, Science, and Engineering. Oak Ridge National Laboratory. October 2015.
18. "A multiphysics model for hydraulic fracture simulation." Eighth International Workshop Meshfree Methods for Partial Differential Equations. Universität Bonn. September 2015.
17. "Nonlocal multiphysics for heterogeneous materials, anomalous diffusion, and fracture." Total. March 2015.
16. "Nonlocal multiphysics for heterogeneous materials, anomalous diffusion, and fracture." Graduate Aerospace Laboratories, California Institute of Technology. January 2015.
15. "Nonlocal multiphysics for heterogeneous materials, anomalous diffusion, and fracture." Institute for Computational Engineering Science, The University of Texas at Austin. October 2014.
14. "Nonlocal multiphysics for heterogeneous materials, anomalous diffusion, and fracture." University of Illinois – Urbana-Champaign, Department of Aerospace Engineering. September 2014.
13. "Nonlocal multiphysics for heterogeneous materials, anomalous diffusion, and fracture." Center for Mechanics of Solids, Structures and Materials, The University of Texas at Austin, Department of Aerospace Engineering and Engineering Mechanics. September 2014.
12. "Nonlocal multiphysics for heterogeneous materials, anomalous diffusion, and fracture." ExxonMobil - Corporate Strategic Research. July 2014.
11. "A model for nonlocal diffusion and fluid-driven fracture." USACM/IUTAM Symposium on Connecting Multiscale Mechanics to Complex Material Design. Northwestern University. May 2014.
10. "Nonlocal multiphysics for heterogeneous materials, anomalous diffusion, and fracture." The University of Texas at Austin, Department of Petroleum & Geosystems Engineering. March 2014.
9. "Nonlocal multiphysics for heterogeneous materials, anomalous diffusion, and fracture." Northwestern University, Department of Mechanical Engineering. January 2014.
8. "Peridynamics as a unified theory for heterogeneous media, anomalous porous flow, and fracture." The University of Texas at Austin, Department of Petroleum & Geosystems Engineering. October 2013.
7. "Unifying the mechanics of continuous and discontinuous media." Army Research Laboratory. February 2013.
6. "Unifying the mechanics of continuous and discontinuous media." The Johns Hopkins University, Center for Advanced Ceramics and Metallic Systems. July 2012.



5. "Unifying the mechanics of continuous and discontinuous media." Texas Tech University, Mechanical Engineering. April 2012.
4. "Hydraulic fracturing and its environmental impact: a short address of major public concerns." Presentation for the Center for Simulation, Visualization, and Real-Time Prediction participation in UTSA Earthweek 2012. April 2012.
3. "Unifying the mechanics of continuous and discontinuous media." 2011 International Workshop on Intensive Loading and its Effects. State Key Laboratory of Explosion Science and Technology, Beijing Institute of Technology. Beijing, China. December 2011.
2. "Peridynamic modeling of viscoplasticity and dynamic fracture." University of Nebraska, Engineering Mechanics. April 2010.
1. "Peridynamic modeling of viscoplasticity and dynamic fracture." University of New Mexico, Mechanical Engineering. February 2010.

### *Conferences*

30. "Finite Deformation Constitutive Models and Mechanics of Peridynamic Mixtures." (with X. Xu). 14th US National Congress on Computational Mechanics. July 2017.
29. "Modeling hydraulic fracturing with a pressure dependent cap model and peridynamics." (with J.R. York). EMI 2017. June 2017.
28. "A model for the transport of miscible fluids in the presence of anomalous diffusion." 2017 SIAM Conference on Computational Science and Engineering. February 2017.
27. "A finite deformation generalized correspondence theory for peridynamic material modeling" (with X. Xu). ASME 2016 International Mechanical Engineering Congress and Exposition. November 2016.
26. "A model for the transport of miscible fluids in the presence of anomalous diffusion." (with R. Tabasi). USACM Thematic Workshop on Isogeometric Analysis and Meshfree Methods. October 2016.
25. "A variationally consistent approach to constrained motion." 24th International Congress on Theoretical and Applied Mechanics. August 2016.
24. "A model for the transport of miscible fluids in the presence of anomalous diffusion." (Keynote, with R. Tabasi). World Congress on Computational Mechanics XII. July 2016.
23. "A peridynamic model for hydraulic fracture." (with H. Ouchi, J.R. York, M.D. Brothers, M.M. Sharma). SIAM Annual Conference. July 2016.
22. "A peridynamic model for hydraulic fracture." (with H. Ouchi, J.R. York, M.M. Sharma). Engineering Mechanics Institute Conference 2016. May 2016.

21. "Bending Failure in Peridynamic Plates." (with J. O'Grady). ASME 2015 International Mechanical Engineering Congress and Exposition. November 2015.
20. "Mesoscale Simulations Investigating the Effects of Shock Wave Stability in Granular Materials with Peridynamics." (with R. Rahman, A. Peterson, T. Vogler). 13th US National Congress on Computational Mechanics. July 2015.
19. "Regularizing numerical simulations of shear-banding using a peridynamics-based plasticity formulation." (with Md.I.H. Kahn). ASME 2014 International Mechanical Engineering Congress and Exposition. November 2014.
18. "An Ordinary State Based Plasticity Model For Peridynamics." (with J.A. Mitchell). ASME 2014 International Mechanical Engineering Congress and Exposition. November 2014.
17. "Fracture in plates and shells with peridynamic non-ordinary state-based models." Meshfree Methods for Large-Scale Computational Science and Engineering. October 2014.
16. "An Overview of the Progress of Meshfree Particle Methods: From SPH to EFG to RKPM to Meshfree Peridynamics." (with W.K. Liu, M. Bessa). Meshfree Methods for Large-Scale Computational Science and Engineering. October 2014.
15. "A nonlocal poroelastic approach to fluid driven fracture." (with J.R. York, A. Katiyar, H. Ouchi, M. Sharma). World Congress on Computational Mechanics XI. July 2014.
14. "Reproducing Continuum Dynamics". (with M. Bessa, W.K. Liu, T. Belytschko). World Congress on Computational Mechanics 2014. July 2014.
13. "A nonlocal poroelastic approach to fluid driven fracture." (with J.R. York, A. Katiyar, H. Ouchi, M. Sharma). US National Congress on Theoretical and Applied Mechanics. June 2014.
12. "Bridging the length scales by linking the atomistic model with coarser peridynamic models through molecular dynamics simulation of Polyethylene". (with R. Rahman). Mach Conference 2014. April 2014.
11. "Regularizing numerical simulations of strain-localization using a peridynamics-based plasticity formulation". (with Md.I. Kahn, D.J. Littlewood, and J.A. Mitchell). International Workshop on Computational Mechanics of Materials, IWCMM XXIII. October 2013
10. "A non-local formulation for fluid flow and mass transport in porous media based on peridynamic theory". (with A. Katiyar and M. Sharma). 12th US National Congress on Computational Mechanics. July 2013.
9. "A novel hierarchical multiscale modeling framework for polyethylene systems using Peridynamics and molecular dynamics". (with R. Rahman). 2013 Mach Conference, Annapolis, MD. April 2013.

8. "Two-Dimensional Semi-Analytic Solutions to the Linearized State-Based Peridynamic Equilibrium Equation". (with J.T. O'Grady). USACM Workshop on Nonlocal Damage and Failure: Peridynamics and other nonlocal methods. March 2013.
7. "A Peridynamics Based Hierarchical Multiscale Modeling Framework Between Continuum and Atomistic Scales". (with R. Rahman, A. Haque). USACM Workshop on Nonlocal Damage and Failure: Peridynamics and other nonlocal methods. March 2013.
6. "Lessons Learned in Modeling Ductile Failure with Peridynamics". (with D.J. Littlewood). USACM Workshop on Nonlocal Damage and Failure: Peridynamics and other nonlocal methods. March 2013.
5. "A Peridynamics Formulation of the Coupled Mechanics-Fluid Flow Problem". (with A. Katiyar, H. Ouchi, M.M. Sharma). USACM Workshop on Nonlocal Damage and Failure: Peridynamics and other nonlocal methods. March 2013.
4. "Implicit time integration of an ordinary state-based peridynamic plasticity model with isotropic hardening." (with D.J. Littlewood, J.A. Mitchell, M.L. Parks). ASME IMECE 2012. November 2012.
3. "Implicit time integration of an ordinary state-based peridynamic plasticity model with isotropic hardening." (with D.J. Littlewood, J.A. Mitchell, M.L. Parks). SiViRT Simulation and Visualization Symposium. November 2012.
2. "Peridynamic Modeling of Localization in Ductile Metals." (with D.J. Littlewood and B.L. Boyce) International Workshop on Computational Mechanics of Materials IWCMM XXII. September 2012.
1. "Viscoplasticity using peridynamics." (with S.A. Silling and W. Chen) 10th US National Congress on Computational Mechanics. July 2009.

### **Student Delivered**

10. "Modeling perturbed shock wave decay in granular materials with intra-granular fracture." (with M. Behzadinasab and T.J. Vogler) 20th Biennial Intl. Conference of the APS Topical Group on Shock Compression of Condensed Matter. July 2017.
9. "Modeling of Contact and Non-Local Friction in a Peridynamic Framework." (with J.R. York). 13th US National Congress on Computational Mechanics. July 2015.
8. "Mesh-Free Non-ordinary Peridynamic Bending." (with J. O'Grady). 13th US National Congress on Computational Mechanics. July 2015.
7. "A Peridynamic Model for Hydraulic Fracture." (with H. Ouchi, A. Katiyar, M. Sharma). 13th US National Congress on Computational Mechanics. July 2015.
6. "Peridynamic beams, plates, and shells: a non-ordinary state-based model." (with J. O'Grady). ASME 2014 International Mechanical Engineering Congress and Exposition. November 2014.

5. “Peridynamic beams, plates, and shells: a non-ordinary state-based model.” (with J. O’Grady). Society of Engineering Science 2014. October 2014.
4. “The Next Generation Model for Predicting the Growth of Complex Fracture Networks.” (with J.R. York). 2014 Hydraulic Fracturing and Sand Control Joint Industry Program Technical Review. April 2014.
3. “A peridynamic model of diffusive fluid flow through a deformable media.” (with J.R. York). 2013 SACNAS National Conference. October 2013.
2. “A complex-step method for tangent-stiffness calculation in a massively parallel computational peridynamics code.” (with M.D. Brothers and H.R. Millwater). 12th US National Congress on Computational Mechanics. July 2013.
1. “Intragranular fracture and frictional effects in granular materials under pressure-shear loading.” (with A.M. Peterson and T.J. Vogler) 18th Biennial Intl. Conference of the APS Topical Group on Shock Compression of Condensed Matter held in conjunction with the 24th Biennial Intl. Conference of the Intl. Association for the Advancement of High Pressure Science and Technology (AIRAPT). July 2013.

### Poster

3. “Modeling perturbed shock wave decay in granular materials with intra-granular fracture.” (with M. Behzadinasab and T.J. Vogler) 20th Biennial Intl. Conference of the APS Topical Group on Shock Compression of Condensed Matter. July 2017.
2. “A Peridynamic Model for Hydraulic Fracture.” (with J.R. York) USACM Thematic Workshop on Nonlocal Models in Mathematics, Computation, Science, and Engineering. Oak Ridge National Laboratory. October 2015.
1. “Intragranular fracture and frictional effects in granular materials under pressure-shear loading.” (with A.M. Peterson and T.J. Vogler) 18th Biennial Intl. Conference of the APS Topical Group on Shock Compression of Condensed Matter held in conjunction with the 24th Biennial Intl. Conference of the Intl. Association for the Advancement of High Pressure Science and Technology (AIRAPT). July 2013.

### Software

Core developer for *Peridigm* open source peridynamics software

Website: <http://peridigm.sandia.gov>

Source Code: <http://github.com/peridigm/peridigm>

Various other projects developed and contributed to

Source Codes: <http://github.com/johntfoster>

## Blog

Contains various useful code snippets, examples, and resources primarily targeted to assist in students working under my supervision and other researchers in scientific computation.

Website: <http://johntfoster.github.io/>

## Grant Proposals

***Externally Funded – PI Total: \$2.4M, co-PI Total: \$10.3M***

11. Pulse Fracture Simulation. GE Global Research, 2016. *PI* \$100,000.
10. Nonlocal and fractional order methods for near-wall turbulence, large-eddy simulation, and fluid–structure interaction. Army Research Office, 2015-2018. ONRFOA14-012, *PI* \$345,000.
9. Fiber failure modeling with peridynamics. *Subaward* from Army Research Laboratories Materials in Extreme Dynamic Environments Cooperative Research Agreement. The Johns Hopkins University, 2014. *PI* \$101,306.
8. MURI Center for Material Failure Prediction Through Peridynamics. Air Force Office of Scientific Research, 2013-2018. ONRBAA12-020, *co-PI w/ E. Madenci (Arizona), F. Bobaru (Nebraska), N. Chawla (Arizona State), Q. Du (Columbia)* Total Award \$7,500,000. Foster Award: \$959,153.
7. Predictive simulation of material failure using peridynamics-advanced constitutive modeling, verification, and validation. Air Force FY2013 Young Investigator Program. BAA-AFOSR-2012-0001, AFOSR, 2013-2015. *PI* \$360,000.
6. Towards a multiscale failure modeling paradigm for polymers: statistical coarse-graining of molecular dynamics into peridynamics. *Subaward* from Army Research Laboratories Materials in Extreme Dynamic Environments Cooperative Research Agreement. The Johns Hopkins University, 2013. *PI* \$91,925.
5. Peridynamic simulation of pressure-shear experiments on granular media. Sandia National Laboratories, 2013. *PI* \$29,071
4. Fracture Design, Placement And Sequencing In Horizontal Wells. National Energy Technology Laboratory 2012-2016, DE-FOA-0000724 *co-PI w/ M. Sharma (UT-Austin)* Total Award: \$1,592,451, Foster Award: \$275,250.
3. Statistical coarse-graining of molecular dynamics into peridynamics. *Subaward* from Army Research Laboratories Materials in Extreme Dynamic Environments Cooperative Research Agreement. The Johns Hopkins University, 2012. *PI* \$91,925.
2. Peridynamic Simulation of Granular Materials Undergoing Shock Compression. Sandia National Laboratories, 2012. *PI* \$32,597
1. Sandia X-Prize Necking Challenge. Sandia National Laboratories, 2012. *PI* \$44,700.

### *Internally Funded*

1. Application of Peridynamics to Hydraulic Fracture Modeling. The University of Texas at San Antonio – Office of the Vice President for Research, 2012. *PI* \$18,927.

## Courses Taught

PGE 334 - Reservoir Geomechanics (UT S2015, S2016)

PGE 383 - Advanced Geomechanics (UT F2014, F2015)

PGE 323M - Reservoir Engineering III (UT F2015, F2016)

Introduction to High-Performance Computing (UTSA F2012, F2013, S2014)

ME 6043 – Continuum Mechanics (UTSA F2012, F2014)

ME 4603 – Finite Element Analysis (UTSA F2011)

ME 400/500 – Numerical Methods (UNM F2010)

## Advising and related student services

### *Graduate Students (Graduated)*

#### PhD

1. James O’Grady, Ph.D.M.E. 2014 (UTSA, now at Army Research Lab)

#### MS

1. Xiao Xu, M.S.P.E. 2017
2. Eric Lynd, M.S.P.E. 2017 *co-advised with Q.Nguyen*
3. Sai Uppati, M.S.P.E. 2016
4. Amanda Peterson, M.S.M.E 2014 (UTSA)
5. Md. Imran Khan, M.S.M.E. 2014 (UTSA)
6. Michael Brothers, M.S.M.E 2013 (UTSA)
7. Jason York, M.S.M.E 2012 (UTSA)
8. Arron Werthiem, M.S.M.E 2012 (UTSA)

### *Graduate Students (In Progress)*

#### PhD Candidate

1. Jason York (PGE)

### PhD - Passed qualifying examination

1. Mingyaun Yang (PGE) *co-advised with Q.Nguyen*
2. Yu Leng (PGE)
3. Masoud Behzadinasab (EM)
4. Rambod Yousefzadeh Tabasi (EM)
5. Xiao Xu (CSEM)

### MS

1. Katy Hanson (PGE) *co-advised with E. van Oort*

### *Postdoctoral Researcher's Supervised*

1. James O'Grady, Ph.D. (UT)
2. Rezwanur Rahman, Ph.D. (UTSA/UT)
3. Shamima Yasmin, Ph.D. (UTSA)

### *Undergraduate Research Assistants*

1. P. Eric Briseno, B.S.M.E. 2013
2. Robert Knobles, B.S.M.E. 2014 (Baker-Hughes)
3. Robert Brothers
4. Jason Crandall
5. Sam Petzold – Moncrief Summer Intern

### *Graduate Committee Member*

Hisanao Ouchi, Ph.D. PGE, Yongcun Feng, Ph.D. PGE 2016  
Sarah Boukris, Ph.D. BME, Daniel Sparkman, Ph.D. M.E., 2014  
Khaled Mahmud, Saurav Kumar, M.S.M.E. 2013  
Miguel Cortina, Carlos Acosta, David Wagner, M.S.M.E 2012

### *External Committee Member*

Md. Essack, University of Cape Town, South Africa 2014

## Academic-related Professional and Public Service

### *Conferences/Workshops Organized*

1. US National Congress on Computational Mechanics 15  
**Conference Chair**  
*To be held* in Austin, TX, July 28-August 1, 2019
2. Workshop on Nonlocal Methods in Fracture  
Sponsored by the US Association for Computational Mechanics.  
*To be held* in Austin, TX, July 15-16, 2018  
<http://nmf2018.usacm.org>
3. Workshop on Isogeometric Analysis and Meshfree Methods  
Sponsored by the US Association for Computational Mechanics.  
Held at UCSD, October 10-12, 2016  
<http://iga-mf.usacm.org>
4. Workshop on Meshfree Methods for Computational Science and Engineering  
Sponsored by the US Association for Computational Mechanics.  
Held at UCF, October 27-28, 2014  
<http://mmlcse2014.usacm.org>
5. Workshop on Nonlocal Damage and Failure: Peridynamics and other nonlocal models.  
Sponsored by the US Association for Computational Mechanics.  
Held at UTSA Downtown Campus, March 11-12, 2013  
<http://ndf2013.usacm.org>

### *Mini-symposia Organized*

1. Peridynamic Modeling and Simulation. USACM USNCCM13.
2. Computational Geomechanics. EMI 2016.
3. Modeling of Material Failure Using Approaches Beyond Locality: A Celebration of Dr. Stewart Silling's 60<sup>th</sup> Birthday, ASME IMECE2016
4. Advances in Galerkin and Collocation Meshfree Methods, WCCM 2016.
5. Corrosion Damage and Stress Corrosion Cracking: Experiments, Modeling, and Computations, ASME IMECE2015



6. Advances in nonlocal/peridynamic modeling: Symposia in honor of Dr. Stewart Silling's 55<sup>th</sup> birthday, ASME IMECE2012.
7. Multiscale methods and nonlocal theories for complex material behavior. USACM US-NCCM12.
8. Multiscale Modeling of Dynamic Material Behavior, SEM Annual Conference 2014.
9. Multiscale Modeling of Dynamic Material Behavior, SEM Annual Conference 2013.
10. Multiscale Modeling of Dynamic Material Behavior, SEM Annual Conference 2012.

## Administrative and Committee Service

### *Committee Assignments*

#### **Department**

PGE Undergraduate Studies 2015-2017  
PGE Graduate Admissions Committee 2015-2017  
PGE Department Awards Committee 2014-2017  
Graduate Committee 2013-2014 (UTSA)  
Faculty Search Committee 2013-2014 (UTSA)  
Department Promotional Activities 2012-2013 (UTSA)  
Seminar 2011-2012 (UTSA)

#### **University**

Cockrell School Engineering Honors 2015-2017  
Undergraduate Research Day Planning Committee 2013-2014 (UTSA)

### *Student Organization Advisor*

Programming for Engineers & Scientists 2016  
Tau Beta Pi 2013-2014 (UTSA)  
Formula SAE Car Team 2013-2014 (UTSA)

## Reviewer For

### *Journals*

Computational Geosciences, Journal of Applied Mechanics, Computational Methods in Applied Mechanics and Engineering, Journal of Computational Particle Mechanics, Journal of

Microelectromechanical Systems, Computational Mechanics, Int. Journal of Fracture, Applied Mathematics & Computation, Int. Journal of Impact Engineering, Engineering Fracture Mechanics, Experimental Mechanics, Review of Scientific Instruments, Int. Journal of Multiscale Computational Engineering, Int. Journal of Solids and Structures, CMC: Computers, Materials, & Continua, Journal of Mechanics of Materials and Structures.

### *Books*

*Split Hopkinson (Kolsky) Bar*. W. Chen and B. Song. Springer 2010.

### *Book Proposals*

CRC Press

## Organizations

Society of Petroleum Engineers, US Association for Computational Mechanics, Pi Tau Sigma - Mechanical Engineering Honor Fraternity, Tau Beta Pi - National Engineering Honor Society, American Society of Mechanical Engineers, American Institute of Aeronautics and Astronautics, Society for Experimental Mechanics – Dynamic Behavior of Materials Technical Division Committee Member, DYMAT, American Society for Engineering Education

## Vita

John T. Foster is an associate professor in the Departments of Petroleum and Geosystems Engineering and Aerospace Engineering and Engineering Mechanics (by courtesy) at the University of Texas at Austin. He received his BS and MS in mechanical engineering from Texas Tech University and PhD from Purdue University. He is a registered Professional Engineer in the State of Texas. During his career in research he has been involved in many projects ranging from full scale projectile penetration field tests, to laboratory experiments using Kolsky bars, to modeling and simulation efforts using some of the world's largest computers. His research interests are in experimental and computational mechanics and multi-scale modeling with applications to geomechanics, impact mechanics, fracture mechanics, and anomalous transport processes. Additionally, he has interest in fundamental theoretical advancement of the peridynamic theory of solid mechanics. His teaching interests are in all areas of theoretical and computational mechanics.