

CURRICULUM VITÆ OF IVAN C. CHRISTOV

Current position: Assistant Professor

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Research Interests:

- **Complex and Nonlinear Systems:** the study of the mechanics of natural phenomena using advanced mathematical techniques and state-of-the-art computational simulations; in particular: diffusion, mixing and self-organization of granular matter, flow in heterogeneous porous media, multiphase interfacial instabilities, fluid-structure interaction, shock-formation in compressible flows, viscoelastic flows and non-Newtonian rheology, dynamics of coherent structures in nonlinear wave equations, nonlinear Fourier analysis of physical data.
- **Numerical Methods/Analysis:** the development of high-performance reliable simulation techniques for real-world applications; in particular: Godunov-type schemes for conservation laws and Hamilton–Jacobi equations, finite-volume methods for reservoir simulation, implicit conservative finite-difference and finite element methods for nonlinear diffusion and nonlinear wave equations.

Education:

- **Ph.D.** in Applied Mathematics — **Northwestern University**, Evanston, IL. (Sept. 2007–June 2011)
 - ⇒ Dissertation: “From Streamline Jumping to Strange Eigenmodes and Three-Dimensional Chaos: A Tour of the Mathematical Aspects of Granular Mixing in Rotating Tumblers.” [UMI: 3456537](https://umi.com/3456537)
 - Advisors: Julio M. Ottino and Richard M. Lueptow.
- **M.S.** in Applied Mathematics — **Northwestern University**, Evanston, IL. (Sept. 2007–June 2008)
- **M.S.** in Mathematics — **Texas A&M University**, College Station, TX. (Aug. 2005–May 2007)
- **S.B.** in Mathematics — **Massachusetts Institute of Technology**, Cambridge, MA. (Sept. 2002–June 2005)

Professional Appointments:

- **Purdue University**, West Lafayette, IN.
 - ⇒ Assistant Professor, School of Mechanical Engineering (Jan. 2016–present)
 - ⇒ Affiliate, Center for Particulate Processes and Products (CP³) (Jan. 2016–present)
 - ⇒ Affiliate, Energy Center (May 2016–present)
 - ⇒ Affiliate, Computational Interdisciplinary Graduate Program (Aug. 2016–present)
- Theoretical Division and Center for Nonlinear Studies, **Los Alamos National Laboratory**, Los Alamos, NM.
 - ⇒ Richard P. Feynman Distinguished Postdoctoral Fellow in Theory and Computing (July 2013–Dec. 2015)
 - Mentors: Eli Ben-Naim and R.E. Ecke.
- Department of Mechanical and Aerospace Engineering, **Princeton University**, Princeton, NJ.
 - ⇒ NSF Mathematical Sciences Postdoctoral Research Fellow (Sept. 2011–June 2013)
 - Mentor: Howard A. Stone.
- Reservoir Simulation Development, **ExxonMobil Upstream Research Company**, Houston, TX.
 - ⇒ Intern/Co-op (June 2008–Sept. 2008)
 - Mentor: Ilya D. Mishev.
- Acoustics Division, **U.S. Naval Research Laboratory**, Stennis Space Center, MS.
 - ⇒ Naval Research Enterprise Intern (June 2007–Aug. 2007); Engineering Tech Level I (June 2005–Aug. 2005)
 - Mentors: Pedro M. Jordan and Stanley A. Chin-Bing.

Publications:

(* indicates corresponding author(s), if applicable; ► denotes a key publication;
†/‡ denotes undergraduate/graduate researchers advised at the time.)

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[Google scholar](#)

Forthcoming:

(Preprints available on arXiv.org or upon request by email.)

4. Mengying Wang,[‡] [Ivan C. Christov](#),* “Cutting and shuffling with diffusion: Cut-offs in interval exchange maps,” submitted; [arXiv:1804.01448](#).
3. Vishal Anand,[‡] [Ivan C. Christov](#),* “On the enhancement of heat transfer and reduction of entropy generation by asymmetric slip in pressure-driven non-Newtonian microflows,” submitted; [arXiv:1803.09178](#).
2. Ivan C. Christov, “On a C -integrable equation for second sound propagation in heated dielectrics,” *Evolution Equations and Control Theory*, in revision; [arXiv:1801.09857](#).
1. R.S. Keiffer, P.M. Jordan,* [I.C. Christov](#), “Acoustic shock and acceleration wave propagation in inhomogeneous fluids,” *Mechanics Research Communications*, to appear, [doi:10.1016/j.mechrescom.2017.11.003](#); [arXiv:1711.09451](#).

In Refereed Journals:

47. Ivan C. Christov, “On the numerical solution of a variable-coefficient Burgers equation arising in granular segregation,” *Materials Physics and Mechanics* **35** (2018) 21–27, [doi:10.18720/MPM.3512018.4](#); [arXiv:1707.00034](#).
- 46. [Ivan C. Christov](#),* Vincent Cognet,[†] Tanmay C. Shidhore,[‡] Howard A. Stone,* “Flow rate–pressure drop relation for deformable shallow microfluidic channels,” *Journal of Fluid Mechanics* **841** (2018) 267–286, [doi:10.1017/jfm.2018.30](#); [arXiv:1712.02687](#).
45. Tanmay C. Shidhore,[‡] [Ivan C. Christov](#),* “Static response of deformable microchannels: a comparative modelling study,” *Journal of Physics: Condensed Matter* **30** (2018) 054002, [doi:10.1088/1361-648X/aaa226](#); [arXiv:1709.03002](#).
44. A. Demirkaya,* R. Decker, P. G. Kevrekidis, [I. C. Christov](#), A. Saxena, “Kink dynamics in a parametric ϕ^6 system: a model with controllably many internal modes,” *Journal of High Energy Physics (JHEP)* **2017** (2017) 71, [doi:10.1007/JHEP12\(2017\)071](#); [arXiv:1706.01193](#).
- 43. [Ivan C. Christov](#),* C.I. Christov, “On mechanical waves and Doppler shifts from moving boundaries,” *Mathematical Methods in the Applied Sciences* **40** (2017) 4481–4492, [doi:10.1002/mma.4318](#); [arXiv:1612.09269](#).
42. Ivan C. Christov, “Nonlinear waves in electromigration dispersion in a capillary,” *Wave Motion* **71** (2017) 42–52, [doi:10.1016/j.wavemoti.2016.06.011](#); [arXiv:1603.08277](#).
41. [Ivan C. Christov](#),* Tyler Kress,[†] Avadh Saxena, “Peakcompactons: Peaked compact nonlinear waves,” *International Journal of Modern Physics B* **31** (2017) 1742008, [doi:10.1142/S0217979217420085](#); [arXiv:1609.09542](#).
40. [Ivan C. Christov](#),* P.M. Jordan, “Comment on “Locomotion of a microorganism in weakly viscoelastic liquids,”” *Physical Review E* **94** (2016) 057101, [doi:10.1103/PhysRevE.94.057101](#).
39. Ivan C. Christov, “Nonlinear acoustics and shock formation in lossless barotropic Green–Naghdi fluids,” *Evolution Equations and Control Theory* **5** (2016) 349–365, [doi:10.3934/eect.2016008](#); [arXiv:1601.06430](#).
38. [Ivan C. Christov](#), P.M. Jordan,* S.A. Chin-Bing, A. Warn-Varnas, “Acoustic traveling waves in thermoviscous perfect gases: Kinks, acceleration waves, and shocks under the Taylor–Lighthill balance,” *Mathematics and Computers in Simulation* **127** (2016) 2–18, [doi:10.1016/j.matcom.2013.03.011](#).
37. [Ivan C. Christov](#),* C.I. Christov, “Stress retardation versus stress relaxation in linear viscoelasticity,” *Mechanics Research Communications* **72** (2016) 59–63, [doi:10.1016/j.mechrescom.2016.01.005](#); [arXiv:1512.09360](#).
36. Ivan C. Christov, “Comment on “The velocity field due to an oscillating plate in an Oldroyd-B fluid” by C.C. Hopkins and J.R. de Bruyn [Can. J. Phys. **92**, 533 (2014)],” *Canadian Journal of Physics* **93** (2015) 1651–1652, [doi:10.1139/cjp-2015-0374](#); [arXiv:1506.01470](#).
35. Ivan C. Christov, “On a hierarchy of nonlinearly dispersive generalized KdV equations,” *Proceedings of the Estonian Academy of Sciences* **64** (2015) 212–218, [doi:10.3176/proc.2015.3.02](#); [arXiv:1501.01044](#).

34. [Ivan C. Christov](#), P.M. Jordan,* “Corrections to Morse and Ingard’s variational-based treatment of weakly-nonlinear acoustics in lossless gases,” *Journal of the Acoustical Society of America* **138** (2015) 361–362, [doi:10.1121/1.4922951](#).
33. Zhong Zheng,[‡] Bo Guo, [Ivan C. Christov](#), Michael A. Celia, Howard A. Stone,* “Flow regimes for fluid injection into a confined porous medium,” *Journal of Fluid Mechanics* **767** (2015) 881–909, [doi:10.1017/jfm.2015.68](#).
32. Avinash Khare, [Ivan C. Christov](#), Avadh Saxena, “Successive phase transitions and kink solutions in ϕ^8 , ϕ^{10} , and ϕ^{12} field theories,” *Physical Review E* **90** (2014) 023208, [doi:10.1103/PhysRevE.90.023208](#); [arXiv:1402.6766](#).
- 31. [Ivan C. Christov](#),* Howard A. Stone, “Shear dispersion in dense granular flows,” *Granular Matter* **16** (2014) 509–515, [doi:10.1007/s10035-014-0498-0](#); [arXiv:1402.6765](#).
30. [Ivan C. Christov](#), Richard M. Lueptow, Julio M. Ottino, Rob Sturman, “A Study in Three-Dimensional Chaotic Dynamics: Granular Flow and Transport in a Bi-Axial Spherical Tumbler,” *SIAM Journal on Applied Dynamical Systems* **13** (2014) 901–943, [doi:10.1137/130934076](#); [arXiv:1404.4660](#).
29. Zhong Zheng,[‡] [Ivan C. Christov](#), Howard A. Stone,* “Influence of heterogeneity on second-kind self-similar solutions for viscous gravity currents,” *Journal of Fluid Mechanics* **747** (2014) 218–246, [doi:10.1017/jfm.2014.148](#).
28. [Ivan C. Christov](#), P.M. Jordan,* “On an instability exhibited by the ballistic-diffusive heat conduction model of Xu and Hu,” *Proceedings of the Royal Society A* **470** (2014) 20130557, [doi:10.1098/rspa.2013.0557](#).
27. Talal T. Al-Housseiny,*[‡] [Ivan C. Christov](#), Howard A. Stone, “Two-Phase Fluid Displacement and Interfacial Instabilities Under Elastic Membranes,” *Physical Review Letters* **111** (2013) 034502, [doi:10.1103/PhysRevLett.111.034502](#).
- 26. [Ivan C. Christov](#), “On a difficulty in the formulation of initial and boundary conditions for eigenfunction expansion solutions for the start-up of fluid flow,” *Mechanics Research Communications* **51** (2013) 86–92, [doi:10.1016/j.mechrescom.2013.05.005](#); [arXiv:1305.5999](#).
25. Conor P. Schlick, [Ivan C. Christov](#), Paul B. Umbanhowar, Julio M. Ottino, Richard M. Lueptow,* “A mapping method for distributive mixing with diffusion: Interplay between chaos and diffusion in time-periodic sine flow,” *Physics of Fluids* **25** (2013) 052102, [doi:10.1063/1.4803897](#).
24. Marissa K. Krotter,[†] [Ivan C. Christov](#), Julio M. Ottino, Richard M. Lueptow,* “Cutting and Shuffling a Line Segment: Mixing by Interval Exchange Transformations,” *International Journal of Bifurcation and Chaos* **22** (2012) 1230041, [doi:10.1142/S0218127412300418](#); [arXiv:1208.2052](#). * [Cover article](#).
- 23. [Ivan C. Christov](#),* Howard A. Stone, “Resolving a paradox of anomalous scalings in the diffusion of granular materials,” *Proceedings of the National Academy of Sciences of the USA* **109** (2012) 16012–16017, [doi:10.1073/pnas.1211110109](#).
22. Florent Pignatel, Caroline Asselin,[†] Lucas Krieger,[†] [Ivan C. Christov](#), Julio M. Ottino, Richard M. Lueptow,* “Parameters and scalings for dry and immersed granular flowing layers in rotating tumblers,” *Physical Review E* **86** (2012) 011304, [doi:10.1103/PhysRevE.86.011304](#).
21. [Ivan C. Christov](#), “Hidden solitons in the Zabusky–Kruskal experiment: Analysis using the periodic, inverse scattering transform,” *Mathematics and Computers in Simulation* **82** (2012) 1069–1078, [doi:10.1016/j.matcom.2010.05.021](#); [arXiv:0910.3345](#).
20. Gabriel Juarez, [Ivan C. Christov](#), Julio M. Ottino, Richard M. Lueptow,* “Mixing by cutting and shuffling 3D granular flow in spherical tumblers,” *Chemical Engineering Science* **73** (2012) 195–207, [doi:10.1016/j.ces.2012.01.044](#).
19. [Ivan C. Christov](#),* P.M. Jordan, “Comments on: “Starting solutions for some unsteady unidirectional flows of a second grade fluid,” [Int. J. Eng. Sci. 43 (2005) 781],” *International Journal of Engineering Science* **51** (2012) 326–332, [doi:10.1016/j.ijengsci.2011.10.012](#); [arXiv:1111.4464](#).
18. Richard S. Keiffer, R. McNorton, P.M. Jordan, [Ivan C. Christov](#),* “Dissipative acoustic solitons under a weakly-nonlinear, Lagrangian-averaged Euler- α model of single-phase lossless fluids,” *Wave Motion* **48** (2011) 782–790, [doi:10.1016/j.wavemoti.2011.04.013](#).

- 17. Ivan C. Christov, Julio M. Ottino, Richard M. Lueptow,* “From streamline jumping to strange eigenmodes: Bridging the Lagrangian and Eulerian pictures of the kinematics of mixing in granular flows,” *Physics of Fluids* **23** (2011) 103302, doi:10.1063/1.3653280.
- 16. Ivan C. Christov, “Comments on: “Energetic balance for the Rayleigh–Stokes problem of an Oldroyd-B fluid” [Nonlinear Anal. RWA 12 (2011) 1],” *Nonlinear Analysis: Real Words Applications* **12** (2011) 3687–3690, doi:10.1016/j.nonrwa.2011.06.025; arXiv:1107.2947.
- 15. Ivan C. Christov, Richard M. Lueptow, Julio M. Ottino,* “Stretching and folding versus cutting and shuffling: An illustrated perspective on mixing and deformations of continua,” *American Journal of Physics* **79** (2011) 359–367, doi:10.1119/1.3533213; arXiv:1010.2256.
- 14. Ivan C. Christov, C.I. Christov, “An improved formula for the frequency shift due to a variable phase speed,” *Journal of Physics A: Mathematical and Theoretical* **44** (2011) 112001, doi:10.1088/1751-8113/44/11/112001.
- 13. Ivan C. Christov, “Stokes’ first problem for some non-Newtonian fluids: Results and mistakes,” *Mechanics Research Communications* **37** (2010) 717–723, doi:10.1016/j.mechrescom.2010.09.006; arXiv:1009.4416.
- 12. Ivan C. Christov,* C.I. Christov, “Comment on “On a class of exact solutions of the equations of motion of a second grade fluid” by C. Fetecău and J. Zierep (Acta Mech. 150, 135–138, 2001),” *Acta Mechanica* **215** (2010) 25–28, doi:10.1007/s00707-010-0300-2; arXiv:1003.2188.
- 11. Ivan C. Christov,* P.M. Jordan, “On the Propagation of Second-Sound in Nonlinear Media: Shock, Acceleration and Traveling Wave Results,” *Journal of Thermal Stresses* **33** (2010) 1109–1135, doi:10.1080/01495739.2010.517674.
- 10. Ivan C. Christov, Julio M. Ottino, Richard M. Lueptow,* “Chaotic mixing via streamline jumping in quasi-two-dimensional tumbled granular flows,” *Chaos* **20** (2010) 023102, doi:10.1063/1.3368695.
- 9. Ivan C. Christov, Julio M. Ottino, Richard M. Lueptow,* “Streamline jumping: A mixing mechanism,” *Physical Review E* **81** (2010) 046307, doi:10.1103/PhysRevE.81.046307.
- 8. Ivan Christov, “Internal solitary waves in the ocean: Analysis using the periodic, inverse scattering transform,” *Mathematics and Computers in Simulation* **80** (2009) 192–201, doi:10.1016/j.matcom.2009.06.005; arXiv:0708.3421.
- 7. Ivan Christov, P.M. Jordan,* “Shock and traveling wave phenomena on an externally damped, non-linear string,” *International Journal of Non-Linear Mechanics* **44** (2009) 511–519, doi:10.1016/j.ijnonlinmec.2008.12.004.
- 6. Ivan Christov, Bojan Popov,* “New non-oscillatory central schemes on unstructured triangulations for hyperbolic systems of conservation laws,” *Journal of Computational Physics* **227** (2008) 5736–5757, doi:10.1016/j.jcp.2008.02.007.
- 5. Ivan Christov, P.M. Jordan,* “Shock bifurcation and emergence of diffusive solitons in a nonlinear wave equation with relaxation,” *New Journal of Physics* **10** (2008) 043027, doi:10.1088/1367-2630/10/4/043027.
- 4. Ivan Christov,* C.I. Christov, “Physical dynamics of quasi-particles in nonlinear wave equations,” *Physics Letters A* **372** (2008) 841–848, doi:10.1016/j.physleta.2007.08.038; arXiv:nlin/0612005.
- 3. Ivan Christov, C.I. Christov, P.M. Jordan,* “Modeling weakly nonlinear acoustic wave propagation,” *The Quarterly Journal of Mechanics and Applied Mathematics* **60** (2007) 473–495, doi:10.1093/qjmam/hbm017.
 ⇒ See also: Corrigendum and Addendum, *ibid.* **68** (2015) 231–233, doi:10.1093/qjmam/hbu023.
- 2. Ivan Christov, C.I. Christov, P.M. Jordan,* “Cumulative Nonlinear Effects in Acoustic Wave Propagation,” *CMES: Computer Modeling in Engineering & Sciences* **17** (2007) 47–54, doi:10.3970/cmescs.2007.017.047.
- 1. Ivan Christov, P.M. Jordan,* C.I. Christov, “Nonlinear acoustic propagation in homentropic perfect gases: A numerical study,” *Physics Letters A* **353** (2006) 273–280, doi:10.1016/j.physleta.2005.12.101.

In Refereed Proceedings/Edited Volumes:

9. R. V. Radomskiy, E. V. Mrozovskaya, V. A. Gani,* I. C. Christov, “Topological defects with power-law tails,” in *Proceedings of International Conference on Particle Physics and Astrophysics* (Moscow, Russian Federation), eds. M. Skorokhvatov, S. Rubin, *Journal of Physics: Conference Series* **798** (2017) 012087, doi:[10.1088/1742-6596/798/1/012087](https://doi.org/10.1088/1742-6596/798/1/012087); arXiv:[1611.05634](https://arxiv.org/abs/1611.05634).
8. Ivan C. Christov,* Richard M. Lueptow, Julio M. Ottino, Rob Sturman, “A Parametric Study of Mixing in a Granular Flow a Biaxial Spherical Tumbler,” *Dynamical Systems: Modelling*, ed. J. Awrejcewicz, Springer Proceedings in Mathematics & Statistics **181** (2016) 143–154, doi:[10.1007/978-3-319-42402-6_13](https://doi.org/10.1007/978-3-319-42402-6_13); arXiv:[1510.01751](https://arxiv.org/abs/1510.01751).
7. Ivan C. Christov, “Wave Solutions,” invited contribution in *Encyclopedia of Thermal Stresses* (2014), ed. R.B. Hetnarski, Springer, 6495–6506, doi:[10.1007/978-94-007-2739-7_33](https://doi.org/10.1007/978-94-007-2739-7_33); arXiv:[1208.3622](https://arxiv.org/abs/1208.3622).
6. Ivan Christov, Ilya D. Mishev, Bojan Popov, “Finite volume methods on unstructured Voronoi meshes for hyperbolic conservation laws,” in *Hyperbolic Problems: Theory, Numerics and Applications*, eds. E. Tadmor, J.-G. Liu, A.E. Tzavaras, *Proceedings of Symposia in Applied Mathematics* **67** (2009) 507–516.
5. I.C. Christov, C.I. Christov, “On the Inertial Force Experienced by a Solid Body Undergoing Rotation about Two Axes,” in *Proceedings of the 1st International Conference on Applications of Mathematics in Technical and Natural Sciences (Sozopol, Bulgaria)*, eds. M.D. Todorov, C.I. Christov, *AIP Conference Proceedings* **1186** (2009) 226–230, doi:[10.1063/1.3265333](https://doi.org/10.1063/1.3265333).
4. Ivan Christov, C.I. Christov, “The coarse-grain description of interacting sine-Gordon solitons with varying widths,” in *Dynamical Systems and Differential Equations: Proceedings of the 7th AIMS International Conference (Arlington, TX, USA)*, eds. X. Hou, X. Lu, A. Miranville, J. Su, J. Zhu, *Discrete and Continuous Dynamical Systems (DCDS) Supplement* (2009) 171–180, doi:[10.3934/proc.2009.2009.171](https://doi.org/10.3934/proc.2009.2009.171).
3. Ivan Christov, “Thermal shock waves under a Maxwell–Cattaneo model with temperature-dependent conductivity,” *Proceedings of The Eighth International Congress on Thermal Stresses* (2009), eds. M. Ostoja-Starzewski, P. Marzocca, vol. II, 525–528, doi:[10.13140/RG.2.1.4704.1047/1](https://doi.org/10.13140/RG.2.1.4704.1047/1).
2. James A. Hawkins, Alex Warn-Varnas, Ivan Christov, “Fourier, Scattering, and Wavelet Transforms: Applications to Internal Gravity Waves with Comparisons to Linear Tidal Data,” in *Nonlinear Time Series Analysis in the Geosciences: Applications to Climatology, Geodynamics and Solar-Terrestrial Physics*, eds. R.V. Donner, S.M. Barbosa, Springer Lecture Notes in Earth Sciences **112** (2008) 223–244, doi:[10.1007/978-3-540-78938-3_10](https://doi.org/10.1007/978-3-540-78938-3_10).
1. Stanley A. Chin-Bing, Alex C. Warn-Varnas, David B. King, Ivan Christov, “Using Ocean Acoustics to Improve Large Shallow-water Soliton Simulations,” *Proceedings of MTS/IEEE Oceans 2007 Conference* (2007) 1754–1758, doi:[10.1109/OCEANS.2007.4449377](https://doi.org/10.1109/OCEANS.2007.4449377).

Other:

12. Ivan C. Christov, Michail D. Todorov,* Sanichiro Yoshida, “Editorial: Special issue of Wave Motion — “Mathematical modeling and physical dynamics of solitary waves: From continuum mechanics to field theory,”” *Wave Motion* **71** (2017) 1–4, doi:[10.1016/j.wavemoti.2016.09.007](https://doi.org/10.1016/j.wavemoti.2016.09.007).
11. Ivan C. Christov,* Hari S. Viswanathan, “Introduction: energy and the subsurface,” *Philosophical Transactions of the Royal Society A* **374** (2016) 20150430, doi:[10.1098/rsta.2015.0430](https://doi.org/10.1098/rsta.2015.0430).
10. Ivan Christov, Pedro Jordan, “Maxwell’s “other” equations,” *The Royal Society Publishing Blog* (September 22, 2015), <http://blogs.royalsociety.org/publishing/maxwells-other-equations/>.
9. Ivan Christov, “Kinematic Waves,” *LinkedIn Pulse* (August 11, 2015), <https://lnkd.in/ewdQE5>.
8. Ivan C. Christov, “From Streamline Jumping to Strange Eigenmodes and Three-Dimensional Chaos: A Tour of the Mathematical Aspects of Granular Mixing in Rotating Tumblers,” Ph.D. Thesis (2011), Northwestern University, Evanston, Illinois. UMI : [3456537](https://www.umi.com/3456537)
7. Julio M. Ottino, Richard M. Lueptow, Ivan C. Christov, “DynSyst_Special_Topics: A Dynamical Systems Approach to Mixing and Segregation of Granular Matter,” *Proceedings of the 2011 NSF Engineering Research and Innovation Conference*, January 4–7, 2011, Atlanta, Georgia.

6. [Ivan Christov](#), Ilya D. Mishev, Bojan Popov, “Finite Volume Methods on Unstructured Voronoi Meshes for Hyperbolic Conservation Laws,” Preprint [IAMCS-2008-030](#) (2008), Institute for Applied Mathematics and Computational Science, Texas A&M University.
5. [Ivan Christov](#), Bojan Popov, “A Jiang–Tadmor Scheme on Unstructured Triangulations,” Technical Report [ISC-06-05-MATH](#) (2006), Institute for Scientific Computation, Texas A&M University.
4. Jeff Baker, [Ivan Christov](#), Simona Dediu, Elana Fertig, Wanda Strychalski, “Properties of a Gradient Descent Algorithm for Active Vibration Control,” *Proceedings of the Twelfth Industrial Mathematical and Statistical Modeling Workshop for Graduate Students*, eds. A. Chertock, M.A. Haider, M.S. Olufsen, R.C. Smith, Technical Report [CRSC-TR06-23](#) (2006) 89–108, Center for Research in Scientific Computation, North Carolina State University.
3. Ivan Christov, “Multiscale Image Edge Detection,” *1.130/18.327, Spring 2004, Final Project* (2004), [doi:10.13140/RG.2.1.2213.7363](#).
2. Ivan Christov, “Shock Waves in a Tube,” *MIT Undergraduate Journal of Mathematics* 7 (2005) 23–34.
1. Ivan Christov, “Integrating the Normal Curve,” *FOLIO: Literary Journal of the Louisiana School for Math Science and the Arts* (2002) 5–8, [doi:10.13140/RG.2.1.4441.9609](#).

Grants & Funding:

Active:

- “Microscale Fluid–Structure Interactions: Towards a Predictive Theory of Their Dynamic Response”
 - ⇒ Role: PI; estimated duration: Aug. 2017 to Aug. 2020.
 - ⇒ Funding: NSF grant [CBET-1705637](#), US\$299,460.
- “Controlling Particle Migration Using Geometry and Hydrodynamic”
 - ⇒ Role: PI; estimated duration: Sept. 2017 to Aug. 2019.
 - ⇒ Funding: ACS PRF grant PRF# 57371-DNI9, US\$110,000.

Completed:

- Richard P. Feynman Distinguished Postdoctoral Fellowship in Theory and Computing: “Mixing and Diffusion in Granular Flows”
 - ⇒ Role: PI; Co-PIs: Eli Ben-Naim, R.E. Ecke; started July 2013, completed December 2015.
 - ⇒ Funding: LANL LDRD grant 20130792PRD2, US\$621,000 (amount projected through June 2016); personal share: \gtrsim 90%.
- Mathematical Sciences Postdoctoral Research Fellowship: “Particle dispersal in dense granular flows: Theory and experiment”
 - ⇒ Role: PI; started Sept. 2011, completed June 2013 (formal completion Aug. 2015).
 - ⇒ Funding: NSF grant [DMS-1104047](#), US\$135,000.

Early-Career Conference Travel Awards:

- Purdue Research Foundation 2017 International Travel Grant to attend the International Summer School-Conference “Advanced Problems in Mechanics,” St. Petersburg, Russia; amount: \$2,000.
- 9th AIMS International Conference on Dynamical Systems, Differential Equations and Applications funded through NSF grant DMS-1204497; amount: \$200.
- 2011 International Congress on Industrial and Applied Mathematics (ICIAM) funded through NSF grant DMS-1004827; amount: \$1,500.
- 2011 SIAM Conference on Applications of Dynamical Systems; amount: \$550.
- 7th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory funded through NSF grant DMS-1048816.

- 63rd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society funded through The Graduate School at Northwestern University; amount: \$500.
- 62nd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society funded through The Graduate School at Northwestern University; amount: \$500.
- 6th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory funded through NSF grant DMS-0840362.
- 61st Annual Meeting of the Division of Fluid Dynamics of the American Physical Society funded through The Graduate School at Northwestern University; amount: \$500.
- 7th AIMS International Conference on Dynamical Systems, Differential Equations and Applications funded through NSF grant DMS-0738356; amount: \$355.
- 5th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory funded through NSF grant DMS-0631857.
- Dynamics Days 2007: an International Conference on Chaos and Nonlinear Dynamics; amount: \$500.
- 2006 SIAM Conference on Analysis of Partial Differential Equations and Annual Meeting; amount: \$500.

Awards & Honors:

- Best Student Paper Award, 7th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory.
- Best Student Paper Award, 6th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory.
- Walter P. Murphy Fellowship for graduate study at Northwestern University. (2007–2008, 2008–2009 and 2009–2010 academic years)
- Regents Fellowship for graduate study at Texas A&M University. (2005–2006 academic year)

Teaching & Mentorship:

- Thesis advisor:
 - PhD:
 1. Vishal Anand (School of Mechanical Engineering, Purdue University).
 2. Daihui Lu (School of Mechanical Engineering, Purdue University).
 3. Xiaojia Wang (School of Mechanical Engineering, Purdue University).
 - MSME:
 1. Tanmay C. Inamdar (School of Mechanical Engineering, Purdue University); Defended/Graduated: Spring 2018; Thesis “Unsteady Fluid–Structure Interactions in Soft-Walled Microchannels.”
 2. Aditya Ghodgaonkar (School of Mechanical Engineering, Purdue University).
 3. Tanmay C. Shidhore (School of Mechanical Engineering, Purdue University); Defended: Fall 2017; Graduated: Spring 2018; Thesis: “Computational analysis of fluid-structure interactions in shallow, deformable microchannels.”
 4. Mengying Wang (School of Mechanical Engineering, Purdue University); Defended/Graduated: Spring 2018; Thesis “Mixing by Cutting and Shuffling a Line Segment: The Effect of Incorporating Diffusion.”
- Thesis committee membership:
 - PhD:
 1. Rajath Kantharaj (School of Mechanical Engineering, Purdue University). Advisors: Timothy S. Fisher and Amy M. Marconnet.
 2. Maathangi Ganesh (School of Mechanical Engineering, Purdue University). Advisor: Sadegh Dabiri.

3. Tianqi Guo (School of Mechanical Engineering, Purdue University). Advisors: Pavlos P. Vlachos and Arezoo M. Ardekani.
4. Prateek Gupta (School of Mechanical Engineering, Purdue University). Advisor: Carlo Scalo.
5. Nitya Kamdar (School of Mechanical Engineering, Purdue University). Advisor: Nicole L. Key.
6. Manish Kumar (School of Mechanical Engineering, Purdue University). Advisor: Arezoo M. Ardekani.
7. Kunal S. Pardikar (School of Mechanical Engineering, Purdue University). Advisor: Carl R. Wassgren.
8. Aminur Rahman (Department of Mathematical Sciences, New Jersey Institute of Technology). Advisor: Denis Blackmore (NJIT); Defended: Spring 2017; Thesis: “Qualitative Modeling and Analysis of Chaotic Logical Circuits and Walking Droplets: A Dynamical Systems Approach.”
9. Lachlan Smith (Department of Mechanical & Aerospace Engineering, Monash University, Australia). Advisor: Murray Rudman (Monash); Defended: Summer 2016; Thesis: “Chaotic Advection in a Three-dimensional Volume-preserving Potential Flow.”
10. Deepti Tewari (School of Mechanical Engineering, Purdue University). Advisor: Partha P. Mukherjee.

- Undergraduates mentored at Purdue University:

- Summer Undergraduate Research Fellowship (SURF) program: Julia Meyer (2017), Zihao Lin & Zoë S. Penko (2018).
- Purdue-India Initiative Undergraduate Research Experience (PURE): Sanketh Saravanan (2017), Joshua David JR (2018).
- S.N. Bose Scholars (SERB-IUSSTF): Pranay Nagrani (2018).
- *Ad-hoc* or undergraduate research credit: Sibi Chandrasekar (Spring 2017, Spring 2018); Julia Meyer (Fall 2017, Spring 2018).

- Undergraduates mentored elsewhere:

- Los Alamos National Laboratory post-baccalaureate student employee: co-directed his research on interactions of compact waves (“compactons”) in nonlinear evolution equations with Hamiltonian structure. (Spring 2014–Summer 2015)
- Center for Nonlinear Studies (Los Alamos National Laboratory) summer undergraduate research assistant: co-directed his research on simulation of interactions of peaked compact waves under a theory of dispersion in materials with an inherent length scale, see publication #41. (Summer 2014)
- Princeton University visiting student: co-directed on theory and experimental measurements flow in deformable microchannels, see publication #46. (Summer 2012)
- Northwestern University undergraduate student: co-supervised the research on mixing of a line segment by cutting and shuffling, see publication #24. (2009-2010 and 2010–2011 academic years)

- Courses taught at Purdue University:

- ⇒ ME 309 – Fluid Mechanics (Spring 2017, Fall 2017, Spring 2018 – *Lead*).
- ⇒ ME 509 – Intermediate Fluid Mechanics (Spring 2016, Fall 2016, Fall 2018).

- Course taught elsewhere:

- ⇒ 4-hour seminar course entitled “Chaos in Simple Systems” at the annual MIT Splash weekend (Nov. 23, 2003).
- ⇒ 5-hour seminar course entitled “Chaos: An Introduction to Dynamical Systems” at the annual MIT Splash weekend (Nov. 23–24, 2002).

Talks & Presentations:

Invited Seminars & Colloquia:

- **May 8, 2018** “Microscale fluid–structure interactions: Theory and simulation of static response,” Microfluidics Seminar, National Institute of Standards and Technology (NIST), Gaithersburg, Maryland.
- **November 3, 2017** “Transport Phenomena in Flows of Granular Materials,” Center for Particulate Products and Processes Seminar, Purdue University, West Lafayette, Indiana.

- **October 12, 2017** “Multiple-scale asymptotics of plane waves in media with variable phase speed,” Seminar, Department of Physics, Clark Atlanta University, Atlanta, Georgia.
- **October 9, 2017** “Mathematical and computational modeling of microfluidic fluid–structure interactions,” Seminar, Department of Mathematics, Savannah State University, Savannah, Georgia.
- **April 20, 2017** “Topics in low Re flow: From microfluidic fluid–structure interactions to multiphase flow in hydraulic fractures,” Special Seminar, Department of Mechanical & Industrial Engineering, New Jersey Institute of Technology, Newark, New Jersey.
- **December 2, 2016** “Topics in low Re flow: From microfluidic fluid–structure interactions to proppant transport in hydraulic fractures,” Computational & Applied Mathematics Lunch Seminar, Department of Mathematics, Purdue University, West Lafayette, Indiana.
- **March 11, 2016** “Multiple-scale asymptotics of plane waves in media with variable phase speed,” Applied Mathematics Colloquium, Department of Mathematical Sciences, New Jersey Institute of Technology, Newark, New Jersey.
- **April 7, 2015** “Low Reynolds Number Flows Through Shaped and Deformable Conduits,” MAE Colloquium, Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, New York.
- **March 5, 2015** “Low Reynolds number flows through shaped and deformable conduits,” Colloquium, Department of Mathematics & Statistics, Texas Tech University, Lubbock, Texas.
- **February 23, 2015** “Transport phenomena in energy applications: The interaction between flow and shape at small scales,” ERE Spring Seminar, Department of Energy Resources Engineering, Stanford University, Stanford, California.
- **February 17, 2015** “Low Reynolds number flows through shaped and deformable conduits,” Faculty Candidate Seminar, School of Mechanical Engineering, Purdue University, West Lafayette, Indiana.
- **February 12, 2015** “Transport phenomena in energy applications: Fluid-structure interactions and beyond,” Colloquium, Department of Mathematics & Statistics, The University of New Mexico, Albuquerque, New Mexico.
- **February 10, 2015** “Low Reynolds number flows through shaped and deformable conduits,” Seminar, Department of Mechanical Engineering, Iowa State University, Ames, Iowa.
- **February 5, 2015** “Low Reynolds number flows through shaped and deformable conduits,” Colloquium, Department of Mathematics, University of British Columbia, Vancouver, Canada.
- **February 2, 2015** “Transport Phenomena in Energy Applications: Fluid-structure Interactions and Beyond,” AMS Lecture, Applied Mathematics & Statistics, Colorado School of Mines, Golden, Colorado.
- **January 29, 2015** “Low Reynolds number flows through shaped and deformable conduits,” MechSE Seminar, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, Illinois.
- **January 22, 2015** “Low Reynolds number flows through shaped and deformable conduits,” Colloquium, Department of Mathematics, Temple University, Philadelphia, Pennsylvania.
- **January 15, 2015** “Low Reynolds number flows through shaped and deformable conduits,” Special Colloquium, Department of Mathematics, UC Riverside, Riverside, California.
- **November 21, 2014** “Low Reynolds number flows through shaped and deformable conduits,” AMS Colloquium, Applied Mathematics & Statistics, Colorado School of Mines, Golden, Colorado.
- **October 13, 2014** “Low Reynolds number flows through shaped and deformable conduits,” Applied Math Seminar, Department of Mathematics & Statistics, The University of New Mexico, Albuquerque, New Mexico.
- **September 26, 2014** “Low Reynolds number flows through shaped and deformable conduits,” ME Seminar, Department of Mechanical Engineering, The University of New Mexico, Albuquerque, New Mexico.
- **December 11, 2013** “Chaotic mixing of granular materials,” Applied and Computational Mathematics Seminar, Department of Mathematics, University of Wisconsin–Madison, Madison, Wisconsin.

- **November 19, 2013** “Transport phenomena in flows of granular materials,” Mathematical Sciences Colloquium, Department of Mathematical Sciences, Rensselaer Polytechnic Institute, Troy, New York.
- **November 7, 2013** “Transport phenomena in flows of granular materials,” Applied Math Lab Seminar, Courant Institute of Mathematical Sciences, Department of Mathematics, New York University, New York, New York.
- **October 18, 2013** “Transport phenomena in flows of granular materials,” Department of Mathematics Colloquium, University of Nebraska–Lincoln, Lincoln, Nebraska.
- **October 17, 2013** “Two case studies in nonlinear Fourier analysis: Ocean internal solitary waves and the Zabusky–Kruskal solitons,” Continuum Mechanics Seminar, Department of Mathematics, University of Nebraska–Lincoln, Lincoln, Nebraska.
- **April 15, 2013** “Diffusion in flows of granular materials,” Fluid Mechanics Seminar, Department of Mathematical Sciences, New Jersey Institute of Technology, Newark, New Jersey.
- **March 7, 2013** “Diffusion in flows of granular materials,” Ergodic Theory & Statistical Mechanics Seminar, Department of Mathematics, Princeton University, Princeton, New Jersey.
- **March 4, 2013** “Transport phenomena in flows of granular materials,” Faculty Candidate Seminar, George W. Woodruff School of Mechanical Engineering, Georgia Tech, Atlanta, Georgia.
- **March 1, 2013** “Transport phenomena in flows of granular materials,” Seminar, Department of Mechanical and Aerospace Engineering, UC San Diego, San Diego, California.
- **February 22, 2013** “Transport phenomena in flows of granular materials,” Special Applied Mathematics Colloquium, Department of Applied Physics and Applied Mathematics, Columbia University, New York, New York.
- **February 12, 2013** “Transport phenomena in flows of granular materials,” Seminar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos, New Mexico.
- **February 6, 2013** “Transport phenomena in flows of granular materials,” Numerical Analysis Seminar, Department of Mathematics, Texas A&M University, College Station, Texas.
- **January 23, 2013** “Transport Phenomena in Flows of Granular Materials,” Special Mathematics Colloquium, Florida State University, Tallahassee, Florida.
- **January 15, 2013** “Transport phenomena in flows of granular materials,” Special Seminar, North Carolina State University, Raleigh, North Carolina.
- **December 11, 2012** “Transport phenomena in flows of granular materials,” Analysis, Dynamics, and Applications Seminar, The University of Arizona, Tucson, Arizona.
- **October 18, 2012** “Transport phenomena in flows of granular materials,” Mechanical Engineering Thursday Seminar, The Johns Hopkins University, Baltimore, Maryland.
- **October 3, 2012** “Two case studies in nonlinear Fourier analysis: Ocean internal solitary waves and the Zabusky–Kruskal solitons,” Solitons, Coherence and Geometry Seminar, Institute for Nuclear Research and Nuclear Energy at the Bulgarian Academy of Sciences, Sofia, Bulgaria.
- **October 2, 2012** “Transport phenomena in flows of granular materials,” Parallel Algorithms and Scientific Computations Seminar, Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences, Sofia, Bulgaria.
- **September 12, 2012** “Diffusion and Dispersion in Flows of Granular Materials,” Oxford Collaborative Development Workshop, Oxford Centre for Collaborative Applied Mathematics, University of Oxford, United Kingdom.
- **April 18, 2012** “Chaotic dynamics in granular flows from the Eulerian and Lagrangian perspectives,” Mechanical and Industrial Engineering Colloquium, New Jersey Institute of Technology, Newark, New Jersey.
- **March 12, 2012** “Chaotic dynamics in granular flows from the Eulerian and Lagrangian perspectives,” MIME Seminar Series, Oregon State University, Corvallis, Oregon.
- **October 6, 2010** “Mixing Things Up with Dynamical Systems,” Department of Mathematics and Department of Physics Seminar Series, Elmhurst College, Illinois.

- **September 10, 2010** “Two case studies in nonlinear Fourier analysis: Ocean internal solitary waves and the Zabusky–Kruskal solitons,” Department of Chemical and Biological Engineering Seminar, The University of Sheffield, United Kingdom.
- **May 6, 2010** “Mixing by cutting and shuffling in tumbled granular flows,” Fluids and MHD Seminar, Department of Applied Mathematics, University of Leeds, United Kingdom.
- **April 27, 2007** Ivan Christov, Bojan Popov, Peter Popov, “Nonoscillatory Central Schemes on Unstructured Meshes and Applications,” ExxonMobil Upstream Research Company, Houston, Texas.
- **March 1, 2007** “A Short Introduction to the Theory and Numerics of First-Order Hyperbolic PDEs,” Graduate Student Seminar, Department of Mathematics, Texas A&M University, College Station, Texas.
- **November 2, 2006** “Nonoscillatory Central Schemes on Unstructured Triangulations for Hyperbolic Systems of Conservation Laws,” Department of Mathematics Colloquium, University of Louisiana at Lafayette.
- **August 17, 2005** “Solitary Internal Waves in the Ocean: The Scattering Transform Perspective,” Acoustic Simulation, Measurements and Tactics Branch, Naval Research Laboratory, Stennis Space Center, Mississippi.
- **August 5, 2005** “Nonlinear Fourier Analysis: The Direct & Inverse Scattering Transforms for the Korteweg–de Vries Equation,” Acoustics Division, Naval Research Laboratory, Stennis Space Center, MS and Washington, DC.

Conferences:

- **January 4, 2018** (Contributed) Mengying Wang, Ivan C. Christov, “Cutting and Shuffling with Diffusion: Cut-offs in Interval Exchange Maps,” Poster Session, Dynamics Days 2018, Denver, Colorado.
- **December 9, 2017** (Invited) Ivan C. Christov, Tanmay C. Shidhore, “Low Reynolds Number Fluid-Structure Interactions: Modeling the Response of Soft Microfluidic Devices,” Minisymposium on Analysis, Control and Inverse Theory of Flows, Material Structures, Acoustics, and Their Interactions, 2017 SIAM Conference on Analysis of Partial Differential Equations, Baltimore, Maryland.
- **June 24, 2017** (Invited) “Traveling Waves in Fluids: Kink Solutions and Bifurcations with Respect to the Wave Speed,” Minisymposium “Nonlinear wave dynamics of generalized continua” (in memory of E. Aero and G. Maugin), XLV International Summer School-Conference “Advanced Problems in Mechanics,” Saint Petersburg, Russian Federation.
- **May 21, 2017** (Invited) “Traveling Waves in Fluids: Bifurcations with Respect to the Wave Speed,” Minisymposium on Exotic Bifurcations in Fluid and Granular Dynamics, 2017 SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah.
- **November 20, 2017** (Contributed) Ivan C. Christov, Tanmay C. Shidhore, “Static response of deformable microchannels,” 70th Annual Meeting of the American Physical Society’s Division of Fluid Dynamics, Denver, Colorado.
- **February 27, 2017** (Invited) Ivan C. Christov, Tanmay C. Shidhore, “Modeling Flow Rate–Pressure Drop Relations of Soft Micro-Fluidic Devices,” Minisymposium on Small-scale flows with industrial applications: Modeling and simulations, 2017 SIAM Conference on Computational Science and Engineering, Atlanta, Georgia.
- **November 22, 2016** (contributed) “Mathematical analysis of electromigration dispersion fronts, 69th Annual Meeting of the American Physical Society’s Division of Fluid Dynamics, Portland, Oregon.
- **October 08, 2016** (Invited) “Self-similar regimes of gravity-driven spreading of viscous liquids in model heterogeneous porous media,” Special Session on Aspects of PDE Arising from Modeling of the Flows in Porous Media, 2016 Fall Western Sectional Meeting of the American Mathematical Society, Denver, Colorado.
- **July 17, 2016** (Invited) “On PDEs with Hamiltonian structure: From kinks in higher-order field theory to peakon-compactons,” Mini-Symposium on “Mathematics of Nonlinear Phenomena,” VI International Conference “Frontiers of Nonlinear Physics,” Nizhny Novgorod, Russian Federation.
- **July 4, 2016** (Invited) Zhong Zheng, Bo Guo, Ivan C. Christov, Michael A. Celia, Howard A. Stone, “Flow regimes for fluid injection into a confined porous medium,” Special Session on New Developments in Porous Media, 11th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, Florida.

- **July 4, 2016** (Invited) Z. Zheng, Ivan C. Christov, H. A. Stone, “Self-similar viscous gravity currents in heterogeneous porous media: Second-kind solutions,” Special Session on New Developments in Porous Media, 11th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, Florida.
- **May 12, 2016** (Contributed) Zhong Zheng, Ivan Christov, Howard Stone, “Self-similar viscous gravity currents in heterogeneous porous media: Second-kind solutions,” 8th International Conference on Porous Media & Annual Meeting (InterPore), Cincinnati, Ohio.
- **April 3, 2016** (Invited) “On PDEs with Hamiltonian structure: From kinks in higher-order field theory to peakon-pactons,” Workshop on Nonlinear Dynamics of Many Body Systems, Buffalo, New York.
- **December 7, 2015** (Contributed) Ivan Christov, Richard Lueptow, Julio Ottino, Rob Sturman, “A Parametric Study of Mixing in a Granular Flow a Bi-Axial Spherical Tumbler,” 13th International Conference on Dynamical Systems: Theory and Applications, Łódź, Poland.
- **November 23, 2015** (Contributed) “On a difficulty in eigenfunction expansion solutions for the start-up of fluid flow,” 68th Annual Meeting of the American Physical Society’s Division of Fluid Dynamics, Boston, Massachusetts.
- **June 9, 2015** (Invited) “On a hierarchy of nonlinearly dispersive generalized KdV equations,” Conference on Emergent Paradigms in Nonlinear Complexity: From PT Symmetry to Nonlinear Dirac Systems, From Polaritons to Skyrmions, Santa Fe, New Mexico.
- **May 18, 2015** (Invited) “Collective Coordinates as Model Reduction for Nonlinear Wave Interactions,” Minisymposium on Reduced Dynamical Models and Their Applications, 2015 SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah.
- **April 19, 2015** (Invited) “On a hierarchy of nonlinearly dispersive generalized KdV equations,” Conference on Recent Developments in Continuum Mechanics and Partial Differential Equations, Lincoln, Nebraska.
- **April 1, 2015** (Invited) Ivan C. Christov, Avadh Saxena and Avinash Khare, “Kinks and their statistical mechanics in higher-order scalar field theories,” Special Session on Mathematical Modeling and Physical Dynamics of Solitary Waves: From Continuum Mechanics to Field Theory, 9th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia.
- **November 24, 2014** (Contributed) Ivan C. Christov, Howard A. Stone, “Continuum modeling of diffusion and dispersion in dense granular flows,” 67th Annual Meeting of the American Physical Society’s Division of Fluid Dynamics, San Francisco, California.
- **September 12, 2014** (Invited) Ivan C. Christov, Avinash Khare, Avadh Saxena, “Kinks and their statistical mechanics in higher-order scalar field theories,” IUTAM Symposium on Complexity of Nonlinear Waves, Tallinn, Estonia.
- **July 7, 2014** (Contributed) “On Eigenfunction Expansion Solutions for the Start-Up of Fluid Flow,” 2014 SIAM Annual Meeting, Chicago, Illinois.
- **April 5, 2014** (Contributed) “On eigenfunction expansion solutions for the start-up of fluid flow,” 2014 Western Spring Sectional Meeting of the American Mathematical Society, Albuquerque, New Mexico.
- **March 3, 2014** (Contributed) Ivan C. Christov, Howard A. Stone, “Continuum modeling of diffusion and dispersion in dense granular flows,” March Meeting 2014 of the American Physical Society, Denver, Colorado.
- **January 7, 2014** (Invited) Zhong Zheng, Ivan C. Christov, Howard A. Stone, “Second-kind Self-similarities for Gravity Currents in Heterogeneous Porous Media,” The Fourth Collaborative Workshop Initiative, Oxford, United Kingdom.
- **November 26, 2013** (Contributed) Ivan C. Christov, Vincent Cagnet, Howard A. Stone, “Flow rate–pressure drop relation for deformable shallow microfluidic channels,” 66th Annual Meeting of the American Physical Society’s Division of Fluid Dynamics, Pittsburgh, Pennsylvania.
- **June 11, 2013** (Invited) Zhong Zheng, Ivan C. Christov, Howard A. Stone, “Influence of Heterogeneity on Second-kind Self-similar Solutions for Gravity Currents,” Minisymposium on Advances in Modeling and Computation of Thin Liquid Films in Materials Science - Part I of II, 2013 SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, Pennsylvania.

- **May 20, 2013** (Invited) Ivan C. Christov, Howard A. Stone, “Anomalous diffusion in granular flow: fractional kinetics or intermediate asymptotics?,” Minisymposium on Granular Flows from a Dynamical Systems Perspective, 2013 SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah.
- **March 27, 2013** (Invited) “Variational approximation of repelling and attracting solitons in coupled nonlinear Schrödinger equations,” Special Session on Modeling and Wave Phenomena in Nonlinear Continuum Mechanics, 8th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia.
- **November 19, 2012** (Contributed) Ivan C. Christov, Howard A. Stone, “Resolving a paradox of anomalous scalings in the diffusion of granular materials,” 65th Annual Meeting of the American Physical Society’s Division of Fluid Dynamics, San Diego, California.
- **November 2, 2012** (Invited) “Pseudolocalized three-dimensional solitary waves as quasi-particles, the legacy of Prof. C.I. Christov,” 2012 Lloyd Roeling UL Lafayette Mathematics Conference, Lafayette, Louisiana.
- **October 30, 2012** (Contributed) Ivan C. Christov, Howard A. Stone, “Intermediate Asymptotics of Axial Diffusion of Tumbled Granular Materials,” 2012 AIChE Annual Meeting, Pittsburgh, Pennsylvania.
- **July 4, 2012** (Invited) “Dissipative acoustic solitons,” Special Session on Nonlinear PDEs and Control Theory with Applications, 9th AIMS International Conference on Dynamical Systems, Differential Equations and Applications, Orlando, Florida.
- **May 26, 2012** (Contributed) Ivan C. Christov, Julio M. Ottino, Richard M. Lueptow, “Pattern formation and destruction in chaotic granular flows: Strange eigenmodes at finite Peclet number,” Poster Session, Workshop on Active Jammed Systems, New York City, New York.
- **February 28, 2012** (Contributed) Ivan C. Christov, Julio M. Ottino, Richard M. Lueptow, “From streamline jumping to strange eigenmodes: Learning from simple continuum models of granular mixing,” March Meeting 2012 of the American Physical Society, Boston, Massachusetts.
- **January 4, 2012** (Contributed) Ivan C. Christov, Julio M. Ottino, Richard M. Lueptow, “Pattern formation and destruction in chaotic granular flows: Strange eigenmodes at finite Peclet number,” Poster Session, Dynamics Days 2012, Baltimore, Maryland.
- **November 20, 2011** (Contributed) Ivan C. Christov, Julio M. Ottino, Richard M. Lueptow, “Strange eigenmodes of chaotic granular flow in a tumbler,” 64th Annual Meeting of the American Physical Society’s Division of Fluid Dynamics, Baltimore, Maryland.
- **July 20, 2011** (Invited) “Dynamics of Polarization in Soliton Collisions in Coupled Nonlinear Schrodinger Equations,” Minisymposium on Solitons and Nonlinear Integrable Systems, 7th International Congress on Industrial and Applied Mathematics, Vancouver, Canada.
- **May 22, 2011** (Invited) Ivan Christov, Richard M. Lueptow, Julio M. Ottino, Rob Sturman, Stephen Wiggins, “3D Aspects of Mixing and Transport in Tumbled Granular Flow,” Minisymposium on Different Faces of Mixing, 2011 SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah.
- **April 5, 2011** (Invited) “Interactions of dissipative solitons in a weakly-nonlinear acoustic Euler- α model,” Recent trends in nonlinear wave phenomena—Achievements and challenges: A symposium dedicated to Prof. Christo I. Christov on the occasion of his 60th birthday, 7th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia.
- **January 25, 2011** (Contributed) “Structure of 3D chaotic transport in a tumbled granular flow in a sphere,” International Workshop on Physics of Mixing, Lorentz Center, Leiden, The Netherlands.
- **November 23, 2010** (Contributed) Ivan C. Christov, Richard M. Lueptow, Julio M. Ottino, Rob Sturman, Stephen Wiggins, “3D aspects of mixing and transport in tumbled granular flow,” 63rd Annual Meeting of the American Physical Society’s Division of Fluid Dynamics, Long Beach, California.
- **November 19, 2010** (Contributed) Ivan C. Christov, Emre D. Yildiz, Julio M. Ottino, Richard M. Lueptow, “Mixing by cutting and shuffling in quasi-2D granular flows,” 2nd Annual Meeting of the Prairie Section of the American Physical Society, Chicago, Illinois.

- **September 9, 2010** (Contributed) I.C. Christov, R.M. Lueptow, J.M. Ottino, R. Sturman, S. Wiggins, “3D aspects of mixing and transport in tumbled granular flow,” Dynamics Days Europe 2010, Bristol, United Kingdom.
- **April 12, 2010** (Contributed) Ivan C. Christov, Julio M. Ottino, Richard M. Lueptow, “Chaotic granular mixing in quasi-two-dimensional tumblers: streamline jumping, piecewise isometries and strange eigenmodes,” Poster Session, IMA Workshop on Transport and Mixing in Complex and Turbulent Flows, Minneapolis, Minnesota.
- **January 5, 2010** (Contributed) Ivan C. Christov, Julio M. Ottino, Richard M. Lueptow, “Chaotic granular mixing in quasi-two-dimensional tumblers: streamline jumping and piecewise isometries,” Poster Session, Dynamics Days 2010: International Conference on Chaos and Nonlinear Dynamics, Evanston, Illinois.
- **November 22, 2009** (Contributed) Ivan Christov, Julio M. Ottino, Richard M. Lueptow, “Granular mixing in quasi-two-dimensional tumblers with a vanishing flowing layer,” 62nd Annual Meeting of the American Physical Society’s Division of Fluid Dynamics, Minneapolis, Minnesota.
- **June 2, 2009** (Invited) “Thermal shock waves under a Maxwell–Cattaneo model with temperature-dependent conductivity,” Symposium on Second-Sound and Thermal Shock Phenomena, 8th International Congress on Thermal Stresses, Urbana-Champaign, Illinois.
- **March 25, 2009** (Invited) “Hidden solitons in the Zabusky–Kruskal experiment: Analysis using the periodic, inverse scattering transform,” Special Session on Nonlinear Wave Phenomena in Discrete and Continuous Models, 6th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia.
- **May 18, 2008** (Invited) “The coarse-grain description of interacting sine-Gordon solitons with varying widths,” Special Session on Nonlinear Waves and Solitons, 7th AIMS International Conference on Dynamical Systems, Differential Equations and Applications, Arlington, Texas.
- **April 16, 2007** (Invited) “Internal solitary waves in the ocean: Analysis using the periodic, inverse scattering transform,” Special Session on Nonlinear Wave Phenomena in the Physical Sciences: Some Recent Studies, 5th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia.
- **January 4, 2007** (Contributed) C.I. Christov, Ivan Christov, “Dynamics of Quasi-Particles in Nonlinear Wave Equations,” Poster Session, Dynamics Days 2007: an International Conference on Chaos and Nonlinear Dynamics, Boston, Massachusetts.
- **November 16, 2006** (Contributed) “Nonoscillatory Central Schemes on Unstructured Triangulations for Hyperbolic Systems of Conservation Law,” Minisymposium on Numerical Methods for First-Order PDEs, 8th IMACS International Symposium on Iterative Methods in Scientific Computation, College Station, Texas.
- **August 20, 2006** (Contributed) “On the Application of Godunov-type Schemes to Conservation Laws Arising from the Equations of Nonlinear Acoustics,” Special Session on Numerical Methods for Hyperbolic Problems, 6th International Conference on Numerical Methods and Applications, Borovets, Bulgaria.
- **July 12, 2006** (Contributed) Ivan Christov, Bojan Popov, Peter Popov, “Nonoscillatory Central Schemes on Unstructured Triangular Grids for Hyperbolic Systems of Conservation Laws,” 2006 SIAM Conference on Analysis of Partial Differential Equations, Boston, Massachusetts.
- **January 5, 2005** (Contributed) “On the Wavelet-Galerkin Solution to the KdV Equation,” MAA Undergraduate Poster Session at the annual Joint Mathematics Meetings, Atlanta, Georgia.
- **July 20, 2004** (Contributed) “On the Wavelet-Galerkin Solution to the KdV Equation,” Texas A&M University’s REU/VIGRE Student Mini-Conference.
- **April 24, 2004** (Contributed) “A Wavelet Method for Image Anti-Aliasing,” Research by Undergraduates in Mathematics Boston University Symposium.
- **July 22, 2003** (Contributed) “Wavelet-Galerkin Methods for Differential Equations,” Texas A&M University’s REU/VIGRE Student Mini-Conference.

Professional Development:

- 31th Annual Workshop on Mathematical Problems in Industry at the University of Delaware; received funding from NSF Grant DMS-1261592. (Jun. 22–26, 2015); [Report](#).
- 30th Annual Workshop on Mathematical Problems in Industry at the New Jersey Institute of Technology; received funding from NSF Grant DMS-1261596. (Jun. 23–27, 2014); [Report](#).
- Institute for Mathematics and its Applications Special Workshop on Careers and Opportunities in Industry for Mathematical Scientists; received funding from the IMA. (Apr. 7–9, 2014)
- 29th Annual Workshop on Mathematical Problems in Industry at the Worcester Polytechnic Institute; received funding from NSF Grant DMS-1261594. (Jun. 17–21, 2013); [Report](#).
- Short Term Visitor at the Oxford Centre for Collaborative Applied Mathematics (OCCAM) at the University of Oxford, hosted by Dr. I.M. Griffiths; received funding from OCCAM. (Sept. 2012)
- 28th Annual Workshop on Mathematical Problems in Industry at the University of Delaware; received funding from NSF Grant DMS-1153940. (Jun. 11–15, 2012); [Report](#).
- International Workshop on Physics of Mixing at the Lorentz Center in Leiden, The Netherlands; received funding from the Lorentz Center. (Jan. 24–28, 2011)
- NSF/CBMS Regional Conference in the Mathematical Sciences on Recent Advances in the Numerical Approximation of Stochastic PDEs at the Illinois Institute of Technology. (Aug. 9–13, 2010)
- 26th Annual Workshop on Mathematical Problems in Industry at Rensselaer Polytechnic Institute; received funding from NSF Grant DMS-0753071. (Jun. 14–18, 2010); [Report](#).
- 7th Annual Graduate Student Mathematical Modeling Camp at Rensselaer Polytechnic Institute; received funding from NSF Grant DMS-0707280. (Jun. 8–11, 2010); [Report](#).
- Institute for Mathematics and its Applications (IMA) Workshop on Transport and Mixing in Complex and Turbulent Flows; received funding from the IMA. (Apr. 12–16, 2010)
- 12th Industrial Mathematical & Statistical Modeling Workshop for Graduate Students at the North Carolina State University; received funding from the NCSU/CRSC/SAMSI. (Jul. 24–Aug. 1, 2006)
- Louisiana State University Workshop on Harmonic Analysis and Fractal Geometry; received funding from NSF Grant DMS-0139783. (Feb. 24–26, 2006)
- Institute for Mathematics and its Applications (IMA) Workshop on New Mathematics and Algorithms for 3-D Image Analysis; received funding from the IMA. (Jan. 9–12, 2006)
- Summer Undergraduate Research Fellow at the Laser Interferometer Gravitational Wave Observatory (LIGO), Livingston; received funding from the MIT Undergraduate Research Opportunities Program. (Jun. 2002–Aug. 2002)

Service & Outreach:

- Co-organizer (with M. Ostoja-Starzewski) of a symposium entitled “Modern aspects of continuum mechanics and thermodynamics, including the legacy of G. A. Maugin,” at the 18th U.S. National Congress for Theoretical and Applied Mechanics.
- Guest co-editor (with M. Destrade) of a special issue in *Mechanics Research Communications* in memory of Gérard A. Maugin.
- Session chair at the 70th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society.
- Co-organizer (with D. Blackmore and A. Rahman) of a minisymposium entitled “Exotic Bifurcations in Fluid and Granular Dynamics” at the 2017 SIAM Conference on Applications of Dynamical Systems.
- Session chair at the 69th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society.
- Session chair at the VI International Conference “Frontiers of Nonlinear Physics.”

- Guest co-editor (with M.D. Todorov and S. Yoshida) of a special issue in *Wave Motion* entitled “Mathematical Modeling and Physical Dynamics of Solitary Waves: From Continuum Mechanics to Field Theory”; <http://www.sciencedirect.com/science/journal/01652125/71>.
- Guest co-editor (with H.S. Viswanathan) of a special issue in *Philosophical Transactions of the Royal Society A* entitled “Energy and the Subsurface”; <http://rsta.royalsocietypublishing.org/content/374/2078/>.
- Head of organizing committee for the Center of Nonlinear Studies Workshop on Grand Challenges in Geological Fluid Mechanics, Santa Fe, New Mexico, September 2–4, 2015; <http://cnls.lanl.gov/geofluid>.
- Co-organizer (with M.D. Todorov and S. Yoshida) of a special session entitled “Mathematical Modeling and Physical Dynamics of Solitary Waves: From Continuum Mechanics to Field Theory” at the 9th IMACS International conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia.
- Member of the Scientific Program Committee of the 9th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia, April 1–4, 2015.
- Session chair at the 2014 Western Spring Sectional Meeting of the American Mathematical Society.
- Member of the Los Alamos Postdoctoral Association’s career committee (2014 fiscal year term).
- Member of the colloquium organizing committee for the Center for Nonlinear Studies at the Los Alamos National Laboratory (2014, 2015 fiscal year terms).
- Co-organizer (with P.M. Jordan and M.D. Todorov) of a special session entitled “Modeling and Wave Phenomena in Nonlinear Continuum Mechanics” at the 8th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia.
- Member of the Scientific Program Committee of the 8th IMACS International conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia, March 25–28, 2013.
- Co-organizer (with R. Sturman) of a minisymposium entitled “Piecewise Isometries: Applications and Theory” at the 2011 SIAM Conference on Applications of Dynamical Systems.
- Co-organizer (with P.M. Jordan and M.D. Todorov) of a special session entitled “Recent trends in nonlinear wave phenomena—Achievements and challenges: A symposium dedicated to Prof. Christo I. Christov on the occasion of his 60th birthday” at the 7th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia.
- Judge at Chicago Public Schools’ Science and Math Fairs (2010), Event Supervisor at Science Olympiad—Wilbur Wright College Regional Tournament (2011).
- Elected Member-at-Large of the American Physical Society’s Forum on Graduate Student Affairs. (2011, 2012 calendar years term)
- Session chair at the 63rd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society.
- Elected Student Representative of the American Physical Society’s Prairie Section. (2010 calendar year term)
- Mentor for Boston public schools’ McNair Science and Technology Program. (Sept. 2002–June 2003)
- Reviewed manuscripts for (at least once a year for bold titles; on *ad hoc* basis): [publons profile: 559425](#)

Acta Mechanica
AIAA Journal
AICHE Journal
AIP Advances
AIP Conference Proceedings
American Journal of Physics
Applied Mathematics Letters
Applied Mathematical Modelling
Applied Numerical Mathematics
Applied Physics Letters

Journal of Non-Equilibrium Thermodynamics
Journal of Non-Newtonian Fluid Mechanics
Journal of Physics A: Mathematical and Theoretical
The Journal of Purdue Undergraduate Research
Journal of Rheology
Journal of Theoretical Biology
Journal of Visualization
Journal of Zhejiang University—SCIENCE A
Lecture Notes in Earth Sciences
Materials Physics and Mechanics

Archives of Mechanics
Biomicrofluidics
Central European Journal of Physics
CHAOS
Chemical Engineering Communications
Chemical Industry and Chemical Engineering Quarterly
Chinese Journal of Physics
Colloids and Surfaces A: Physicochemical and Engineering Aspects
Communications in Nonlinear Science and Numerical Simulation
Computer Methods in Applied Mechanics and Engineering
Computer Physics Communications
Engineering Science and Technology, an International Journal
European Journal of Computational Mechanics
The European Physical Journal Plus
Europhysics Letters (EPL)
Evolution Equations & Control Theory
International Journal of Computer Applications in Technology
International Journal of Computer Mathematics
International Journal of Differential Equations
International Journal of Engineering Science
International Journal of Partial Differential Equations
International Journal of Non-Linear Mechanics
International Journal of Thermal Sciences
International Scholarly Research Notices
Journal of Applied Mathematics and Computing
Journal of Engineering Mathematics
Journal of the Egyptian Mathematical Society
Journal of Fluid Mechanics
Journal of Fluids Engineering—Transactions of the ASME
Journal of Mathematical Physics
Journal of Mech. Eng. Science—Proc. IMechE Part C
Journal of Mountain Science

Mathematical Biosciences and Engineering
Mathematical Methods in the Applied Sciences
Mathematics and Computers in Simulation
Mechanics Research Communications
Mathematical Modelling and Analysis
Meccanica
Modern Physics Letters B
New Journal of Physics
Nonlinear Analysis A: Theory, Methods & Applications
Nonlinear Analysis B: Real World Applications
Nonlinear Analysis C: Hybrid Systems
Nonlinear Analysis: Modelling and Control
Nonlinear Processes in Geophysics
Philosophical Transactions of the Royal Society A
Open Physics
Physica D
Physica Scripta
Physical Review E
Physical Review Fluids
Physical Review Letters
Physics Letters A
Physics of Fluids
Proceedings of the Estonian Academy of Sciences
Proceedings of the Natl Acad. of Sci. of the USA
Proceedings of the Royal Society A
Studies in Applied Mathematics
Scientific Reports
Water Resources Research
Wave Motion
Zeitschrift für Naturforschung A
Zeitschrift für Angewandte Mathematik und Mechanik

- Reviewed proposals/manuscripts for (regularly, i.e., > once, for bold titles; on *ad hoc* basis):

Army Research Office
American Chemical Society Petroleum Research Fund
 European Research Council
 FWF Austrian Science Fund
 Israeli Science Foundation
 Ministry of Education and Science of the Republic of Kazakhstan
National Science Foundation (Proposals Review Panel)
CRC Press (Taylor & Francis Group)
Springer Science+Business Media

- Reviewer for *Mathematical Reviews* database of the American Mathematical Society (MathSciNet).

Professional Memberships:

- American Physical Society (APS), 2006–present.
- Society for Industrial and Applied Mathematics (SIAM), 2006–present.
- American Mathematical Society (AMS), 2005–2007, 2012–present.
- Society of Petroleum Engineers (SPE), 2013–present.
- InterPore—The International Society for Porous Media, 2016–present.
- National Postdoctoral Association (NPA), 2013–2016.

Scientometrics:

- *h*-index: 13 (source: Web of Science®).
- Citations: 439 (source: Web of Science®) or 528 (source: personal count excluding self-citations).