Peter Vorobieff
Curriculum Vitæ

Work Address:
Department of Mechanical Engineering
The University of New Mexico
Albuquerque, NM 87131
Phone: (505) 277-8347
E-mail: kalmoth@unm.edu
WWW: http://unm.edu/∼kalmoth

Research Interests
- Energy
- Meandering flows
- Multiphase flows
- Shock-accelerated flows
- Fundamental hydrodynamic instabilities
- Non-equilibrium states

EXPERIENCE

2025 – ... **Interim Chair,** The University of New Mexico, Albuquerque, New Mexico.
Supervised staff and faculty hire, facility renovations, and curriculum enhancement.

2024 – ... **Regents' Professor and Special Advisor to the Dean,** The University of New Mexico, Albuquerque, New Mexico.
Worked to foster, evaluate, and support research centers within the UNM School of Engineering.

2016 – 2024 **Associate Chair and Director of Facilities,** The University of New Mexico, Albuquerque, New Mexico.
Supervised the departmental graduate program and directed facilities upgrades. Led award-winning undergraduate (J. Ludwigsen, 2019) and graduate (D. Freelong, 2019) research.

2013 – 2016 **Professor and Assistant Chair,** The University of New Mexico, Albuquerque, New Mexico.
Led award-winning graduate (N. Fathi, 2015) and undergraduate (D. Simons, 2016) research, organized successful faculty and staff hires.

2005 – 2012 **Associate Professor,** The University of New Mexico, Albuquerque, New Mexico.
Built novel tiltable shock tube. Led discovery of a new instability in shock-driven multiphase flow. Participated in the conversion of the Mechanical Engineering building into a smart building with active solar energy collection and thermal storage. Supervised award-winning graduate research (M. Anderson, 2012).

1999 – 2005 **Assistant Professor,** The University of New Mexico, Albuquerque, New Mexico.
Built state-of-the-art experimental facilities and diagnostic systems. Supervised award-winning undergraduate (D. Georgiev, J. Vigil, 2001) and graduate (A. Palekar, 2004, S. Gogte, 2005) research.

1996 – 1999 **Research Associate**, Los Alamos National Laboratory, Los Alamos, New Mexico.
Conducted experimental studies of fluid instabilities and turbulence.
Developed first implementations of particle-image velocimetry (PIV) diagnostic for shock-accelerated flows, for three-dimensional studies of turbulent rotating convection, and for flowing soap films. Supervised two graduate students.

1995–1996 **Research Assistant**, Lehigh University, Bethlehem, Pennsylvania.
Conducted research in fluid mechanics, developed software, demonstrated a new energetically efficient technique of stall control on delta wings – intermittent trailing-edge blowing.

1992-1995 **Teaching Assistant**, Lehigh University, Bethlehem, Pennsylvania.
Conducted laboratory workshops, supervised undergraduate projects. Designed and programmed computer interface for a series of laboratory experiments in mechanical vibrations.

1991-1992 **Interpreter/Programmer**, Association of Space Explorers, Moscow, Russia.
Developed code and computer graphics for an educational computer game and several computer videos, performed synchronous Russian/English translation.

1989-1991 **Research Assistant**, Institute for High Temperatures, Moscow, Russia.
Conducted research in theoretical gas dynamics (laser propulsion). Developed code for numerical simulation programs. Performed the duties of UNIX system administrator.

EDUCATION

Lehigh University, Bethlehem, Pennsylvania. Ph.D. Mechanical Engineering, May 1996.
Research combining experimental fluid dynamics and applied mathematics. GPA 4.0. Dissertation: "Vortex breakdown on a maneuvering delta wing and related issues of flow analysis and topology."
M.V. Lomonosov Moscow State University, Moscow, Russia. M.S. Mechanical Engineering and Applied Mathematics, May 1989. Cum Laude.
Development of analytical methods applicable to a wide range of problems. GPA 4.0. Thesis: "On averaging parabolic equations."

SKILLS

Experience of designing, building and operating custom PIV (particle image velocimetry) velocity field acquisition and TLC (thermochromic liquid crystal) temperature visualization systems for experiments in gas and fluid dynamics. Expert knowledge of water tunnel, tow tank, wind tunnel and shock tube experimental system operation.
Expert knowledge of PC hardware and software (Windows, Linux, OpenBSD, CygWin), and of UNIX workstations: SGI, IBM, Sun. C, C++, FORTRAN, Poco, HTML, XHTML, XML, Java, Javascript, Perl, Labview, Matlab, LaTeX.

HONORS

2021 Regents' Professor.

2019 Halliburton Professor (reappointed in 2023).

2018 University of New Mexico School of Engineering Senior Faculty Research Excellence Award.

2016 University of New Mexico Golden Paw online teaching award.

2015 New Mexico Pi Sigma Professor of the Year.

2014 AIAA Associate Fellow.

2009 Best presentation award, Energy for the 21st Century conference, Los Alamos National Laboratory.

2001 American Physical Society ***Gallery of Fluid Motion*** winner, APS-DFD 2001 Meeting. With K.P. Prestridge and others.
Junior Faculty Research Excellence Award, School of Engineering, The University of New Mexico.

1999 Los Alamos National Laboratory ***DX Division Teamwork Award*** (with R.F. Benjamin, P.M. Rightley, and K.P. Prestridge).

1998 American Physical Society ***Gallery of Fluid Motion*** winner, APS-DFD 1998 Meeting. With D. Blair and I. Aronson.

1996 American Physical Society ***Gallery of Fluid Motion*** winner, APS-DFD 1996 Meeting. With P.M. Rightley and R.F. Benjamin.

1995 ***S.W. Kung Award*** for best graduate research, Lehigh University, Bethlehem, Pennsylvania.

1989 ***Lomonosov scholarship***, Moscow University.

1988 ***Chebyshev scholarship***, Moscow University.

SERVICE

Associate editor, ASME Journal of Fluids Engineering, 2010-2016.
Member of the Editorial Board, Transactions of the Wessex Institute, since 2014.
Refereed for: AIAA Journal, Experiments in Fluids, International Journal of Imaging Systems and Technology, Journal of Fluid Mechanics, ASME Journal of Fluids Engineering, Physical Review E, Physical Review Letters.

Membership: APS, ASME (NM student chapter advisor), AIAA (Associate Fellow), Pi Tau Sigma (NM Pi Sigma chapter coordinator).
Member, APS Committee on International Freedom of Scientists (2019-2021, chair in 2021-2022).
Organizer of the *Nonlinear Phenomena and Dynamic Systems* workshop, Apr. 30-May 2, 1998, Boulder, CO. Minisymposium chair at the *13th Canadian Symposium on Fluid Dynamics* (CSFD), May 26-30, 1998, Vancouver, BC, Canada.
Session chair at the 1998, 2006, 2007, 2008 APS-DFD Meetings, 2012 AIAA ASM Meeting, 29th International Symposium on Shock Waves (ISSW29), 2013.
Organizing committee member, 6th International Conference on Computational and Experimental Methods in Multiphase and Complex Flow, 2011, Kos, Greece.
Organizer and chair, 7th International Conference on Computational and Experimental Methods in Multiphase and Complex Flow, 2013, A Coruña, Spain.
Organizer and chair, 8th International Conference on Computational and Experimental Methods in Multiphase and Complex Flow, 2015, Valencia, Spain.
Organizer and chair, 9th International Conference on Computational and Experimental Methods in Multiphase and Complex Flow, 2017, Tallinn, Estonia.
Organizer and chair, 10th International Conference on Computational and Experimental Methods in Multiphase and Complex Flow, 2019, Lisbon, Portugal.
Organizing committee member, 1st International Conference on Maritime Transport, 2019, Rome, Italy.
Organizing committee member, 13th International Conference on Advances in Fluid Mechanics, 1–3 September 2020, Prague, Czech Republic.
Organizer and session chair, Sakharov-100: Physics, Peace, Human Rights webinar, May 21, 2021, online
Organizer and chair, 11th International Conference on Advances in Fluid Dynamics with emphasis on Multiphase and Complex Flow, July 6-8, 2021, online
Session chair, XIII International Conference of RASA (Russian-speaking Academic Scientists' Association), November 19-20, 2022, La Verne, CA
Member, NASA Decadal Survey on Biological and Physical Sciences Research in Space, 2021-2023
International Scientific Advisory Council member, the Wessex Institute, 2023 – . . .

Service within department

1999-2001	Computer committee member
2000-2006	webmaster-at-large
2001-2005	Computer committee chair
2003	Faculty search committee
2004-2010	Steering committee member
2005-2007	Lab committee chair
2009	Faculty search committee
2012-2015	Leadership committee member
2014	Staff search committee
2015	Faculty search committee
2016	Staff search committee
2018	Faculty search committee
2019	Faculty search committee
2022	Faculty search committee (three hires)

Service within university

2003-2005	KUNM board member
2010-2013	Faculty Ethics Committee member
2011-2012	Research Allocations Committee member
2012-2013	Research Allocations Committee chair
2014-2016	Research Policy Committee member
2014-2016	Information Tecnology (IT) use committee member
2016-2019	Chemical and Laboratory Safety committee member
2016-2022	UNM School of Engineering Academic Council member
2016-2023	UNM School of Engineering Ranking and Reputation Committee member
2019-2023	Provost's Promotion and Tenure Committee member
2021-2024	UNM School of Engineering Promotion and Tenure Committee member
2025-...	UNM School of Engineering Leadership Council member

Graduate Students

Jonathan Gallegos, M.S. (2001), *Experimental Studies of the onset of Bénard - von Kármán instability.*

Nagoor-Gani Mohamed, M.S. (2003), *Quantitative Analysis of Disorder Growth in Transition to Turbulence.*

Tanveer Shakeel, M.S. (2003), *Far wake interactions behind a pair of cylinders*, **Ph.D. (2006)**, *Experimental study of turbulence using soap film tunnel.*

Chris Platero, M.S. (2003, co-advised with C.R. Truman), *Fractal dimension evolution in a shear layer instability.*

Kathy Meyer, M.S. (2003, co-advised with C.R. Truman), *Planar Laser Induced Fluorescence (PLIF): Low Pressure Investigations.*

Salil Gogte, M.S. (2005), *Flow measurements near superhydrophobic surfaces.*
Richard Truesdell, **Ph.D. (2006, co-advised with A.A. Mammoli)**, *Modification of the no-slip boundary condition by superhydrophobic wall patterning.*
Charlie Booker, M.S. (2006), *Destruction of the second wake.*
Aparna Korlimarla, M.S. (2006), *Evolution of a quasi-2D shear layer in a soap-film flow.*
Greg Orlicz, M.S. (2007), *Shock driven instabilities in a varicose, heavy-gas curtain : Mach number effects*, **Ph.D. (2012)**, *A Mach number study of shock-accelerated heavy gas curtain.*
Daniel Coughlin, M.S. (2008), *Real-time detection of biological threat agents in a cloud.*
Evan Johnson, M.S. (2009), *Planar and oblique shock wave interaction with a droplet seeded gas cylinder.*
Michael Anderson, **Ph.D. (2011)**, *Experimental and numerical investigation of shock interaction with multiphase media.*
Joseph Conroy, M.S. (2012), *Experimental studies of particle-lag instability.*
Ross White, M.S. (2012), *Planar and oblique shock interaction with gas and particle-seeded cylinders.*
Nima Fathi, M.S. (2012), *Particle trajectories in low Reynolds number linear shear flow,* **Ph.D. (2017)**, *Evaluation and enhancement of clean energy systems: analytical, computational and experimental study of solar and nuclear cycles.*
Clinton Corbin, M.S. (2014, co-advised with C.R. Truman), *UNM Shock Tube Modernization.*
Tennille Bernard, M.S. (2014, co-advised with C.R. Truman), *Observation and Measurement of Instabilities due to Shock Focusing.*
Garrett Kuehner, M.S. (2014, co-advised with C.R. Truman), *Behavior of the Embedded Phase in a Shock-Driven Two-Phase Flow.*
Lin Zheng, M.S. (2014), *A 3D Computational Fluid Dynamics Model Validation for Candidate Molybdenum-99 Target Geometry.*
Jianwei Ju, Ph.D. (2014), *Effective colloidal particle properties from molecular dynamics simulations.*
Gregory Naranjo, M.S. (2015), *Development and analysis of a converging-diverging nozzle laboratory apparatus.*
Alfred Flores, M.S. (2015), *Design and fabrication of a flexible apparatus for a low Reynolds number particle interaction flow.*
Patrick Wayne, M.S. (2015), *Analysis of Kelvin-Helmholtz instabilities developing from oblique shock interaction with a heavy gas column,* **Ph.D. (2019)**, *Characterization of single- and multi-phase shock-accelerated flows.*

Andrew Williams, **Ph.D. (2016)**, *Effect of slip boundary condition in laminar flow on heat transfer using microtextured, superhydrophobic surfaces.*
Wendy Flores, M.S. (2020), *Emissivity measurements of painted and aerosol-deposited thermographic phosphors (YAG:DY and MFG:MN).*
Caleb White, M.S. (2020), *Qualitative investigation of gaseous hydrodynamic mixing model efficacy and associated sensitivity.*
Will M. Davidson, M.S. (2021), *Printing Parameter Development and Characterization of Additively Manufactured Kovar Steel.*
Daniel Freelong, M.S. (2021), *Interaction of a Shock Wave with a Particle Curtain.*
Matthew Aragon, M.S. (2021), *Incorporating In-situ Monitoring to Detect Anomalies in Additively Manufactured Kovar Steel on a Layer-to-Layer Basis.*
Guillermo Anaya, M.S. (2022), *Particle Image Velocimetry Methodology for Calculating the Advective Losses at the Solar Tower for the Gen 3 Concentrated Solar Power System.*
Joshua Chavez, M.S. (2022), *Evolution of Shock-Driven Multiphase Instability.*
Jesus Ortega, **Ph. D.** (2022), *A Novel Imaging Methodology to Estimate Advective Losses from a Concentrating Solar Power Particle Receiver.*
Bryan Steiner, M.S. (2023), *Main Effects Screening Study of Fe/$KClO_4$ Thermal Battery Heat Pellet Resistive Activation.*
Graham Monroe, M.S. (2023), *Aerodynamic Dimpling for the Nose Cone of a High-Power Competition Rocket.*
Felicia Brimigion, M.S. (2024), *SOFAST CAD Layout Tool.*
Carolina Shaheen, M.S. (2025), *Characterization of Mechanical Response to Shock Wave Interactions with Soda Lime Glass*

Patents

US Patent 7,416,903, "Wavy Interface Mixer," L.A. Sklar, A.A. Mammoli, R.A. Truesdell, P. Vorobieff, 2008.
US Patent 8,567,259, "Optical Phase Shift Fluid Flow Velocity Measurement Mechanism," G. Ballard, P. Vorobieff, 2013.
US Patent 10,006,443, "Inflatable, Free-Standing Solar Updraft Tower with Optimal Geometry and Active Control," P. Vorobieff, N. Fathi, A. Mammoli, V. Putkaradze, M. Chi, S. Aleyasin, F. Gay-Balmaz, 2018.
US Patent 11,698,058 B1, "Multi-Source Sustainable-Renewable Energy Harvester," P. Vorobieff, N. Fathi, S. Aleyasin, P. McDaniel, 2023.

PUBLICATIONS (technical only)[1]
Total number of citations (including references to Ph.D. dissertation and conference papers and abstracts): about 3,900, $h-$index 33.

Books Co-Authored

1. National Academies of Sciences, Engineering, and Medicine,"Thriving in Space: Ensuring the Future of Biological and Physical Sciences Research: A Decadal Survey for 2023-2032," The National Academies Press, Washington, DC (2023), ISBN: 978-0-309-69498-8, 322 pp. [20].

Books Edited

2. C.A. Brebbia, P. Vorobieff (eds.), "Computational Methods in Multiphase Flow VII," in series *WIT Transactions on Engineering Sciences*, WIT Press, Southhampton, UK (2013), ISBN: 9781845647346, 360 pp. [7].

3. P. Vorobieff, C.A. Brebbia (eds.), "Computational Methods in Multiphase Flow VIII," in series *WIT Transactions on Engineering Sciences*, WIT Press, Southhampton, UK (2015), ISBN: 9781845649463, 620 pp. [3].

4. P. Vorobieff, C.A. Brebbia (eds.), "Computational & Experimental Methods in Multiphase & Complex Flow IX," in series *WIT Transactions on Engineering Sciences*, WIT Press, Southhampton, UK (2017), ISBN: 9781784661953, 276 pp.

5. P. Vorobieff, C.A. Brebbia (eds.), "Multiphase Flow: Theory and Applications," WIT Press, Southhampton, UK (2018), ISBN: 9781784663117, 466 pp. [2].

6. S. Hernandez, P. Vorobieff (eds.), "Computational & Experimental Methods in Multiphase & Complex Flow X," in series *WIT Transactions on Engineering Sciences*, Vol. 123, WIT Press, Southhampton, UK (2019), ISBN: 9781784663292, 250 pp.

7. S. Hernandez, P. Vorobieff (eds.), "Multiphase Flow: Computational & Experimental Methods," WIT Press, Southhampton, UK (2020), ISBN: 9781784664176 , 136 pp.

8. S. Hernandez, P. Vorobieff (eds.), "Advances in Fluid Dynamics with emphasis on Multiphase and Complex Flow," in series *WIT Transactions on Engineering Sciences*, Vol. 132, WIT Press, Southhampton, UK (2021), ISBN: 978-1-78466-435-0, 194 pp.

Book contributions

9. I. Aranson, D. Blair, and P. Vorobieff, "Interface motion in a vibrated granular layer[2]," in *A gallery of fluid motion*, ed. M. Samimy, Cambridge University Press, 2003, p. 55.

[1]Numbers in square brackets indicate number of times cited (according to ISI Citation index or Google Scholar Citation index), if known. In this section, publications are first organized by type (books and book contributions, review papers, research papers), then by journal, in descending order of journal 5-year impact factor (as indicated in round brackets after journal name). Names of UNM student authors are underlined, * indicates undergraduate and ** – graduate student authors.

[2]This contribution is a revised version of an entry originally published in Physics of Fluids.

10. P.M. Rightley, P. Vorobieff, and R.F. Benjamin, "Mushrooms and snakes: a visualization of Richtmyer-Meshkov instability[3]," in *A gallery of fluid motion*, ed. M. Samimy, Cambridge University Press, 2003, p. 93 [3].

Review Papers

1. P. Vorobieff, S. Kumar, "Experimental studies of Richtmyer-Meshkov instability," *Recent Research Developments in Fluid Dynamics* Vol. 5 (2004), pp. 33-55 [9].

Reviewed Journals and Proceedings

Nature (54.4)

2. K. Mertens**, V. Putkaradze, and P. Vorobieff, "Braiding patterns on an inclined plane," *Nature* Vol. 430, No. 6996 (2004), p. 165 [23].

Science Advances (14.1)

3. P. Wayne**, S. Cooper*, D. Simons*, I. Trueba-Monje*, D. Freelong**, G. Vigil*, C. R. Truman, V. Vorob'ev, T. Clark, and P. Vorobieff, "Dalton's and Amagat's laws fail in gas mixtures with shock propagation," *Science Advances* (2019), Vol. 5 No. 12, art. no. eaax4749 [9].

Journal of Cleaner Production (10.0)

4. N. Fathi, P. McDaniel, S. S. Aleyasin, M. Robinson, P. Vorobieff, S. Rodriguez, and C. deOliveira, "Efficiency enhancement of solar chimney power plant by use of waste heat from nuclear power plant," *Journal of Cleaner Production* Vol. 180 (2018), pp. 407-416 [73].

Physical Review Letters (8.1)

5. M.K Rivera, P. Vorobieff, and R.E. Ecke, "Turbulence in Flowing Soap Films: Velocity, Vorticity and Thickness Fields," *Physical Review Letters* Vol. 81 No. 7 (1998), pp. 1417-1420 [186].

6. P. Vorobieff, P.M. Rightley, and R.F. Benjamin, "Power-law Spectra of Incipient Gas-Curtain Turbulence," *Physical Review Letters* Vol. 81 No. 11 (1998), pp. 2240-2243 [38].

7. K.P. Prestridge, P.M. Rightley, P. Vorobieff, and R.F. Benjamin, "Validation of an Instability Growth Model Using PIV Measurements," *Physical Review Letters* Vol. 84 No. 19 (2000), pp. 4353-4356 [75].

8. E. Ben-Naim, Z.A. Daya, P. Vorobieff, and R.E. Ecke, "Knots and random walks in vibrated granular chains," *Physical Review Letters* Vol. 86 No. 8 (2001), pp. 1414-1417 [127].

[3]This contribution is a revised version of an entry originally published in Physics of Fluids.

9. R. Truesdell**, A. Mammoli, P. Vorobieff, F van Swol, and C.J. Brinker, "Drag reduction on a patterned superhydrophobic surface," *Physical Review Letters* Vol. 97 No. 4 (2006), art. no. 044504 [459].

10. V. Putkaradze and P. Vorobieff, "Instabilities, Bifurcations, and Multiple Solutions in Expanding Channel Flows," *Physical Review Letters* Vol. 97 No. 14 (2006), art. no. 144502 [19].

11. B. Birnir, K. Mertens, V. Putkaradze, and P. Vorobieff, "Meandering fluid streams in the presence of flow rate fluctuations," *Physical Review Letters* Vol. 101 No. 11 (2008), art. no. 114501 [28].

12. P. Vorobieff, M. Anderson**, J. Conroy**, R. White**, C.R. Truman, and S. Kumar,"Vortex formation in a shock-accelerated gas induced by particle seeding," *Physical Review Letters* Vol. 106 (2011), art. no. 184503 [79].

Energy and Buildings (7.1)

13. M. Ortiz**, H. Barsun, H. He**, P. Vorobieff, and A. Mammoli, "Modeling of a solar-assisted HVAC system with thermal storage," *Energy and Buildings* Vol. 42, No. 4 (2010), pp. 500-509 [137].

14. A. Mammoli, P. Vorobieff, H. Barsun, R. Burnett, and D. Fisher**, "Energetic, economic and environmental performance of a solar-thermal-assisted HVAC system," *Energy and Buildings* Vol. 42, No. 9 (2010), pp. 1524-1535 [125].

Applied Thermal Engineering (6.9)

15. J. Carlson, D. Menicucci, P. Vorobieff, A. Mammoli, and H. He, "Infrared imaging method for flyby assessment of solar thermal panel operation in field settings," *Applied Thermal Engineering* Vol. 70 No. 1 (2014), pp. 163-171 [10].

16. N. Fathi**, S.S. Aleyasin, and P. Vorobieff, "Numerical-Analytical Assessment on Manzanares Prototype," *Applied Thermal Engineering* Vol. 102 No. 5 (2016), pp. 243–250 [27].

Solar Energy (6.6)

17. C. Armenta**, P. Vorobieff, and A. Mammoli, "Summer off-peak performance enhancement for rows of fixed solar thermal collectors using flat reflective surfaces," *Solar Energy* Vol. 85 no. 9 (2011), pp. 2041-2052 [18].

18. V. Putkaradze, P. Vorobieff, A. Mammoli, and N. Fathi**, "Inflatable free-standing flexible solar towers," *Solar Energy* Vol. 98 (A) (2013), pp. 85-98 [34].

Physics of Fluids (4.2)

19. J.-C. Lin, P. Vorobieff, and D.O. Rockwell, "Space-Time Imaging of a Turbulent Near-Wake by High-Image-Density Particle Image Cinematography," *Physics of Fluids* Vol. 8 No. 2 (1996), pp. 555-564 [35].

20. P.M Rightley, P. Vorobieff,and R.F. Benjamin, "Evolution of a Shock-Accelerated Thin Fluid Layer," *Physics of Fluids* Vol. 9 No. 6 (1997), pp. 1770-1782 [101].

21. P.M. Rightley, P. Vorobieff, and R.F. Benjamin, "Mushrooms+Snakes: an investigation of Richtmyer-Meshkov instability," *Physics of Fluids* Vol. 9 No. 9 (1997), Special Section p. S6 [3].

22. P. Vorobieff and R.E. Ecke, "Transient States During Spin-Up of a Rayleigh-Bénard Cell," *Physics of Fluids* Vol. 10 No. 10 (1998), pp. 2525-2538 [18].

23. P.M. Rightley, P.Vorobieff, R. Martin, and R.F. Benjamin, "Experimental Observations of the Mixing Transition in a Shock-Accelerated Gas Curtain," *Physics of Fluids* Vol. 11 No. 1 (1999), pp. 186-209 [100].

24. P. Vorobieff, M.K. Rivera, and R.E. Ecke,"Soap Film Flows: Statistics of Two-Dimensional Turbulence," *Physics of Fluids* Vol. 11 No. 8 (1999), pp. 2167-2177 [99].

25. I. Aranson, D. Blair, and P. Vorobieff, "Interface Nucleation in Vibrating Granular Media," *Physics of Fluids* Vol. 11 No. 9 (1999), p. S9.

26. K.P. Prestridge, C. Tomkins, P. Rightley, P. Vorobieff, and R.F. Benjamin, "The Courtship and Mating Rituals of Vortices," *Physics of Fluids*, Vol. 14 No. 9 (2002), p. S10.

27. P. Vorobieff, D. Georgiev*, and M.S. Ingber, "Onset of the second wake: Dependence on the Reynolds number," *Physics of Fluids*, Vol. 14 No. 7 (2002), pp. L53-L56 [51].

28. C. Tomkins, K. Prestridge, P. Rightley, M. Marr-Lyon, P. Vorobieff, and R.F. Benjamin, "A quantitative study of the interaction of two Richtmyer-Meshkov unstable gas cylinders," *Physics of Fluids* Vol. 15 No. 4 (2003), pp. 986-1004 [90].

29. S. Gogte**, P. Vorobieff, R. Truesdell**, A. Mammoli, F. van Swol, P. Shah, and C.J. Brinker, "Effective slip on textured superhydrophobic surfaces," *Physics of Fluids* Vol. 17 (2005), art. no. 051701 [355].

30. S. Kumar, G. Orlicz**, C. Tomkins, C. Goodenough, K. Prestridge, P. Vorobieff, and R. Benjamin, "Stretching of material lines in shock-accelerated gaseous flows," *Physics of Fluids* Vol. 17 (2005), art. no. 082107 [100].

31. G. Orlicz, S. Balasubramanian, P. Vorobieff, and K. Prestridge."Mixing transition in a shocked variable-density flow," *Physics of Fluids* Vol. 27 No. 11 (2015), art. no. 114102 [41].

32. A. Korlimarla and P. Vorobieff, "Evolution of a quasi-two-dimensional shear layer in a soap film flow," *Physics of Fluids* Vol. 32 No. 12 (2020), art. no. 124112 [9].

33. B. Romero, S. V. Poroseva, P. Vorobieff, and J. M. Reisner, "Simulations of the shock-driven Kelvin–Helmholtz instability in inclined gas curtains," *Physics of Fluids* Vol. 33, (2021), art. no. 064103 [17].

Journal of Fluid Mechanics (4.2)

34. P. Vorobieff and R.E. Ecke, "Turbulent Rotating Convection: an Experimental Study," *Journal of Fluid Mechanics* Vol. 458 (2002), pp. 191-218 [137].

35. K. Mertens**, V. Putkaradze, and P. Vorobieff, "Morphology of a stream flowing down an inclined plane. Part 1. Braiding," *Journal of Fluid Mechanics* Vol. 531 (2005), pp. 49-58 [54].

36. B. Birnir, K. Mertens, V. Putkaradze, and P. Vorobieff, "Morphology of a stream flowing down an inclined plane. Part 2: Meandering," *Journal of Fluid Mechanics* Vol. 607 (2008), pp. 401-411 [30].

37. B.E. Romero, J.M. Reisner, P. Vorobieff, and S.V. Poroseva, "Statistical characterization of a shock interacting with an inclined gas column," *Journal of Fluid Mechanics* Vol. 971 (2023), pp. A26-1–A26-31 [2].

Scientific Reports (3.9)

38. M. S. Rahman**, A. Mohamed**, A. Sweis*, J. Chavez**, and P. Vorobieff , "Development of a novel method to characterize shock wave interaction with solid objects," *Scientific Reports* Vol. 14 (2024), art. no. 28956 [2].

Journal of Rheology (3.6)

39. M.S. Ingber, A.A. Mammoli, P. Vorobieff, T. McCollam**, and A.L. Graham, "Experimental and numerical analysis of irreversibilities among particles suspended in a Couette device," *Journal of Rheology* Vol. 50 (2006), pp. 99-114 [22].

Physica D – Nonlinear Phenomena (3.5)

40. P. Vorobieff and R.E. Ecke, "Vortex Structure in Rotating Rayleigh-Bénard Convection," *Physica D* (Amsterdam) Vol. 123 (1998), pp. 153-160 [50].

41. P. Vorobieff, P.M. Rightley, and R.F. Benjamin,"Shock-driven Gas Curtain: Fractal Dimension Evolution in Transition to Turbulence," *Physica D* (Amsterdam) Vol. 133, pp. 469-476 (1999) [43].

42. P. Vorobieff, P.M. Rightley, and R.F. Benjamin,"Shock-driven Gas Curtain: Fractal Dimension Evolution in Transition to Turbulence," *Physica D* (Amsterdam) Vol. 133, pp. 469-476 (1999) [43].

43. S. Kumar,P. Vorobieff, G. Orlicz**, A. Palekar**, C. Tomkins, C. Goodenough, M. Marr-Lyon, K.P. Prestridge, and R.F. Benjamin, "Complex flow morphologies in shock-accelerated gaseous flows," *Physica D* (Amsterdam) Vol. 235 no. 1-2 (2007), pp. 21–28 [46].

Proceedings of the Royal Society A (3.3)

44. M. Chi, F. Gay-Balmaz, V. Putkaradze, and P. Vorobieff, "Dynamics and optimal control of flexible solar updraft towers," *Proceedings of the Royal Society A: Mathematical, Physical, and Engineering Sciences* Vol. 471 (2015), art. no. 20140539 [12].

Experiments in Fluids (2.9)

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145. B. Roshanzadeh**, P. Vorobieff, and G. Mohan, "Design and Simulation of a Novel and Efficient PVT System: Evacuated Tube Photovoltaic Thermal System," Energy Sustainability (Vol. 87899, p. V001T10A001). American Society of Mechanical Engineers, 2024.

146. D. McGraw**, T. Nyonga**, L. Green, P. Vorobieff, D. Hanson, G. Mohan, and T. Busani, "Experimental Study of a Novel Semi-Transparent Bi-Facial Agri-Voltaic System: Initial Results," AgriVoltaics World Conference Proceedings, Vol. 3, 2025.

Reports

147. P. Vorobieff and R.E. Ecke, "Evidence of 2D turbulence," Los Alamos National Laboratory *CNLS Newsletter*, February 1998 [1].

148. P. Vorobieff, C.R. Truman, and J. Gallegos**,"PIV diagnostics for flow control applications," *Proceedings of 2000 Contractors' Meeting in Turbulence and Rotating Flows*, Air Force Office of Scientific Research, Arlington, VA, pp. 285-289.

149. P. Vorobieff, C.R. Truman, J. Gallegos**, and P. Chavez**, "PIV diagnostics for flow control applications: Part 2," *Proceedings of 2001 Contractors' Meeting in Turbulence and Rotating Flows*, Air Force Office of Scientific Research, Arlington, VA, pp. 227-232.

150. K. Prestridge, C.A. Zoldi, P. Vorobieff, P.M. Rightley, and R.F. Benjamin, "Velocity-field measurements of a shock-accelerated fluid instability," Los Alamos National Laboratory Report LA-UR-01-2682 (2001), 6 pp.

151. K. Prestridge, C.A. Zoldi, P. Vorobieff, P.M. Rightley, and R.F. Benjamin, "Experiments and Simulations of Instabilities in a Shock-Accelerated Gas Cylinder," UCRL-ID-146350, *8th International Workshop on the Physics of Compressible Turbulent Mixing (IWPCTM)*, December 9-14, 2001, Pasadena, CA, p. 36 [10].

152. C.A. Noren**, G. Rothschopf, T. Perschbacher, T.J. Madden, G.D. Hager, C.R. Truman, and P.V. Vorobieff, "PLIF Flow Visualization of a Supersonic Coil Nozzle," *Air Force Research Lab Kirtland AFB NM Directed Energy Directorate Report* A655174, Oct. 16, 2006, pp. 1-9.

153. P. Vorobieff and C.R. Truman, "Prediction of chemical laser flow," *Final Report on US DOD/DOI Contract No. FA95500510031*, Apr. 14, 2006, pp. 1-25.

154. P. Vorobieff, "Shock-driven Multiphase Flows: Complexity and Challenges," Spotlight on Science, DTRA Basic and Applied Research Program Newsletter, Volume 3, Issue 2, June 2010, 1-2.

155. J. Carlson, H. He**, A. Mammoli, D. Menicucci, P. Vorobieff, "Development of a photometric method to identify non-operating solar hot water systems in field settings," SAND2011-4759, Sandia National Laboratories report (2012), 106 pp.

156. P. Vorobieff and C.R. Truman, "Shock interaction with multiphase matter: Unraveling the puzzles," DOE/NA-0020, *2014 Stewardship Science Academic Programs Annual*, p. 7.

157. M. Ingber and P. Vorobieff, "Localized Scale Coupling and New Educational Paradigms in Multiscale Mathematics and Science," DOE Technical Report DOE-UNM-25705 2R64F (2014).

158. C. Ho, J.D. Ortega, P. Vorobieff, G. Mohan, A. Glen, A. Sanchez, D. Dexheimer, N. Schroeder, and V. Martins, "Characterization of Particle and Heat Losses from a High-Temperature Particle Receiver," SAND2022-1021, Sandia National Laboratories report (2022), 130 pp.

Invited presentations

1. "Kraichnan was right! 2D turbulence," poster presentation. Presented at the *Turbulence: Challenges for the 21st Century* conference, May 18-21, 1998, Los Alamos, New Mexico. With R.E. Ecke.

2. "Phenomenology and statistics of 2D turbulence," presented at the *13th Canadian Symposium on Fluid Dynamics* (CSFD), May 26-30, 1998, Vancouver, Canada.

3. "Fluid instabilities and turbulence: some experimental results," presented at the seminar of the Mechanical Engineering Department, University of New Mexico, Sep. 15, 1998, Albuquerque, New Mexico.

4. "Fluid instability and turbulence studies via PIV," presented at the seminar of the Department of Theoretical and Applied Mechanics, University of Illinois, Sep. 24, 1998, Urbana, Illinois.

5. "Experiments in fluid turbulence," presented at the University of California, San Diego Physics Seminar, Jan. 18, 1999, San Diego, California.

6. "Interface motion in a vibrated granular layer," video presentation. Presented at the *Centennial Meeting of the American Physical Society*, March 20-26, 1999, Atlanta, Georgia. With D. Blair and I. Aronson.

7. "Dynamics of shock-accelerated density interfaces," presented at the *Dynamics of Interfaces, Patterns and Domains '99 International Workshop*, April 22-24, 1999, Los Alamos, New Mexico.

8. "Wakes in soap films," presented at the *5th Experimental Chaos Conference*, June 28-July 1, 1999, Orlando, Florida.

9. "Experiments in nonlinear science," presented at Santa Fe Institute with R.E. Ecke, 1999, 2000.

10. "Quasi-two-dimensional studies in gravity-driven soap films," presented at Eötvös University (Physics Department) Graduate Student Seminar, Budapest, Hungary, June 2001.

11. "Bluff-body wake evolution and interaction in 2D," presented at the *4th International conference on Advances in Fluid Mechanics (AFM2002)*, Ghent, Belgium, May 14-17, 2002. With D. Georgiev* and T. Shakeel**.

12. "Experimental studies of shock-driven instabilities," presented at the Washington University in St. Loius (MAE Department) Graduate Student Seminar, St. Louis, Missouri, USA, Oct. 30, 2003.

13. "Experiments in impulsively-driven instabitities," presented at the Fluid Mechanics Series seminar, California Institute of Technology, Pasadena, California, USA, Apr. 23, 2004.

14. "Shock-driven transition to turbulence: curiouser and curiouser," presented at the Special Session on Mathematical Methods in Turbulence, Fall Western Section Meeting of the American Mathematical Society, Albuquerque, New Mexico, USA, Oct. 17, 2004.

15. "Richtmyer-Meshkov instability," presented at the University of Victoria, Victoria, British Columbia, Canada, June 30, 2006.

16. "Irreversibility and chaos in shear flow carrying particles," presented at the 2007 Spring Western Section Meeting of the American Mathematical Society, Special Session on Subjects in and Around Fluid Dynamics, Tucson, Arizona, USA, Apr. 22, 2007.

17. "Turbulence in two, three, and one dimension," presented at the Institute for High Temperatures, Russian Academy of Sciences, Moscow, Russia, June 21, 2007,

18. "Turbulence and spatial dimensionality," keynote presentation at Russian Low-Temperature Plasma Conference, St. Petersburg – Petrozavodsk, Russia, June 26, 2007.

19. "Quasi-two-dimensional turbulent decay and fossil turbulence," presented at the Fall Western Section Meeting of the American Mathematical Society, Special Session on Recent Developments in 2-D Turbulence, Albuquerque, New Mexico, USA, Oct. 13, 2007.

20. "Analogues of Rayleigh-Taylor and Richtmyer-Meshkov instabilities in flows with non-uniform particle and droplet seeding," presented at the Sixth International Conference on Computational and Experimental Methods in Multiphase and Complex Flow, Kos, Greece, June 15, 2011.

21. "Analogues of Rayleigh-Taylor and Richtmyer-Meshkov instabilities in gas and plasma with inclusions," presented at the Russian Low-Temperature Plasma Conference, Petrozavodsk, Russia, June 23, 2011.

22. "Vortex deposition and transition to turbulence in a shock-accelerated gas with particle/droplet seeding," presented at the 17th Biennial International Conference of the APS Topical Group on Shock Compression of Condensed Matter (APS-SCCM), June 26 – July 1 2011, Chicago, Illinois. With J. Conroy**, M. Anderson**, R. White**, C.R. Truman, and S. Kumar.

23. "Particle lag instability," presented at the 2011 Fall Western Section Meeting of the American Mathematical Society, University of Utah, Salt Lake City, UT, October 22-23, 2011. With M. Anderson**, J. Conroy**, R. White**, P. Wayne*, C.R. Truman, and S. Kumar.

24. "Optimal design of an inflatable, free-standing solar updraft tower," presented at the 2013 Spring Western Section Meeting of the American Mathematical Society, University of Colorado–Boulder, Boulder, CO, April 13-14, 2013. With A.A. Mammoli, V.P. Putkaradze, and N. Fathi**.

25. "Shock-driven instability in multiphase flow," presented at San Diego State University Aerospace Engineering Department, May 3, 2013.

26. "Morphology of shock-accelerated multiphase flow: experiment and modeling," presented at the 7th International Conference onc Computational and Experimental Methods in Multiphase and Complex Flow, A Coruña, Spain July 3-5, 2013. With M. Anderson, J. Conroy, C.R. Truman, and S. Kumar.

27. "Particle-lag instability and other oddities in shock-driven multiphase flow," presented at the Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos, New Mexico, March 12, 2014.

28. "Новая неустойчивость за ударной волной в многофазных потоках (New Shock-Driven Instability in Multiphase Flows)," presented at V.V. Fortov (President of the Russian Academy of Sciences) OIVT Seminar, Moscow, Russia, April 10, 2014.

29. "Richtmyer-Meshkov and other instabilities in compressible multiphase flow," presented at the 8th International Conference on Computational and Experimental Methods in Multiphase and Complex Flow, Valencia, Spain, April 20-22, 2015. With P. Wayne, D. Olmstead, C.R. Truman, and S. Kumar.

30. "Control of a flexible chimney under wind loading," presented at the Special Session on Inverse Problems, AMS Spring Western Sectional Meeting, University of Utah, Salt Lake City, UT, April 9-10, 2016. With M. Chi, F. Gay-Balmaz, V. Putkaradze, and N. Fathi.

31. "Flow pattern alteration near a hydrofoil due to effective slip: an experimental study," presented at the 11th International Conference on Advances in Fluid Mechanics, Ancona, Italy, September 5-7, 2016. With S. Gogte and A. Mammoli.

32. "Flexible solar updraft towers: stability and control," presented at the Special Session on Contemporary Geometric Methods in Mechanics and Control, AMS Fall Southeastern Sectional Meeting, North Carolina State University, Raleigh, NC, November 12-13, 2016. With M. Chi, F. Gay-Balmaz, V. Putkaradze, and N. Fathi.

33. "Instabilities in a shock interaction with a perturbed curtain of particles," keynote talk presented at the 9th International Conference on Computational & Experimental Methods in Multiphase & Complex Flow, Tallinn, Estonia, March 20, 2017. With R. González Izard, S. Reddy Lingampally, P. Wayne, and G. Jacobs.

34. "Unexpected features in shock-driven hydrodynamics," Los Alamos National Laboratory Physics/Theory Coloquium presented on March 8, 2018.

35. "Recent developments in studies of shock-accelerated multiphase flows," Fluid Dynamics Seminar, Imperial College, London, presented on May 17, 2018.

36. "Formation of a falling particle curtain," keynote talk presented at the 10th International Conference on Computational & Experimental Methods in Multiphase & Complex Flow, May 21 — 23, 2019, Lisbon, Portugal. With P. Wayne, S. Reddy Lingampally, G. Vigil, D. Freelong, and C. R. Truman.

37. "Transport of a single spherical particle in low Reynolds number linear shear flows: experiment and modeling," invited talk presented at the 13th International Conference on Advances in Fluid Mechanics, 1–3 September 2020, online.

38. "Three–dimensional validation exercise for FIESTA code: evolution of shock-driven instabilities," keynote talk presented at the 11th International Conference on Advances in Fluid Dynamics with emphasis on Multiphase and Complex Flow, 6–8 July 2021, online.

39. "Solar Energy Studies at University of New Mexico," invited talk presented at the IES Seminar, University of Edinburgh, 25 Sep. 2023.

40. "Quantitative characterization of advective losses in a falling particle receiver," keynote talk presented at the 10th International Conference on Energy and Sustainability, 2–4 October 2023, Lisbon, Portugal.

41. "Interfacial instability as a single- and multiphase phenomenon," invited talk presented at the Interfaces and Mixing in Fluids, Plasmas, and Materials conference, Kavli Institute for Theoretical Physics, Oct 23-26, 2023, Santa Barbara, CA.

42. "Beyond Solar Panels: Renewable Energy Studies," invited talk presented at ATCO Spacelab Speaker Series, Feb. 25, 2025, online.

Funded Research

Title:	Quantification of Disorder Growth in Transition to Turbulence
PIs:	P. Vorobieff
Funding Agency:	Sandia National Laboratories
Start Date:	10/01/1999
End Date:	09/30/2000
Funding Level:	$ 29,073
Summary:	Develop advanced analysis methods using summation concepts for studies of disorder growth in pre-turbulent mixing flows.

Title:	PIV Diagnostics for Flow Control Applications
PIs:	P. Vorobieff (PI), C.R. Truman (co-PI)
Funding Agency:	AFOSR
Start Date:	03/31/2000
End Date:	03/30/2001
Funding Level:	$ 128,823
Summary:	Develop capability for particle image velocimetry (PIV) diagnostics suitable for investigation of controlled flows.

Title:	Shock-induced Instability of a Thin Fluid Layer/Instabilities in Soap-Film Flows
PIs:	P. Vorobieff
Funding Agency:	Los Alamos National Laboratory
Start Date:	06/05/2000
End Date:	08/18/2000
Funding Level:	$ 24,337
Summary:	Perform advanced-diagnostics experiments on fluid instabilities in two and three dimensions.

Title:	Hysteresis of Vortex-Shedding Behind a Circular Cylinder
PIs:	P. Vorobieff
Funding Agency:	Oak Ridge Associated Univerisites
Start Date:	07/01/2000
End Date:	07/01/2001
Funding Level:	$ 10,000 (50% cost-sharing)
Summary:	Investigate the recent claims of hysteretic behavior near the onset of Bénard - von Kármán instability.

Title:	Shock-Driven Transition to Turbulence as a Code Validation Problem
PIs:	P. Vorobieff
Funding Agency:	Sandia National Laboratories
Start Date:	10/01/2000
End Date:	09/30/2001
Funding Level:	$ 35,000
Summary:	Develop analysis methods for quantitative validation of numerical prediction of transition to turbulence. Provide a sample set of experimental benchmarks.

Title:	Experimental Flow Diagnostics and Numerical Prediction of Mixing in Chemical Lasers
PIs:	P. Vorobieff (PI), C.R. Truman (co-PI)
Funding Agency:	DARPA
Start Date:	04/01/2001
End Date:	08/31/2003
Funding Level:	$ 300,000
Summary:	Develop an experimental system for quantitative diagnostics of flow inside a chemical laser. Examine the influence of flow hydrodynamics on laser performance. Perform numerical simulations.

Title:	Experimental Study of Wake and Cavity Flows
PIs:	P. Vorobieff, C.R. Truman (subaward; program PIs: L. Crossey, D. Kauffman, program director: N. Vadiee)
Funding Agency:	NASA PURSUE
Start Date:	01/01/2001
End Date:	12/21/2001
Funding Level:	$ 25,630
Summary:	Use advanced diagnostics for 2D hydrodynamics studies. Involve undergraduate students in research.

Title:	Fluid Mechanics Studies for Aerodynamic Flow Control
PIs:	C.R. Truman, P. Vorobieff (subaward; program PIs: L. Crossey, D. Kauffman, program director: N. Vadiee)
Funding Agency:	NASA PURSUE
Start Date:	06/01/2000
End Date:	12/21/2001
Funding Level:	$ 32,750
Summary:	Develop diagnostics for wind-tunnel studies of controlled flow. Involve undergraduate students in research.

Title:	Experimental Analysis in Support of Physics-Based Validation
PI:	P. Vorobieff
Funding Agency:	Los Alamos National Laboratory
Start Date:	10/01/2001
End Date:	09/30/2003
Funding level:	$ 79,000
Summary:	Perform experiments and analysis of experimental data to provide quantitative benchmarks for development of numerical codes predicting transition to turbulence.

Title:	Flow Diagnostic System Development
PIs:	C.R. Truman (PI), P. Vorobieff (co-PI)
Funding Agency:	Boeing
Start Date:	03/01/2002
End Date:	09/30/2002
Funding level:	$ 97,340
Summary:	Instrumentation for a high-speed laser induced fluorescence system.

Title:	Experimental Analysis in Support of Physics-Based Validation
PI:	P. Vorobieff
Funding Agency:	Los Alamos National Laboratory
Start Date:	04/22/2003
End Date:	04/30/2005
Funding level:	$ 150,000
Summary:	Perform experiments and analysis of experimental data to provide quantitative benchmarks for development of numerical codes predicting transition to turbulence.

Title:	Bifurcations in a wedge flow
PI:	V. Putkaradze (PI), P. Vorobieff (co-PI)
Funding Agency:	Petroleum Research Foundation
Start Date:	06/01/2003
End Date:	05/31/2006
Funding level:	$ 80,000
Summary:	Study of fundamental instabilities and bifurcations in wedge flows.

Title:	Predictions of HYSIM HF Laser Flow
PI:	C.R. Truman (PI), P. Vorobieff (co-PI)
Funding Agency:	Missiel Defense Agency via Boeing and AFRL
Start Date:	10/01/2003
End Date:	09/30/2005
Funding level:	$ 231,000
Summary:	Experiment and numerics to understand mixing processes inside a chemical laser.

Title:	Experimental and Numerical Investigation of Flows in Expanding Channels
PI:	V. Putkaradze (PI), P. Vorobieff (co-PI)
Funding Agency:	US DOE
Start Date:	02/01/2004
End Date:	01/31/2007
Funding level:	$ 495,000
Summary:	Study of fundamental instabilities and bifurcations in wedge flows.

Title:	Experimental and numerical studies of superhydrophobic surfaces
PI:	A.A. Mammoli (PI), P. Vorobieff (co-PI)
Funding Agency:	Sandia National Laboratories
Start Date:	05/01/2004
End Date:	08/30/2005
Funding level:	$ 50,000
Summary:	Investigation of the possibility of macroscopic fluid slip on superhydrophobic surfaces.

Title:	Localized scale coupling and new educational paradigms in multiscale mathematics and science
PIs:	M.S. Ingber (PI), P. Vorobieff (co-PI)
Funding Agency:	US DOE
Start Date:	10/01/2005
End Date:	09/30/2008
Funding level:	$ 345,000
Summary:	Experimental and numerical study of irreversibility in multiphase flows.

Title:	Experimental and numerical studies of superhydrophobic surfaces
PI:	A.A. Mammoli (PI), P. Vorobieff (co-PI)
Funding Agency:	Sandia National Laboratories
Start Date:	10/01/2005
End Date:	09/30/2006
Funding level:	$ 50,000
Summary:	Investigation of macroscopic fluid slip on textured superhydrophobic substrates.

Title:	UNM Solar Power Testbed
PI:	A.A. Mammoli (PI), P. Vorobieff (co-PI)
Funding Agency:	State of New Mexico ENMRD
Start Date:	11/01/2005
End Date:	10/31/2006
Funding level:	$ 225,000
Summary:	Construction and testing of a solar thermal system.

Title:	PLIF diagnostics of iodine injection
PI:	C.R. Truman (PI), P. Vorobieff (co-PI)
Funding Agency:	DOD SBIR Phase I
Start Date:	03/01/2006
End Date:	09/01/2006
Funding level:	$ 30,000
Summary:	Analysis of mixing in chemical laser.

Title:	Analysis of PLIF images in iodine injection studies
PI:	P. Vorobieff (PI), C.R. Truman (co-PI)
Funding Agency:	DOD SBIR Phase II
Start Date:	01/01/2007
End Date:	12/31/2008
Funding level:	$ 30,000
Summary:	Analysis of mixing enhancement in a chemical laser.

Title:	Studies of High-Speed Mixing Flows with Particulates
PI:	F. Gilfeather (UNM lead PI), P. Vorobieff (PI), C.R. Truman (co-PI)
Funding Agency:	DTRA
Start Date:	08/01/2007
End Date:	07/31/2008
Funding level:	$ 401,000
Summary:	Construction of a tiltable shock tube, experiments with shock-driven multiphase flows.

Title:	Multiphase shock-driven hydrodynamic experiments for hydrocode validation
PI:	P. Vorobieff (PI), C.R. Truman (co-PI)
Funding Agency:	NNSA
Start Date:	01/01/2010
End Date:	12/31/2012
Funding level:	$ 539,080
Summary:	Experiments to provide code-validation benchmarks for shock interaction with gas density interfaces and multiphase media.

Title:	Experimental and numerical studies of respirable particle transport surfaces by acoustic/shock waves
PI:	C.R. Truman (PI), P. Vorobieff (co-PI)
Funding Agency:	DTRA
Start Date:	01/01/2010
End Date:	12/31/2011
Funding level:	$ 230,367
Summary:	Experiments to provide code-validation benchmarks for shock interaction with gas density interfaces and multiphase media.

Title:	Optimization of UNM solar thermal plant
PI:	A. Mammoli (PI), P. Vorobieff (co-PI), H. Barsun (co-PI)
Funding Agency:	State of New Mexico ENMRD
Start Date:	03/21/2010
End Date:	09/20/2011
Funding level:	$ 128,000
Summary:	Installation of booster mirrors and other components to improve solar collector efficiency.

Title:	Attracting, Motivating and Preparing Mathematics students in the Southwest by building an energetic community of students and educators.
PI:	M. Nitsche (PI), D. Appelo, P. Vorobieff et al.
Funding Agency:	NSF
Start Date:	06/01/2012
End Date:	05/30/2016
Funding level:	$ 1,200,000
Summary:	Educational proposal to attract more US nationals to mathematical sciences.

Title:	Collaborative research: Particle Dynamics in Viscous Shear Flows
PI:	P. Vorobieff
Funding Agency:	NSF
Start Date:	09/01/2013
End Date:	08/30/2016
Funding level:	$ 204,764
Summary:	Experimental and numerical study of irreversibility in particle-carrying flow.

Title:	Shock-driven complex behavior of multiphase flow: dynamics of particles and droplets
PI:	P. Vorobieff (PI), C.R. Truman (co-PI)
Funding Agency:	NNSA
Start Date:	09/01/2013
End Date:	08/30/2016
Funding level:	$ 399,956
Summary:	Experimental study of shock-driven multiphase flows.

Title:	A 3D CFD model validation for candidate Mo-99 target geometry
PI:	P. Vorobieff
Funding Agency:	LANL
Start Date:	10/01/2013
End Date:	09/30/2015
Funding level:	$ 110,500
Summary:	Numerical study of a closed flow loop.

Title:	UNM Shock Tube Facility Upgrade
PI:	P. Vorobieff
Funding Agency:	UNM OVPR Equipment Fund
Start Date:	04/23/2014
End Date:	04/22/2015
Funding level:	$ 50,906
Summary:	Equipment grant to upgrade flow visualization.

Title:	Ionization of Shocked Flow
PI:	P. Vorobieff
Funding Agency:	New Mexico Small Business Assistance Program
Start Date:	07/01/2015
End Date:	09/30/2015
Funding level:	$ 8,000
Summary:	Experiments with a prototype jet engine (business partner: Dark Sea Indurstries LLC).

Title:	Quantification of normal and oblique shock-driven phase interaction and transition to turbulence in media with multiscale density interfaces
PI:	P. Vorobieff (PI), C.R. Truman (co-PI)
Funding Agency:	NNSA
Start Date:	08/01/2015
End Date:	07/31/2018
Funding level:	$ 600,000
Summary:	Shock tube studies.

Title:	Collaborative research: Shock interaction with a complex hydrodynamic medium
PI:	P. Vorobieff
Funding Agency:	NSF
Start Date:	08/01/2016
End Date:	07/31/2020
Funding level:	$ 240,001
Summary:	Shock-driven multiphase flow studies.

Title:	Multiphase Flow Physics for Reduced Order Models
PI:	P. Vorobieff
Funding Agency:	DTRA
Start Date:	03/14/2018
End Date:	03/13/2022
Funding level:	$ 1,050,000
Summary:	Three-university collaboration (UNM, NMT, UC) on shock-driven multiphase flow studies. UNM share – 38%.

Title:	Characterization and Mitigation of Radiative, Convective, and Particle Losses in High Temperature Particle Receivers
PI:	P. Vorobieff (PI), A. Mammoli (co-PI)
Funding Agency:	Sandia National Laboratories
Start Date:	05/10/2018
End Date:	12/31/2021
Funding level:	$ 400,000
Summary:	Optimization study for concentrating solar power particle receiver.

Title:	Radiation Emissivity Measurements
PI:	P. Vorobieff (PI)
Funding Agency:	Sandia National Laboratories
Start Date:	11/12/2018
End Date:	09/31/2019
Funding level:	$ 60,000
Summary:	Emissivity studies for material samples.

Title:	Efficient Microgravity Heat and Mass Transfer
PI:	P. Vorobieff (UNM PI)
Funding Agency:	NASA
Start Date:	05/01/2020
End Date:	04/30/2023
Funding level:	$ 100,000
Summary:	Orbital payload development.

Title:	Research Partnership with UNM
PI:	T. Khraishi (PI), P. Vorobieff (co-PI)
Funding Agency:	Sandia National Laboratories
Start Date:	01/01/2020
End Date:	09/30/2020
Funding level:	$ 75,000
Summary:	Sample shear tests.

Title:	Hypervelocity MHD jet engine
PI:	P. Vorobieff
Funding Agency:	New Mexico Small Business Assistance
Start Date:	01/01/2020
End Date:	12/31/2020
Funding level:	$ 7,500
Summary:	Energy-efficient ionization experiments for MHD propulsion.

Title:	Harvesting the energy of a planetary or stellar magnetosphere for space propulsion
PI:	P. Vorobieff
Funding Agency:	New Mexico Small Business Assistance
Start Date:	01/01/2020
End Date:	12/31/2020
Funding level:	$ 7,500
Summary:	Energy-efficient ionization experiments for MHD propulsion.

Title:	Fundamental Experimental and Numerical Combustion Study of H_2 Containing Fuels for Gas Turbines
PI:	D. Banuti (original PI), P. Vorobieff (PI since October 2023)
Funding Agency:	DOE
Start Date:	08/01/2021
End Date:	07/31/2024
Funding level:	$ 90,000
Summary:	Computational testing of hydrogen diffusion models.

Title:	Heat Pellet Optimization
PI:	P. Vorobieff
Funding Agency:	DOE
Start Date:	09/01/2021
End Date:	08/31/2022
Funding level:	$ 27,000
Summary:	Energy efficiency improvements for concentrating solar power.

Title:	A new paradigm for transcritical injection simulations and understanding
PI:	D. Banuti, P. Vorobieff (UNM PI since October 2023)
Funding Agency:	AFOSR
Start Date:	07/14/2022
End Date:	07/13/2026
Funding level:	$ 600,000
Summary:	Experiments and simulations studying a transcritical jet in supersonic crossflow.

Title:	Efficient Microgravity Heat Transfer
PI:	P. Vorobieff
Funding Agency:	NASA
Start Date:	10/01/2022
End Date:	09/30/2024
Funding level:	$ 25,000
Summary:	Forced convection in microgravity.

Title:	High-speed flow characterization system
PI:	P. Vorobieff (PI), S. Poroseva (co-PI)
Funding Agency:	DOD
Start Date:	08/01/2022
End Date:	07/31/2023
Funding level:	$ 720,000
Summary:	Construction of a high-speed wind tunnel.

Title:	Rio Grande Consortium for Advanced Research on Exascale Simulation (Grande CARES)
PI:	P. Vorobieff (lead PI and director), multiple co-PIs
Funding Agency:	DOE
Start Date:	10/01/2022
End Date:	09/30/2027
Funding level:	$ 5,000,000
Summary:	A five-university research consortium funded by NNSA Minority Serving Institution Partnership Program.

Title:	Semi-transparent Bifacial Agrivoltaic System with Machine Learning
PI:	G. Mohan (PI), P. Vorobieff (co-PI), D. Hanson (co-PI), T. Busani (co-PI)
Funding Agency:	DOE
Start Date:	10/01/2022
End Date:	09/30/2025
Funding level:	$ 400,000
Summary:	Combination of greenhouse roof and photovoltaics.

Title:	Receiver Slide Gate Development and Evaluation for Gen 3++ Falling Particle Receivers
PI:	G. Mohan (PI), P. Vorobieff (co-PI)
Funding Agency:	DOE
Start Date:	04/01/2023
End Date:	03/31/2026
Funding level:	$ 400,000
Summary:	Energy efficiency improvements for concentrating solar power.