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## **Pavlos P. Vlachos**

*Professor*

*School of Mechanical Engineering, Purdue University  
St. Vincent Health Professor of Healthcare Engineering  
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### Home

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### Work

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## **EDUCATION**

BS, Mechanical Engineering, National Technical University of Athens,	1995
MS, Engineering Mechanics, Virginia Tech,	1998
PhD, Engineering Mechanics, Virginia Tech,	2000

## **HONORS-AWARDS-RECOGNITION (PARTIAL LIST)**

- 2023, Fellow, American Heart Association
  - 2023, Paper Award Winner 2022, Fluid Mechanics, Measurement Science and Technology, Institute of Physics. Jiacheng Zhang, Sayantan Bhattacharya and Pavlos P Vlachos for the paper Uncertainty of PIV/PTV based Eulerian pressure estimation using velocity uncertainty
  - 2022, Featured Article, Physics of Fluids, Ahmadzadegan, et al. "Spatiotemporal Measurement of Concentration-Dependent Diffusion Coefficient."
  - 2022, Fellow, American Institute of Medical and Biological Engineers
  - 2021, St. Vincent Health Professor of Healthcare Engineering
  - 2020, Fellow of the American Society of Mechanical Engineers
  - 2019, Selected as Editors Suggestion for particular interest, importance, and clarity by the editors and referees for Physical Review Fluids; Singh, et al, "Two regime cooling in flow induced by a spark discharge".
  - 2019, Invited Paper, *Measurement Science and Technology*, IOP Publishing; Special Section on the 13th International Symposium on Particle Image Velocimetry (PIV 2019), "Assessment of uncertainty quantification methods for density estimation from Background Oriented Schlieren (BOS) measurements".
  - 2018, Annual Journal Highlights, *Measurement Science and Technology*, IOP Publishing; Sayantan Bhattacharya et al, 2018 *Meas. Sci. Technol.* 29 115301.
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- 2016, Journal Cover, *Measurement Science and Technology*, IOP Publishing; Jun, Brian; Giarra, Matthew; Yang, Haisheng; Main, Russell; Vlachos, Pavlos, 2016 “Nanoparticle flow velocimetry with image phase correlation for confocal laser scanning microscopy”, *Meas. Sci. Technol.* 27 104003.
  - 2015, Cover and Journal Highlight, *Proceedings of the National Academy of Science*; Gart S, Socha JJ, Vlachos PP, Jung S. 2015 “Dogs lap using acceleration-driven open pumping”, *PNAS*, Dec 14; 201514842–5.
  - 2015, University Faculty Fellow, Purdue University
  - 2015, 2016, 2017, Solberg Award Citation for Instruction. Voted among the top 10 best instructors by undergraduate students, School of Mechanical Engineering, Purdue University.
  - 2014, Cover and Journal Highlight, *Journal of Experimental Biology*; Holden D, Socha JJ, Cardwell ND, Vlachos PP, 2014 “Aerodynamics of the flying snake *Chrysopelea paradisi*: how a bluff body cross-sectional shape contributes to gliding performance”, *J. Exp. Biol.* 217(3): 382–94.
  - 2013, Journal Highlights, *Measurement Science and Technology*; Raben, SG, Charonko, JJ, Vlachos, PP, 2012 “Adaptive gappy proper orthogonal decomposition (POD) for particle image velocimetry (PIV) data reconstruction”, *Meas. Sci. Technol.* 23 025303.
  - 2013, Outstanding Paper Award, ASME Global Congress on Nano Engineering for Medicine and Biology. Awarded for Cara Buchanan, Elizabeth Voigt, Christopher Szot, Pavlos Vlachos, and Marissa Rylander “Tissue-engineered tumor microvessels to study shear stress-mediated angiogenesis”, Paper Number NEMB2013-93220. Proceedings of the 2013 ASME Global Congress on Nano Engineering for Medicine and Biology, February 4-6, 2013, Boston, MA, USA.
  - 2012, Robert E. Hord Professor of Mechanical Engineering Dept., College of Engineering, Virginia Tech.
  - 2010, John R. Jones Faculty Fellow, Mechanical Engineering Dept. College of Engineering, Virginia Tech.
  - 2011, Moody Award, ASME Division of Fluids Engineering. Awarded for the most outstanding technical paper dealing with the practice of fluids engineering.
  - 2010, Outstanding Paper Award, Fluid Mechanics, Measurement Science and Technology, Institute of Physics.
  - 2009, Outstanding Paper Award, Fluid Mechanics, Measurement Science and Technology, Institute of Physics.
  - 2009-2020, Dean’s Award of Excellence in Research, Virginia Tech.
  - 2010, Scholar of the Week, Virginia Tech.
  - 2008, W.M. Reed Lecture, University of Kentucky.
  - 2007, Keynote Speaker, Fluids Engineering Summer Meeting, Forum on Fluid Measurement and Instrumentation.
  - 2007, College of Engineering Faculty Fellow Award, Virginia Tech
  - Moody Award, ASME Division of Fluids Engineering. Awarded for the most outstanding technical paper dealing with the practice of fluids engineering
  - 2006, Frontiers of Engineering Symposium, National Academy of Engineering. Nominated and selected attendee. One out of 81 attendees across the nation, across all areas

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of engineering and academia, government or industry.

(Abstract from the news release “...*Frontiers of Engineering attendees — engineers 30 to 45 years of age and representing academia, industry and government — were nominated and selected in recognition of their contributions to the advancement of engineering and their potential as future leaders in their fields...*”

- 2006, NSF CAREER Award, Arterial Flow Dynamics: Effects of Pulsatility Compliance and Curvature.
- 2005, 11th Annual T.F. Ogilvie Award, Young Investigator Lectureship in Ocean Engineering and Fluid Mechanics, MIT.
- 2004-2005, Dean’s Award of Excellence for Outstanding Assistant Professor, Virginia Tech.
- 2004, 2005, Dean’s List for Teaching Excellence, Virginia Tech.
- 2000, Member of Hellenic Academia of Abroad (HELLADIA Organization) Recognition to promising or established Greek scientists outside the Greek borders.

## **MEDIA MENTIONS (PARTIAL LIST)**

- 2023, CardiacWire, “Echo-Based RV Intracardiac Flow”, <https://cardiacwire.com/newsletter/top-8-of-acc-2023-esperions-clear-outcomes/>
- 2023 Research Article: “Purdue engineer, IU cardiologist collaborate to offer innovative tool and fresh hope for babies with heart defect”, Associate Press, and various other local channels, <https://www.purdue.edu/research/features/stories/purdue-engineer-iu-cardiologist-collaborate-to-offer-innovative-tool-and-fresh-hope-for-babies-with-heart-defects/>
- (across several outlets): Coalescence of oblique jets ... Engineers Explain Physics of Fluids Some 100 Years After Discovery
- R&D Magazine (and many other outlets): How do animals drink ... Nature's phenomena might teach engineers new tricks
- Related to our paper on flying snake gliding flight in the journal of Biomimetics & Bioinspiration (Socha et al. 2010):
  - Pentagon seeks flying snakes' secret. By Marc Kaufman, The Washington Post, November 22, 2010.
  - Flying snakes' secret revealed. By Stephanie Pappas, Livescience.com, November 22, 2010. Also found at MSNBC.com and foxnews.com, among others.
  - How snakes can fly. By Ker Than, National Geographic Daily News, November 23, 2010.
  - Flying snakes, caught on tape. From the AIP press release (written by Kathy Svitil) on PhysOrg.com, November 23, 2010.
  - Video reveals how a flying snake slithers through the air. By Jennifer Walsh, Discover magazine 80beats blog, November 23, 2010.
  - NPR All Things Considered. Interview on NPR by Mary Louise Kelly, November 24, 2010.
  - Sakes Alive! Snakes That Fly! By Mark Memmott, NPR “The Two-Way”, November 24, 2010.

- Daily Planet television segment. November 24, 2010.
- Video: See snakes fly: Virginia Tech researchers are learning how the reptiles are able to glide so gracefully to the ground. By Jef Akst, The Scientist, November 24, 2010.
- Flying ophidians! Physicists uncover how snakes soar between trees. By Katherine Harmon, Scientific American online, November 24, 2010.
- Pentagon wants secret of flying snakes. By Lee Spiegel, AolNews, November 24, 2010.
- it's a bird. It's a plane. No, it's a flying snake. By Sindya Bhanoo, The New York Times, November 29, 2010.
- Snakes with no #&%\$\$!! plane! CBC Radio program Quirks and Quarks with Bob McDonald, December 4, 2010.
- The Conversation: Flying snakes? ABC News Video, December 7, 2010.
- MultiSTEPS (Multi-Scale Transport in Environmental and Physiological Systems) NSF-IGERT program award news releases and announcements across multiple news outlets
- Feature at NPR “All things considered.” and other radio stations for the work to fight cardiovascular disease.
- Featured in the Virginia Tech Research Magazine, Article titled: “Engineers seek to stem massive, deadly flow of heart disease”, Aug. 2009
- Science360 featured the NSF EFRI award, “Complex Microsystem Networks Inspired by Internal Insect Physiology” Article titled: The Secrets of the Lowly Ground Beetle Could Lead to Better Tissue Engineering, Sept 2009.
- Featured in “NewScientistTech: *Underwater Weapons-the New Wave*” for research in future underwater weapons

## **PROFESSIONAL AND ACADEMIC APPOINTMENTS**

### **PURDUE UNIVERSITY, WEST LAFAYETTE, IN, AUG. 2013-PRESENT**

09/21-present : St. Vincent Health Professor of Healthcare Engineering  
 02/21-present : Director, Regenstrief Center for Healthcare Engineering, Purdue University  
 08/13- present : Professor, School of Mechanical Engineering, Purdue University  
 2018 - 2019 : Presidents Fellow, Office of Vice President for Engagement, Partnerships and Research Purdue University  
 08/13- present : Professor, School of Biomedical Engineering Purdue University (by courtesy)  
 2013- 2016 : Affiliate Professor, Mechanical Engineering Dept. Virginia Tech  
 2013- 2016 : Affiliate Professor, School of Biomedical Engineering and Sciences Virginia Tech  
 2006-2015 : Adjunct Faculty, Wake Forest School of Medicine  
 2004-2016 : Affiliate Faculty, Dept of Engineering Sciences and Mechanics, Virginia Tech

### **VIRGINIA TECH, BLACKSBURG, VA, 2000-2013**

10/12-08/13 : Robert E. Hord Professor, Mechanical Engineering Dept. Virginia Tech  
 06/11-10/12 : Professor, John R. Jones Faculty Fellow, Mech. Engineering Dept. Virginia Tech  
 06/07-06/11 : Associate Prof. Mechanical Engineering Dept. Virginia Tech

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08/03-08/13 : Core Faculty, School of Biomedical Engineering and Sciences, Virginia Tech  
08/03-06/07 : Assistant Prof. Mechanical Engineering Dept. Virginia Tech  
01/01-08/03 : Aeroprobe Corp (Blacksburg, Va.) Senior Scientist. R&D (part time).  
07/02-08/03 : Research Assistant Prof. Eng. Sc. and Mechanics Dept. Virginia Tech (part time)  
09/00-07/02 : Visiting Assistant Prof. Eng. Sc. and Mechanics Dept. Virginia Tech (part time)

## FELLOWSHIPS

Fellow, American Heart Association  
Fellow, American Society of Mechanical Engineers  
Fellow, American Institute of Medical and Biological Engineers

## RESEARCH AND CREATIVE ACTIVITIES

### SCHOLARLY ACTIVITIES SUMMARY

Journal Publications	181
Conference Papers (Full/Peer Reviewed)	128
Conference extended and short abstracts	186
Patents	8
Intellectual Property Disclosures	43

(\*) denotes a paper that received a journal highlight, featured article, journal cover, or journal award.

### JOURNAL PAPERS

1. Quantifying Numerical Uncertainty in Background-Oriented Schlieren ... accepted Experiments in Fluids
2. Torres Jessica E., Meng Fanfei, Bhattacharya Sayantan, Buno Kevin P., Ahmadzadegan Adib, Madduri Sathvik, Babiak Paulina M., Vlachos P. Pavlos, Solorio Luis, Yeo Yoon, Liu Julie C. Interpenetrating Networks of Collagen and Hyaluronic Acid that Serve as In Vitro Tissue Models for Assessing Macromolecular Transport, accepted. *acs Biomolecules*
3. dos Santos A.C.F., Ahmadzadegan A., Ximenes E., Vlachos P.P., Ardekani A.M., Kapur S., Corvari V., Ladisch M.R. 2023. Concentration dependent diffusion of unlabeled protein within an in vitro hyaluronic acid matrix, accepted *Biotechnology Bioengineering*
4. de Lucio M., Leng Y., Wang H., Ardekani, A.M., Vlachos P. P., Shi G. Gomez H., Computational modeling of the effect of skin pinch and stretch on subcutaneous injection of monoclonal antibodies using autoinjector devices, 2023, <https://doi.org/10.1007/s10237-023-01746-x>, *Biomechanics and Modeling in Mechanobiology*.
5. ... 2023, Mechanistic computational modeling of implantable, bioresorbable, drug release systems *to be accepted Advanced Materials*.
6. Ahmadzadegan Adib, Harsa Mitra, Vlachos P.P., Ardekani A.M., 2023, Particle Image micro-Rheology (PIR) using Displacement Probability Density Function, <https://doi.org/10.1122/8.0000629>, DOI: 10.1122/8.0000629, *Journal of Rheology*

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7. Zhong X., Veilleux J.-C., Shi G.H., Collins D.S., Vlachos P.P., Ardekani A.M., 2023, Hydrodynamic considerations for spring-driven autoinjector design, *accepted International Journal of Pharmaceutics*
  8. Meyers Brett, Jonathan Nyce, Jiacheng Zhang, Lowell Frank, Elias Balaras, Pavlos Vlachos, and Yue-Hin Loke. 2023, Intracardiac Flow Analysis of the Right Ventricle in Pediatric Patients with Repaired Tetralogy of Fallot, using a novel Color-Doppler Velocity Reconstruction, *Journal of the American Society of Echocardiography*, doi: 10.1016/j.echo.2023.02.008.
  9. Rothenberger S.M., Zhang J., Ansari. S., Markl M., Vlachos P.P., Rayz V.L. 2023, 4D flow MRI Segmentation Using the Standardized Difference of Means Velocity *IEEE Transactions on Medical Imaging*, doi: 10.1109/TMI.2023.3251734.
  10. Salcedo M. et al, A living network: Complex hemolymph circulation patterns in locust wings, *Communications Biology*, **6**, 313 (2023). doi:<https://doi.org/10.1038/s42003-023-04651-2>
  11. Hakim M.H., Jun B.H., Ahmadzadegan A., Babiak P.M., Xu Q., Buno K.P., Liu J.C., Ardekani A.M., Vlachos P.P. and Solorio L., 2023, Investigation Of Macromolecular Transport Through Tunable Collagen Hyaluronic Acid Matrices, *Colloids and Surfaces B: Biointerfaces*, doi: <https://doi.org/10.1016/j.colsurfb.2023.113123>
  12. Dellinger S., Munoz, M., De Vita P., Vlachos P.P., and Socha J., 2023. Material properties of skin in the flying snake *Chrysopelea ornata*, *Journal of Experimental Zoology Part A* doi: 10.1002/jez.2676.
  13. Brindise M.C., Buno K., Solorio L., Vlachos P.P. 2023. Automated Layer Identification Method for Skin Tissue Histology Images, *Annals of Biomedical Engineering*, doi: [10.1007/s10439-022-03106-9](https://doi.org/10.1007/s10439-022-03106-9)
  14. Ishizaka S., Iwano H., Tsujinaga S., Murayama M., Tsuneta S., Aoyagi H., Tamaki Y., Motoi K., Chiba Y., Tanemura A., Nakabachi M., Yokoyama S., Nishino H., Okada K., Meyers B.A., Vlachos, P.P., Sato T., Kamiya K., Watanabe M., Kaga S. 2023. Determinants of exercise capacity in patients with heart failure showing normal left ventricular morphology, *Journal of Cardiology* **81** (1):33-41
  15. Eshraghi J., Dou Z., Veilleux J.-C., Shi G.H., Collins D.S., Ardekani A.M., Vlachos P.P. 2022. The Air Entrainment and Hydrodynamic Shear of the Liquid Slosh in Syringes, *International Journal of Pharmaceutics* **627**:122210
  16. Jun B.H., Ahmadzadegan A., Ardekani A.M., Solorio L., Vlachos P.P. 2022. Multi-feature-based robust cell tracking, *Annals of Biomedical Engineering* <https://doi.org/10.1007/s10439-022-03073-1>
  17. dos Santos A.C.F., Ahmadzadegan A., Ximenes E., Vlachos P.P., Ardekani A.M., Kapur S., Corvari V., Ladisch M.R. 2022. In vitro measurement of concentration of unlabeled protein within a hyaluronic acid matrix, *Biotechnology Bioengineering* **119** (12):3647-3656
  18. Leng Y., Vlachos P.P., Juanes R., Gomez H. 2022. Cavitation in a soft porous material, *PNAS Nexus* **1** (4):150
  19. Eshraghi J., Veilleux J.-C., Shi G.H., Collins D.S., Ardekani A.M., Vlachos P.P. 2022. Assessment of cavitation intensity in accelerating syringes of spring-driven autoinjectors, *Pharmaceutical Research* **39**:2247–2261
  20. Zhang J., Rothenberger S.M., Brindise M.C., Markl M., Rayz V.L., Vlachos P.P. 2022. Wall Shear Stress Estimation for 4D Flow MRI using Navier-Stokes Equation Correction,

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- Annals of Biomedical Engineering* Dec;50(12):1810-1825. doi: 10.1007/s10439-022-02993-2.
21. Ahmadzadegan A., Zhang j., Ardekani A.M., Vlachos P.P. 2022. Spatiotemporal Measurement of Concentration-Dependent Diffusion Coefficient, *Physics of Fluids* **34**:51910
  22. Ahmadzadegan A., Bhattacharya S., Ardekani A.M., Vlachos P.P. 2022. Uncertainty Estimation for Ensemble Particle Image Velocimetry, *Measurement Science and Technology* **33**:85302
  23. Zhang J., Bhattacharya S., Vlachos P.P. 2022. Uncertainty of PIV/PTV based Eulerian pressure estimation using velocity uncertainty, *Measurement Science and Technology* **33** (6):65303
  24. Meyers B.A., Brindise M.C., Kutty S., Vlachos P.P. 2022. A Method for Direct Estimation of Left Ventricular Global Longitudinal Strain Rate from Echocardiograms, *Scientific Reports* **12**:4008
  25. Sree V.D., Ardekani A.M., Vlachos P.P., Tepole A.B. 2022. The Biomechanics of Autoinjector - Skin Interactions During Dynamic Needle Insertion, *Journal of Biomechanics* **134**:110995
  26. Rothenberger S.M., Zhang J., Brindise M.C., Markl M., Vlachos P.P., Rayz V.L. 2022. Modeling Bias Error in 4D flow MRI Velocity Measurements, *IEEE Transactions on Medical Imaging* **41** (7):1802-1812
  27. Chiba Y., Iwano H., Tsuneta S., Tsujinaga S., Meyers B.A., Vlachos P.P., Ishizaka S., Motoi K., Aoyagi H., Tamaki Y., Tanemura A., Murayama M., Yokoyama S., Nakabachi M., Nishino H., Kaga S., Kamiya K., Ohira H., Tsujino I., Anzai T. 2022. Determinants of altered left ventricular suction in pre-capillary pulmonary hypertension, *European Heart Journal - Cardiovascular Imaging* **23** (1):1399-1406
  28. Zhang J., Brindise M.C., Rothenberger S.M., Markl M., Rayz V.L., Vlachos P.P. 2022. A multi-modality approach for enhancing 4D flow magnetic resonance imaging via sparse representation, *Journal of the Royal Society Interface* **19** (186):20210751
  29. Brindise M.C., Meyers B.A., Kutty S., Vlachos P.P. 2022. Automated peak prominence-based iterative Dijkstras algorithm for segmentation of B-mode echocardiograms, *IEEE Transactions on Biomedical Engineering* **69** (5):1595-1607
  30. Chakraborty S., Allmon E., Sepulveda M.S., Vlachos P.P. 2021. Haemodynamic dependence of mechano-genetic evolution of the cardiovascular system in Japanese medaka, *Journal of the Royal Society Interface* **18** (183):20210752
  31. Zhang Y., Dou Z., Veilleux J.-C., Shi G.H., Collins D.S., Ardekani A.M., Vlachos P.P. 2021. Modeling cavitation bubble dynamics in an autoinjector and its implications on drug molecules, *International Journal of Pharmaceutics* **608**:121062
  32. Vasiukhina A., Eshraghi J., Ahmadzadegan A., Goergen C.J., Vlachos P.P., Solorio L. 2021. Stable Thermally-Modulated Nanodroplet Ultrasound Contrast Agents, *Nanomaterials* **11** (9):2225
  33. Singh B., Rajendran L.K., Vlachos P.P., Bane S.P.M. 2021. Shock generated vorticity in spark discharges, *Journal of Physics D: Applied Physics* **54**:315202
  34. Rajendran L.K., Bhattacharya S., Bane S.P.M., Vlachos P.P. 2021. Meta-Uncertainty for Particle Image Velocimetry, *Measurement Science and Technology* **32**:104002
  35. Erickson C.T., Meyers B.A., Li L., Craft M., Jani V., Bliamptis J., Moukagna K.S.B., Danford D.A., Vlachos P.P., Kutty S. 2021. Progression of Left Ventricular Diastolic

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- Function in the Neonate and Early Childhood from Transmitral Color M-Mode Filling Analysis, *Pediatric Research* **89**:987–995
36. Rajendran L.K., Singh B., Vlachos P.P., Bane S.P.M. 2021. Filamentary surface plasma discharge flow length and time scales, *Journal of Physics D: Applied Physics* **54**:205201
  37. Eshraghi J., Rajendran L.K., Yang W., Stremmer M.A., Vlachos P.P. 2021. On flowing soap films as experimental models of 2D Navier–Stokes flows, *Experiments in Fluids* **62** (8):162
  38. Jafari F., Holden D., LaFoy R., Vlachos P.P., Socha J.J. 2021. The aerodynamics of flying snake airfoils in tandem configuration, *Journal of Experimental Biology* **224** (14):233635
  39. Eshraghi J., Ardekani A.M., Vlachos P.P. 2021. Data assimilation for modeling cavitation bubble dynamics, *Experiments in Fluids* **62** (5):90
  40. Zhong Y., Han D., Dou Z., Veilleux J.-C., Shi G.H., Collins D.S., Vlachos P.P., Ardekani A.M. 2021. The Interface Motion and Hydrodynamic Shear of the Liquid Slosh in Syringes, *Pharmaceutical Research* **38** (2):257-275
  41. Zhang J., Rothenberger S.M., Brindise M.C., Scott M.B., Berhane H., Baraboo J.J., Markl M., Rayz V.L., Vlachos P.P. 2021. Divergence-Free Constrained Phase Unwrapping and Denoising for 4D Flow MRI Using Weighted Least-Squares, *IEEE Transactions on Medical Imaging* **4** (12):3389-3399
  42. Chakraborty S., Meyers B.A., Iwano H., Hall M.E., Vlachos P.P. 2021. A Wavelet Approach to the Estimation of Left Ventricular Early Filling Wave Propagation Velocity from Color M-Mode Echocardiograms, *Ultrasound in Medicine and Biology* **47** (5):1397-1407
  43. de Lucio M., Bures M., Ardekani A.M., Vlachos P.P., Gomez H. 2021. Isogeometric analysis of subcutaneous injection of monoclonal antibodies, *Computer Methods in Applied Mechanics and Engineering* **373**:113550
  44. Meyers B.A., Goergen C.J., Segers P., Vlachos P.P. 2020. Colour-Doppler echocardiography flow field velocity reconstruction using a streamfunction-vorticity formulation, *Journal of the Royal Society, Interface* **17** (173):20200741
  45. Singh B., Rajendran L.K., Zhang J., Vlachos P.P., Bane S.P.M. 2020. Vortex rings drive entrainment and cooling in flow induced by a spark discharge, *Physical Review Fluids* **5** (11):114501
  46. Zhong X., Guo T., Veilleux J.-C., Shi G.H., Collins D.S., Vlachos P.P., Ardekani A.M. 2020. An experimentally validated dynamic model for spring-driven autoinjectors, *International Journal of Pharmaceutics* **594**:120008
  47. Rajendran L.K., Zhong J., Bane S.P.M., Vlachos P.P. 2020. Weighted Least Squares (WLS) Density Integration for Background Oriented Schlieren (BOS), *Experiments in Fluids* **61** (11):239
  48. Rajendran L.K., Zhong J., Bane S.P.M., Vlachos P.P. 2020. Uncertainty-based Weighted Least Squares Density Integration for Background Oriented Schlieren, *Experiments in Fluids* **61** (11):239
  49. Eshraghi J., Jung S., Vlachos P.P. 2020. To seal or not to seal: The closure dynamics of a splash curtain, *Physical Review Fluids* **5** (1):104001
  50. Ahmadzadegan A., Ardekani A.M., Vlachos P.P. 2020. Estimation of the probability density function of random displacements from images, *Physical Review E* **102** (3):33305
  51. Zhong X., Eshraghi J., Vlachos P.P., Dabiri S., Ardekani A.M. 2020. A model for a laser-induced cavitation bubble, *International Journal of Multiphase Flow* **132**:103433



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52. Carter D.W., Hassaini R., Eshraghi J., Vlachos P.P., Coletti F. 2020. Multi-scale imaging of upward liquid spray in the far-field region, *International Journal of Multiphase Flow* **132**:103430
  53. Bhattacharya S., Vlachos P.P. 2020. Volumetric particle tracking velocimetry (PTV) uncertainty quantification, *Experiments in Fluids* **61** (9):197
  54. Jun B.H., Guo T., Libring S., Chanda M.K., Paez J.S., Shinde A., Wendt M.K., Vlachos P.P., Solorio L. 2020. Fibronectin-expressing mesenchymal tumor cells promote breast cancer metastasis, *Cancers* **12** (9):2553
  55. Dou Z., Eshraghi J., Guo T., Veilleux J.-C., Duffy K.H., Shi G.H., Collins D.S., Ardekani A.M., Vlachos P.P. 2020. Performance characterization of spring actuated autoinjector devices for Emgality and Aimovig, *Current Medical Research and Opinion* **36** (8):1343-1354
  56. Zhang Y., Guo T., Vlachos P.P., Ardekani A.M. 2020. Velocity scaling and breakup criteria for jets formed due to acceleration and deceleration process, *Physical Review Fluids* **5** (7):74003
  57. Rajendran L.K., Bane S.P.M., Vlachos P.P. 2020. Uncertainty amplification due to density/refractive index gradients in background-oriented schlieren experiments, *Experiments in Fluids* **61**:139
  58. Zhang J., Bhattacharya S., Vlachos P.P. 2020. Using uncertainty to improve pressure field reconstruction from PIV/PTV flow measurements, *Experiments in Fluids* **61**:131
  59. Zhang J., Brindise M.C., Rothenberger S., Schnell S., Markl M., Saloner D., Rayz V.L., Vlachos P.P. 2020. 4D Flow MRI Pressure Estimation Using Velocity Measurement-Error-Based Weighted Least-Squares, *IEEE Transactions on Medical Imaging* **39** (5):1668-1680
  60. Brindise M.C., Meyers B.A., Vlachos P.P. 2020. Universality of vortex ring decay in the left ventricle, *Journal of Biomechanics* **103**:109695
  61. Singh B., Rajendran L.K., Vlachos P.P., Bane S.P.M. 2020. Two regime cooling in flow induced by a spark discharge, *Physical Review Fluids* **5** (1):14501
  62. Rajendran L.K., Zhang J., Bhattacharya S., Bane S.P.M., Vlachos P.P. 2020. Uncertainty quantification in density estimation from background-oriented Schlieren measurements, *Measurement Science and Technology* **31** (5):54002
  63. Erickson C.T., Meyers B.A., Li L., Craft M., Jani V., Bliamptis J., Moukagna K.S.B., Danford D.A., Vlachos P.P., Kutty S. 2021. Progression of left ventricular diastolic function in the neonate and early childhood from transmitral color M-mode filling analysis, *Pediatric Research* **89**:987–995
  64. Ahmadzadegan A., Wang S., Vlachos P.P., Ardekani A.M. 2019. Hydrodynamic attraction of bacteria to gas and liquid interfaces, *Physical Review E* **1** (6):62605
  65. Rajendran L.K., Bane S.P.M., Vlachos P.P. 2019. Dot tracking methodology for background-oriented schlieren (BOS), *Experiments in Fluids* **6** (11):62
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## PAPERS IN REFERRED CONFERENCE PROCEEDINGS

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## **EXTENDED ABSTRACTS, ABSTRACTS AND POSTERS**

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  120. Voigt E., Buchanan C., Schmiege J., Rylander N., Vlachos P.P., Flow Characterization of an Arterial Flow Bioreactor using Particle Image Velocimetry, *Biomedical Engineering Society (BMES) Annual Meeting*, Austin, TX USA, 2010.
  121. Niebel E., Stewart K.C., Kumar R., Ohara T., Vlachos P.P., Little W.C., Relationships of E and A wave Pressure Distribution to Left Ventricular Diastolic Dysfunction, *Biomedical Engineering Society (BMES) Annual Meeting*, Austin, TX USA, 2010.
  122. Cooper D.B., Vlachos P.P., 2D Analysis of Acoustic Transfer of Cardiovascular Sounds in the Human Chest, *ASME Summer Bioengineering Conference*, Lake Tahoe, CA USA, 2009.
  123. Karri Satya D.B., Vlachos P.P., Effect of Stent Design Parameter on Coronary Artery Flow, *ASME Summer Bioengineering Conference*, Lake Tahoe, CA USA, 2009.
  124. Weiland C., Vlachos P.P., Dynamic Characteristics at the Interface of Underwater Round Jets, *62nd Annual Meeting of the APS Division of Fluid Dynamics*, Minneapolis, MN USA, 2009.
  125. Weiland C., Vlachos P.P., Organization of Cylinder Wake using a Splitter Plate Active Flow Control, *62nd Annual Meeting of the APS Division of Fluid Dynamics*, Minneapolis, MN USA, 2009.
  126. Stewart K.C., Kumar R., Vlachos P.P., Little W.C., Analysis of Diastolic Filling Pressure Gradients Assessed by Color M-Mode Echocardiography, *Biomedical Engineering Society Annual Meeting*, Pittsburgh, PA USA, 2009.
  127. Stewart K.C., Kumar R., Charonko J.J., Vlachos P.P., Little W.C., A New Automated Method for Characterizing Diastolic Dysfunction Using Color M-Mode Echocardiography, *Biomedical Engineering Society Annual Meeting*, Pittsburgh, PA USA, 2009.
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  129. Apsilidis N., Raben S.G., Diplas P., Dancey C.L., Vlachos P.P., Khosronejad A., Sotiropoulos F., Reynolds number effects on the dynamics of the turbulent horseshoe vortex: High resolution experiments and numerical simulations, *62nd Annual Meeting of the APS Division of Fluid Dynamics*, Minneapolis, MN USA, 2009.
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  133. Kumar R., Stewart K.C., Charonko J.J., Vlachos P.P., Little W.C., Diastolic Intraventricular Pressure Gradients Assessed by Color M-Mode Echocardiography, *American Heart Association*, New Orleans, LA USA, 2008.
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  135. Weiland C., Vlachos P.P., The Role of Vortex Ring Formation on the Development of Impulsively Induced Supercavitation, *International Union and Theoretical and Applied Mechanics Symposium*, Copenhagen, Denmark, 2008.
  136. Weiland C., Yagla, J., Vlachos P.P., Submerged Gas Jet Interface Stability, *International Congress on Theoretical and Applied Mechanics*, Adelaide, Australia, 2008.
  137. Eckstein A., Vlachos P.P., Compensating for the Phosphorescent Persistence in Intensified Cameras for Micro-PIV, *ASME Fluids Engineering Conference*, Jacksonville, FL USA, 2008.
  138. Jaime S., Williams A., Vlachos P.P., Magnetic Drug Targeting: Drug Delivery in Large Vasculature, *ASME Summer Bioengineering Conference*, Marco Island, FL USA, 2008.
  139. Charonko J.J., Karri S.P., Schmieg J., Prabhu S.V., Vlachos P.P., A Time Resolved DPIV in-vitro evaluation of coronary stents in realistic conditions: Part I – influence of stent configuration, *ASME Summer Bioengineering Conference*, Marco Island, FL USA, 2008.
  140. Stewart K.C., Kumar R., Charonko J.J., Vlachos P.P., Little W.C., A Hydrodynamic Efficiency Parameter As A Novel Left Ventricular Diastolic Dysfunction Diagnostic Metric, *ASME Summer Bioengineering Conference*, Marco Island, FL USA, 2008.
  141. Charonko J.J., Stewart K.C., Kumar R., Little W.C., Vlachos P.P., Hydrodynamics of Left Ventricle Diastolic Dysfunction: In-Vivo Investigation, *VT Engineering Science and Mechanics*, Blacksburg, VA USA, 2008.
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  148. Williams A.M., Vlachos P.P., Dynamics of Magnetic Drug Targeting in Cardiovascular Flows, *ASME Summer Bioengineering Conference*, Keystone, CO USA, 2007.
  149. Karri S., Etebari A., Vlachos P.P., Time Resolved DPIV Analysis of Pulsatile flow in Symmetric Stenotic Arteries-A Comparison Between Arterial and Coronary Flow, *ASME Summer Bioengineering Conference*, Keystone, CO USA, 2007.
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  152. Etebari A., Pierrakos O., Raben S., Satyaprakash B.K., Vlachos P.P., Direct, dynamic wall shear stress measurements in cardiovascular flows: Application to stenotic vessels, *ASME Summer Bioengineering Conference*, Amelia Island, FL USA, 2006.
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  156. Raben S., Satyaprakash B.K., Etebari A., Vlachos P.P., DPIV analysis of flow through an asymmetric coronary stenosis, *ASME Summer Bioengineering Conference*, Amelia Island, FL USA, 2006.
  157. Satyaprakash B.K., Raben S., Etebari A., Vlachos P.P., Effects of stents in curved coronary arteries, *ASME Summer Bioengineering Conference*, Amelia Island, FL USA, 2006.
  158. Satyaprakash B.K., Raben S., Etebari A., Vlachos P.P., Time-resolved analysis of stented coronary arteries, *ASME Summer Bioengineering Conference*, Amelia Island, FL USA, 2006.
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  162. Etebari A., Akle B., He X., Leo D., Lee Y., Vlachos P.P., Development of a novel dynamic bioreactor, *ASME Summer Bioengineering Conference*, Vail, CO USA, 2005.
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  164. Brady M., Vlachos P.P., Telionis D., Bubble Bouncing, *58th Annual Meeting of the APS Division of Fluid Dynamics*, Chicago, IL USA, 2005.
  165. Charonko J.J., Sykes D., Vandsburger U., Vlachos P.P., Endoscopic DPIV for Gas Turbine Measurements, *Virginia Tech Turbomachinery and Propulsion Review*, Blacksburg, VA USA, 2005.
  166. Pierrakos O., Vlachos P.P., Quantifying the Incoming Jet Past Heart Valve Prostheses Using Vortex Formation Dynamics, *58th Annual Meeting of the APS Division of Fluid Dynamics*, Chicago, IL USA, 2005.
  167. Weiland C., Vlachos P.P., Cavitation Inception on Submerged, High-Speed Bodies, *58th Annual Meeting of the APS Division of Fluid Dynamics*, Chicago, IL USA, 2005.
  168. Pierrakos O., Vlachos P.P., Identification of a New Energy Loss Mechanism for Flow Past Heart Valves, *Biomedical Engineering Society (BMES) Meeting*, Philadelphia, PA USA, 2004.
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  170. Charonko J.J., Yazdani S., Vlachos P.P., In-Vitro Examination of Coronary flow in Stented Arteries using DPIV, *Biomedical Engineering Society (BMES) Meeting*, Philadelphia, PA USA, 2004.
  171. Charonko J.J., Ragab S.A., Vlachos P.P., A Numerical Analysis of Cardiovascular Stent Design Considerations, *ASME International Mechanical Engineering Congress & Exposition*, Washington DC USA, 2003.
  172. Charonko J.J., Etebari A., Akle B., Vlachos P.P., Leo D., Novel Non-Invasive Methods For In-Vitro or Ex-Vivo Vessel Compliance Measurements, *Biomedical Engineering Society (BMES) Meeting*, Nashville, TN USA, 2003.
  173. Charonko J.J., Ragab S.A., Vlachos P.P., Improved Stent Design Through Mathematical Modeling, *Virginia Tech-Wake Forest 2nd Student Research Symposium*, Blacksburg, VA USA, 2003.
  174. Etebari A., Pierrakos O., Vlachos P.P., Automatic MRI Image Segmentation And Left Ventricle Surface Reconstruction For Characterizing Myocardial Muscle Function, *ASME International Mechanical Engineering Congress & Exposition*, New Orleans, LA USA, 2002.
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  183. Vlachos P.P., Pierrakos O., Phillips A., Telionis D.P., Vorticity And Turbulence Characteristics Inside A Transparent Flexible Left Ventricle, *ASME Bioengineering Division*, Snowbird, UT USA, 2001.
  184. Pierrakos O., Vlachos P.P., Telionis D.P., Turbulent Flow Characteristics Downstream Of Biological And Mechanical Mitral Heart Valves, *Biomedical Engineering Society (BMES) Meeting*, Durham, NC USA, 2001.
  185. Phillips A., Vlachos P.P., Telionis D.P., The Effect Of The Chordae Tendineae On Blood Flow Turbulence, *Biomedical Engineering Society (BMES) Meeting*, Durham, NC USA, 2001.
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## **PATENTS INTELLECTUAL PROPERTIES AND SOFTWARE RELEASED**

### **PATENTS**

1. A Method for Automatic Echocardiogram Segmentation, US Utility Patent, 62/987,978, (Licensed)
2. A Method for Direct Estimation of Heart Mechanics from Echocardiograms, US Utility Patent, 62/987,964 (Licensed)

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3. Thermally Activated Ultrasound Contrast Agents, US Utility Patent, 62/774,040
  4. Optical Detection Of Neurological Alterations, US Utility Patent, 62/774,040
  5. Method for Reconstructing Two Component Velocity Fields from Ultrasound Color Doppler Scans,
    - a. US Utility Patent, 62/640,849, (Licensed)
    - b. Copyright, 1-6364800131, (Licensed)
  6. “A Launcher for Cavitating Weapons” VTIP# 06.100- WIPO Pub. No.: WO/2008/105930 International Application No.: PCT/US2007/078504 Publication Date: 04.09.2008
  7. (\*) “A 360-degree roof membrane pressure equalizer” Development of an Omni-Directional Roof-Vent for wind hazard mitigation (VTIP 03.050). US Patent # 7,001,266.
  8. (\*) Rooftop vent for reducing pressure under a membrane roof, US Patent # 7,607,974 B2

\*Now commercialized under the trade name V2T Vent™ by Acrylife  
<http://sites.google.com/site/v2tventurivent/>

#### **INTELLECTUAL PROPERTY DISCLOSURES**

1. A Non-invasive Method for Characterization of Liquid Slosh in Accelerating Liquid Column 2022-VLAC-69710
2. An Image Based Method for Measuring Apparent Viscosity using Microrheology 2022-VLAC-69711
3. Passive Microrheology using Estimation of Particle Image Displacement Probability Density Function 2022-VLAC-69712
4. 3D Spatial-Temporal Solver for Concentration Dependent Diffusion Coefficient 2022-VLAC-69713
5. Automated Feature Identification from Histology Images 2022-VLAC-69720
6. Multi-feature-based robust cell tracking 2022-VLAC-69721
7. Subvisible Particle Measurement Instrumentation 2022-VLAC-69722
8. Spatial-Temporal Solver for Concentration Dependent Diffusion Coefficient 2021-VLAC-69331
9. A Method for Automatic Tissue Layer Identification 2021-VLAC-69325
10. A Method for Automatic Tissue Stain Quantification 2021-VLAC-69326
11. Ex Vivo Mammalian Skin and Subcutaneous Tissue Model 2021-VLAC-69327
12. Feature Based Automatic Labeling of Subvisible Particles 2021-VLAC-69328
13. Feature Based Supervised Classification of Subvisible Particles 2021-VLAC-69329
14. Investigation of Macromolecular Transport through Tunable Collagen and Hyaluronic Acid in Vitro Subcutaneous Tissue via Transwell Assay 2021-VLAC-69330
15. Flow-physics Constrained Phase Unwrapping and Denoising for 4D Flow MRI 2020-VLAC-69043
16. Dual Patient Ventilation Model for ARDS COVID-19 Crisis Response 2020-VLAC-69028
17. A Dynamic Model for Spring-driven Auto-injectors 2020-ARDE-68923
18. Video Processing Method for Analysis of Autoinjector Kinematics 2020-VLAC-68909

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19. An image-based Non-invasive Method for Fluid Stress Field Estimation 2020-VLAC-68910
  20. Rose Bengal Labeled Proteins for Assessment of Protein Distribution after Subcutaneous Injection, 2020-SOLO-68883
  21. Design Considerations for Low-Fill Eli-Lilly Irma Autoinjectors 2020-VLAC-68782
  22. Procedures for Testing Drug Delivery Auto-injectors 2020-VLAC-68783
  23. A Method for Automatic Echocardiogram Segmentation 2020-VLAC-68780
  24. A Method for Direct Estimation of Heart Mechanics from Echocardiograms 2020-VLAC-68781
  25. Non-slip Tip Surface for Geometrically Controlled mAb Injection into SQ in vitro Tissue Environment (SITE) 2020-LADI-68736
  26. Thermally Activated Ultrasound Contrast Agents 2019-SOLO-68683
  27. Simulated Subcutaneous (SQ) Environments for Ranking Monoclonal Antibody Formulations 2019-LADI-68531
  28. Method for optical detection of neurological alterations, 2019-VLAC-68416
  29. Microgel Device for Geometric Simulation of SQ Environment, 2019-LADI-68373
  30. Uncertainty Quantification in Volumetric Particle Tracking Velocimetry (PTV), 2019-VLAC-68470
  31. Stereo-Particle Image Velocimetry Uncertainty Quantification, 2017-VLAC-67630
  32. Method for Reconstructing Two Component Velocity Fields from Ultrasound Color Doppler Scans. 2017-SCAL-67985
  33. Passive Implant Embedded Sensing for Arterial Disease VTIP#08-112
  34. Weapon Assisted Free Surface Penetration (WASP) VTIP#08-107
  35. Color M-Mode Echocardiogram Propagation Velocity and Pressure Analysis Algorithm VTIP#08-099
  36. Phase Correlation Algorithms for DPIV Estimation, (copyright) VTIP#08-042
  37. A Hydrodynamic Efficiency as a Diagnostic Tool for Cardiac Health VTIP#07-087
  38. A Novel Nafion Polymer Mixer for Laminar Flows” VTIP # 06.101
  39. “A flush-mounted wall shear sensor based on ionomeric polymers” patent (Licensed to Discover Technologies). VTIP 06.101
  40. “A Launcher for Cavitating Weapons” VTIP# 06.100- Provisional patent filed “A flush-mounted wall shear sensor based on ionomeric polymers” VTIP#05.082
  41. “Rooftop Vent for Reducing Pressure Under a Membrane Roof” VTIP#05.038
  42. “A 360-degree roof membrane pressure equalizer” Development of an Omni-Directional Roof-Vent for wind hazard mitigation VTIP#03.050.
  43. “Active Skin for Turbulent Drag Reduction”, Development of a novel actuator for active turbulent boundary-layer control NASA Invention Disclosure, LAR16742-1

## SOFTWARE

- 1) **Flow Image Quantification (FlowIQ):** a comprehensive flow analysis tools for quantification of flow properties using imaging and optical diagnostics principles.



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- 2) **PIV Research and Analysis (PRANA) Matlab Toolbox:** A comprehensive and state-of-the-art Particle Image Velocimetry (PIV) Matlab Toolbox, distributed as open source and aimed to support current and further research in the area of particle velocimetry.

### **INVITED KEYNOTE PRESENTATIONS OR LECTURES (PARTIAL LIST)**

1. Invited keynote, 4D-Flow MRI in Diastolic Dysfunction, 20<sup>th</sup> Conference on Cardiac Imaging, Athens, Greece, Feb 2023
2. From Device to Patient: Physics and Physiology of Injectable Drug Delivery, Eli-Lilly Grand Rounds, Aug 2022
3. Vortex Formation in LV Filling, 19<sup>th</sup> Conference on Cardiac Imaging, Athens, Greece (virtual), Feb 2022
4. Fluid mechanics in clinical cardiology: from adult to fetal hearts, Lindbergh Lecture, Mechanical Engineering Dept, University of Wisconsin Madison, Nov. 2020
5. Fluid Mechanics in Clinical Echocardiography, Mechanical, and Aerospace Engineering Dept, University of Southern California, Feb. 2020
6. Mechanics for Evidence-Based Clinical Decisions, Indiana University School of Medicine, 2019 Morris Green Physician Scientist Development Program Fall Retreat, Sept 2019
7. Clinical flow measurements, putting experimental fluid mechanics in clinical practice, Mechanical Engineering Dept, Johns Hopkins University, April. 2019
8. Clinical fluid mechanics, Mechanical Engineering Dept, NTUA Greece, July 2018
9. The signal in the noise, Saint Antony Falls Laboratory, Univ. of Minnesota, April 2017
10. The Hearts Vortices, Saint Antony Falls Laboratory, ETHZ, Jan2017
11. The Hearts Vortices, Saint Antony Falls Laboratory, Univ. of Minnesota, Oct 2015
12. Optimization of tomographic particle image velocimetry, Office of Naval Research, Oct 2013
13. Advances in Particle Image Velocimetry, TSI Corp. Oct 2013
14. Hydrodynamics of left-ventricular filling and diastolic dysfunction, Rutgers University, April 2013
15. Hydrodynamics of left-ventricular filling and diastolic dysfunction, University of Virginia, June 2012
16. Hydrodynamics of left-ventricular filling and diastolic dysfunction, Purdue University, April 2012
17. Vortices formed at the mitral valve tips aid left ventricle filling, Mini symposium: Cardiac Fluid Dynamics: Translating Fundamental Insights into Clinical Practice, Annual Division of Fluid Dynamics, American Physical Society, Meeting 2011.
18. Accuracy and uncertainty in velocity and wall shear stress estimation in (stented) arteries using particle image velocimetry (PIV), Food and Drug Administration (FDA), August 2011.
19. CFD / EFD Choice – A Dilemma for Industries, “Application of CFD/EFD to Bio Fluid Mechanics – Challenges” ASME IMECE 2010 Vancouver CA.
20. Hydrodynamics of Left-Ventricle Filling. Mechanical Engineering Dept, Johns Hopkins University, Oct. 2010,

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21. Mechanical and Aerospace Engineering Dept, George Washington University, April 2010, “Cardiovascular fluid mechanics of arterial stents and left-ventricular diastolic dysfunction”.
  22. Mechanical and Aerospace Engineering Dept, University of Patras, Greece, May 2009, “Quantitative Visualization, from Multiphase to Cardiovascular Flows”
  23. Petroleum Institute, Abu-Dhabi, UAE, May 2009, “Robust Particle Image Velocimetry Estimation, Post Analysis and Applications for Single and Multi-Phase Flows”
  24. Mechanical and Nuclear Engineering Dept. Penn State University, March 2009, “Cardiovascular fluid mechanics of arterial stents and left-ventricular diastolic dysfunction: Two cases of translational research”
  25. W. M Reed Seminar University of Kentucky, April 2008, “Hemodynamics of coronary stents”
  26. Abbott Vascular Advance Research and Development Feb 2008, “Hemodynamic evaluation of commercialized stent designs”
  27. Keynote paper, Fluids Engineering Summer Meeting 2007, Forum on Fluid Measurement and Instrumentation, “Time-Accurate Measurement of Pressure From Particle Image Velocimetry Data”
  28. Guidant Stent Design R&D Group, Jan 2006 “Cardiovascular Fluid Mechanics Measurements”
  29. F. T Ogilvie Annual Lectureship Dept of Mechanical Engineering, MIT, Oct 2005 “Measuring and controlling near wall turbulence”
  30. Univ. of Maryland, College Park Dept of Mechanical Engineering, September 2005 “Measuring and controlling near wall turbulence”
  31. Brown University, Center of Fluid Mechanics Fall 2004 ”Measuring Near Wall Turbulence and Fluctuating Wall Shear Stresses”
  32. Caltech, Workshop of Wall shear stress, Feb 2004 ”Accuracy of wall shear stress measurements using Particle Image Velocimetry”
  33. Virginia Tech, School of Biomedical Engineering , Jan 2004 ”On to wall shear stress”
  34. Wake Forest University, Dept of Biomedical Engineering, May 2003 ”Vortex Dynamics in the Cardiovascular System”
  35. Virginia Tech, Dept of Mechanical Engineering, April 2003 ”Vortex Dynamics in the Cardiovascular System”
  36. Rutgers University, Dept of Mechanical and Aerospace Engineering, Feb 2003 ”Vortex Dynamics: From Aerodynamics to Cardiovascular Hemodynamics”
  37. Buffalo University (SUNY) Mechanical Engineering Dept, April 2002 “Super Spatio-Temporal Resolution Digital Particle Image Velocimetry Application to Left Ventricular Hemodynamics.”
  38. Vanderbilt University Mechanical Engineering Dept, April 2002 “Super Spatio-Temporal Resolution Digital Particle Image Velocimetry Application To Left Ventricular Hemodynamics.”
  39. Virginia Tech Dept of Engineering Mechanics, April 2002 “Application Of Time Resolved Super Resolution Digital Particle Image Velocimetry To Cardiovascular Hemodynamics.”

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40. Alstom-Power Ltd (former ABB Swiss). Basic Research Group, Zurich, Nov.2000.  
“Applications Of High Speed Particle Image Velocimetry To Unsteady Vortical Flows”.
  41. 30th AIAA Fluid Dynamics Conference Invited paper, Norfolk '99 “Unsteady Separated Flows Over 3-D Slender Bodies” WITH Telionis D.P. and Zeiger M. D

**PRESENTATIONS AT PROFESSIONAL MEETINGS**

Over 250. Contributed prepared and/or delivered the presentation.

**GRANTS AND CONTRACTS - SPONSORED RESEARCH**

**FUNDED RESEARCH SUMMARY:**

**SPONSORS (PARTIAL LIST):**

NSF, NIH, DARPA, AFOSR, AFRL, ARO, ONR, US Navy, NASA, NIST, DOE, American Heart Association, Eli-Lilly, CTSI, Abbott Vascular, Pratt and Whitney, FL Smith Minerals, Clariant, Carilion Biomedical Institute, VA Center of Innovative Technologies, Aeroprobe, Techsburg.

During his career (past the PhD) Dr Vlachos has been PI or co-PI in 90 funded research projects.

**SUMMARY OF RESEARCH FUNDING:**

<b>Total Funded Research</b>	<b>Total</b>	<b>PI Portion</b>
<b>USD</b>	~\$67,347,938	~\$28,100,869

**EXTERNAL FUNDING (ACTIVE)**

1. Eli-Lilly-Purdue Research Collaboration, Sponsor: Eli-Lilly, PI: P. Vlachos, amount: \$6,188,254, 0.5yrs.
2. An Integrated and Automated Tool for Quantification of Biomechanics in Fetal and Neonatal Echocardiography, Sponsor: NIH, NHLBI, R21 HD109490-01, PI: P.P Vlachos, Multi-PI: Mark R. Payne, Budget: \$ 431,893, Duration: 2 yrs.
3. Collaborative Research: Flying snakes: fluid mechanics of deforming articulated bodies, Sponsor: NSF PI: Shane Ross (Virginia Tech), Co-PI: P.P Vlachos, (25% share) 639,919, Duration: 3 yrs.
4. Risk Assessment of Cerebral Aneurysm Growth with 4D flow MRI, Sponsor: NIH, NHLBI, 2 R01 HL115267, PI: V.L. Rayz, Multi-PI: P.P Vlachos, (40% share), Budget: \$2,635,330, Duration: 4 yrs.
5. Miscibility-immiscibility conundrum in air-liquid-vapor flow modeling: Bridging the gap by using the phase-field method Sponsor: NSF, PI: Hector Gomez, co-PI P. P. Vlachos, Budget: 359, 655, (50% share) Duration: 3 yrs.

**INTERNAL FUNDING (ACTIVE)**

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6. miFluidsLab: Multi-modal Interactive Fluids Laboratory, Sponsor: Purdue's Instructional Innovation Program, Office of the Provost, PI: P. Vlachos, Co-PI: Sally Bane, Sean Brophy, amount: \$ 240,000.00 (total), Duration: 2 yrs.

**REGENSTRIEF CENTER OTHER EXTERNAL FUNDING  
(ACTIVE, NOT COUNTED IN REPORTED RESEARCH TOTAL)**

7. AnalytiXIN Consortium, Sponsor: CICP, PI: Karen Plaut, amount: \$6,000,000, Duration: 2 yrs.
8. I-HOPE Sponsor: CDC/IDOH, PI: Melanie Cline, amount: \$10,400,000, Duration: 2 yrs
9. CORE-ECI Sponsor: FSSA, PI: Catherine Scott, amount: \$1,500,000, Duration: 2 yrs

**EXTERNAL FUNDING (COMPLETED)**

10. Eli-Lilly-Injectable Biologics, Sponsor: Eli-Lilly, Co-PI: P. Vlachos, amount: YR5: \$7,605,467, YR4: \$7,327,864, YR3: \$6,601,300, YR2: \$6,415,068, YR1: \$3,906,069 (total, 25% share), 5 yrs.
11. Plenoptic Particle Image Velocimetry, Sponsor: NSF, PI: B. Thurow (Auburn), Co-PI: P. Vlachos, amount: \$ 1,105,207.00 (total, \$205,314 share), Duration: 3 yrs.
12. Echocardiography Analysis Tools for Congenital Heart Disease, Sponsor: CTSI, PI: P.P Vlachos (100%), Budget: \$74,000, Duration: 1 yr.
13. Accumulation of particles and organisms in density stratified fluids with applications in algal blooms, Sponsor: NSF, PI: A.M. Ardekani, Co-PI: P. Vlachos, amount: \$435,000, Duration: 3 yrs.
14. Multi Multi-modality 4D Flow MRI data enhancement for quantification of cerebral aneurysms hemodynamics Sponsor: NIH, NINDS R21 NS106696, PI: V.L. Rayz, coPIs, P.P. Vlachos: S. Schnell, M. Markl. Budget: \$418,784 total (50% share) Duration: 2 yrs.
15. Nanosecond Repetitively Pulsed (NRP) Plasmas: Relationship Between Induced Flow and Plasma Characteristics at Atmospheric Pressure, Sponsor: DOE-NSF, PI: S. Bane, Co-PI: P. Vlachos, amount: \$744,679 (total, 20% share), Duration: 3 yrs.
16. Boundary Layer Turbulence Control via Acoustically Resonating Porous Surfaces, Sponsor: NSF, PI: C. Scalo, Co-PI: P. Vlachos, amount: \$ 449,788.00 (total), Duration: 3 yrs.
17. Assessing the Growth and Rupture of Cerebral Aneurysms Using 4D PC-MRI and 4D PIV, American Heart Association, PI: P. Vlachos, amount: \$53,688.00 (total), Duration: 2 yrs.
18. Long term dynamics of water entry, PI: Sunny Jung, Co-PI: Pavlos Vlachos, Sponsor: NSF, Funding amount ~\$490,000, Duration: 3 yrs.
19. A 3D Co-Culture System for Examining Osteocyte-Osteoblast Interactions and Response to Physical Stimuli Sponsor: NIH-NIAMS PI: Russell Main, CoI: Pavlos Vlachos, amount: \$384,879, Duration:2 yrs.
20. Numerical and experimental modeling of multiphase flow through porous media for enhanced-oil-recovery applications, PI: A.M. Ardekani, Co-PI: Pavlos Vlachos, Sponsor: Pioneer Oil Company, amount \$109,850, Duration: 1 yr.
21. How do animals harness water entry and exit dynamics, PI: Sunny Jung, Co-PI: Pavlos Vlachos, Sponsor: NSF, Funding amount ~\$510,000, Duration: 3 yrs.

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22. IDBR: Development of a method for three-dimensional quantitative analysis of animal flight and stability, PI: PP Vlachos, Sponsor: NSF, Funding amount ~\$600,000, Duration: 3 yrs.
  23. “Assessment of Left Ventricle Function Using Color M-Mode Echocardiography” , PI: PP Vlachos, Sponsor: NIH, R21, Funding amount ~\$420,000, Duration:2 yrs (under no cost extension).
  24. Nanoparticle Transport as a function of Physiologic and Hyperthermic Conditions in a 3D Vascularized Microfluidic Tumor Platform, PI: Nichole Rylander, Co-PI: Pavlos Vlachos, Sponsor: NIH, R21, Funding amount ~\$415,000, Duration: 2 yrs.
  25. Numerical and experimental modeling of multiphase flow through porous media for enhanced-oil-recovery applications, PI: A.M. Ardekani, Co-PI: Pavlos Vlachos, Sponsor: Pioneer Oil Company, amount \$151,899, Duration: 1 yr.
  26. Pioneer Oil Projects, PI: Joseph Penki, Co-PI: Pavlos Vlachos, Sponsor: Pioneer Oil, Funding amount ~\$600,000
  27. NASA, Nicole Key (PI) An Experimental Investigation of the Flow Physics Associated with End Wall Losses and Large Rotor Tip Clearances as Found in the Rear Stages of a High Pressure Compressor\* (participated only during the last 6 months of the project)
  28. Novel Tumor Vascular Model for Investigating Tumor Angiogenesis and Cancer Therapies, PI: Nichole Rylander, Sponsor: NIH, R21, Funding amount ~\$355,000, Duration: 2 yrs.
  29. “IGERT: Multi-Scale Transport in Environmental & Physiological Systems (MultiSTEPS)” PI: M. Stremmer et al. (coPI P. P. Vlachos, 5 PIs and 15 Senior Personnel ) Sponsor: NSF, Funding amount ~\$3,000,000, Duration: 5 yrs.
  30. “EFRI-BSBA Complex Microsystem Networks Inspired by Internal Insect Physiology”, PI: J. Socha et al., (coPI P. P. Vlachos, 8 coPIs), Sponsor: NSF, Funding amount: \$2,000,000, Duration:4 yrs.
  31. Development of PIV uncertainty analysis methods for the MRI facility at INL, PI: PP Vlachos, Sponsor: Idaho National Laboratory (INL), Funding amount ~\$135,000, Duration: 2 yrs.
  32. (project title proprietary), PI: P P Vlachos, Sponsor: Non-disclosed, Funding amount ~\$1,115,000, Duration: 21 mo.
  33. “NSF CAREER Graduate student research supplement”, PI: PP Vlachos, Sponsor: NSF, Funding amount: \$42,000, Duration: 1 yrs.
  34. “CAREER: “Arterial flow dynamics: Effects of pulsatility compliance and curvature”, PI: PP Vlachos, Sponsor : NSF. Total \$400,000. Duration: 5 yrs.
  35. “Flotation Modeling and Experiments” PI: R. H. Yoon, et. al. (co-PI PP Vlachos) Sponsor: FLSmith Minerals, Funding amount ~\$541,000, Duration: 12 months.
  36. “Comparison of Next-Generation Commercial Stent Designs: Experimental and Computational Hemodynamic Evaluation of Stented Artery Flow Patterns” PI: PP Vlachos, Sponsor: Abbott, Funding amount ~\$30,000, Duration: 0.5 yrs.
  37. “Fundamental Mechanics of Gliding Flight in Snakes” PI: Jake Socha (co-PI PP Vlachos), Sponsor: DARPA, Funding amount \$330,000, Duration: 9 months.
  38. “Experimental and Computational Studies of A Water Surface Piercing Gas Jet Part-II”, PI: PP Vlachos, Sponsor: NWCDD/US Navy, Funding amount \$65,000, Duration: 0.5 yr.

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39. “Computational and Experimental Studies Of A Water Surface Piercing Gas Jet, Part I” PI: PP Vlachos, Sponsor: NWCDD/US Navy, Funding amount \$196,000, Duration: 1 yr.
  40. “Robust, High Sensitivity, Dynamic Wall Shear Sensors for Flow Diagnostics” Sponsor NSF, PI: PP Vlachos, Total \$250,000, Duration: 3 yrs.
  41. “Magnetic Drug Targeting” PI: PP Vlachos, Sponsor: Abbott Vascular Systems, Funding amount: \$75,000, Duration: 0.5 yrs.
  42. “Computational and Experimental Investigation of the EOTSG-AFW System”, PI: D Tafti & PP Vlachos, Sponsor: AREVA, CAER, Funding amount: \$160,000 Duration: 1 yrs.
  43. “Flow Characterization of Hydrophobic Surface Coatings for Wall Shear-Stress Modification”, PI: PP Vlachos, Sponsor: Clariant , Funding amount: \$140,000, Duration: 1 yrs.
  44. “Left Ventricle Filling hydrodynamic Efficiency as a Predictive Tool for Diagnosing Heart Diastolic Dysfunction”, PI: PP Vlachos, Sponsor: Wake Forest School of Medicine, Funding amount \$50,000 (Direct only), Duration: 1 yrs.
  45. “Development of a comprehensive model for simulation, scale up and design of large flotation machines”, PI: RH Yoon, et al. (CoPI P. P. Vlachos, 4 CoPIs), Sponsor: DOE-CAST and FL Smith Dorr Oliver, Funding amount ~\$750,000 total, Duration: 2 yrs.
  46. “Sand Particle Tracking in Ribbed Channels”, PI: PP Vlachos ( with K. Thole Penn State), Sponsor:Pratt & Whitney, Funding amount, \$40,000,Duration: 1 yrs.
  47. “Gas Encapsulation Methods for Payload Deployment”, PI: PP Vlachos, Sponsor: DARPA, Funding amount, \$250,000, Duration: 1 yrs.
  48. “A General Theory for the Effect of Large-Scale Freestream Turbulence on Surface Heat Transfer”, PI: TE Diller, PP Vlachos, Sponsor: NSF, Funding amount, \$270,000, Duration: 3 yrs.
  49. “Validation Of An Active Ionic Polymer Sensor For Dynamic Skin Friction Measurements”, PI: PP Vlachos, Sponsor Office of Naval Research SBIR, Funding amount \$307,000 (Total SBIR project ~\$700,000), Duration: 3 yrs.
  50. “Validation Measurements of Metal Rubber Wall Shear Stress Sensor”, PI: PP Vlachos, Sponsor: Office of Naval Research, Funding amount \$30,000, Duration: 5 months.
  51. ”MRI: Development of a Spatiotemporal Velocimeter with Simultaneous Size Measurement for Polydispersed Multi-Phase Flows”, PI: PP Vlachos K. Thole and C. Dancey, Sponsor: NSF: Major Research Instrumentation, Funding amount: \$394,000, Duration: 2 yrs.
  52. “Subscale studies of a water surface piercing gas jet-Phase III effort”, PI: PP Vlachos, Sponsor: US Navy, Funding amount \$70,000. Duration: 0.5 yrs.
  53. “Subscale studies of a water surface piercing gas jet-Phase II effort”, PI: PP Vlachos, Sponsor:US Navy, Funding amount \$99,904. Duration: 1 yrs.
  54. “Aerodynamics and flight control of circulation-control rotor disk aircraft”, PI: DP Telionis P.P Vlachos and S. A Ragab, Sponsor: DARPA, Funding amount:~\$280,000, Duration: 1 yr.
  55. “Hemodynamic Evaluation of Stented Artery Flow Pattern: A Comparison of Commercialized Stent Designs”, PI: PP Vlachos, Sponsor Abbott Vascular, Funding amount \$39,000, Duration: 1 yr.
  56. “Structural waveguides for aerodynamic turbulent drag reduction”, PI: J Carneal, M. Johnson and P. P. Vlachos, Sponsor AFOSR, Funding amount \$40,000, Duration: 1 yr.

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57. “Effects of Leading Edge Thin Film Cooling and Surface Roughness on Downstream Film Cooling along a Transonic Turbine Blade for Low and High Free-Stream” Turbulence”, PI: W Ng, K Thole and PP Vlachos, Sponsor AFOSR, Funding amount \$100,000 (\$50K + \$50K renewal), Duration: 1 yr.
  58. “Foam and Froth Analysis and Modeling.”, PI: RH Yoon, , DP Telionis, PP Vlachos, Sponsor: DOE-Center of Advanced Separation Technologies, Funding amount \$504,000, Duration: 3 yrs.
  59. “Supplement I to “455118” Development and validation of computational model for flotation”, PI: PP Vlachos, Sponsor: Dorr Oliver Elmco, Funding amount: ~\$25,000, Duration: 0.5 yrs.
  60. “Development and validation of computational model for flotation”, PI: PP Vlachos, DP Telionis, RH Yoon, Sponsor Dorr-Oliver–CAST, Funding amount \$45,000, Duration 1 yr.
  61. “Supplement to “Development and validation of computational model for flotation”, PI: PP Vlachos, Sponsor: Dorr Oliver Elmco, Funding amount: ~\$13,158 , Duration: 1 yrs .
  62. “Flow Control Over Swept, Sharp-Edged Wings”: PI: DP Telionis, PP Vlachos, Sponsor: AFOSR, Funding amount: \$220,000, Duration: 3 years
  63. “Inlet Guide Vanes Flow Control”, PI: PP Vlachos, Sponsor: AFOSR-SBIR w/ Techsburg, Funding amount: \$100,000, Duration: 2yr.
  64. “Flow Control and Vibration Isolation for IMP Quieting”, PI: PP Vlachos, Sponsor, ONR-STTR w/ Techsburg, Funding amount: ~\$100,000, Duration: 2yr.
  65. “Addendum to: Subscale studies of a water surface piercing gas jet”, PI: PP Vlachos, Sponsor: US Navy, Funding amount \$19,000, Duration: 0.5 yrs.
  66. “Subscale studies of a water surface piercing gas jet”, PI: PP Vlachos, Sponsor: US Navy, Funding amount \$58,000, Duration: 1 yrs.
  67. “Testing Effect of Racetrack Air on Wake Fuel” PI: U Vandsburger and PP Vlachos, Sponsor: Pratt & Whitney, Funding amount: \$123,000, Duration: 6 mo.
  68. “Drag Reduction Performance For A Traveling Wave”, PI: PP Vlachos, Sponsor NASA, Funding amount \$70,700, Duration: 1 yrs.
  69. “Wall Shear Stress Measurements Using Ionic Polymer Transducers”, PI: PP Vlachos, Sponsor: ONR SBIR w/ Discover Technologies LLC, Funding amount: \$33,000, Duration: 1 yr.
  70. “Testing Effect of Racetrack Air on Wake Fuel”, PI: U Vandsburger and PP Vlachos, Sponsor: Pratt & Whitney, Funding amount: \$128,000, Duration: 6 mo.
  71. “Flotation Processes/ Experiments and Analysis”, PI: DP Telionis, PP Vlachos, Sponsor: DOE-Center of Advanced Separation Technologies, Funding amount: \$190,000, Duration: 2 yrs.
  72. “Validation measurements of separated turbulent flows with active flow control”, PI: PP Vlachos, Sponsor: Aeroprobe, Funding amount: \$70,400, Duration: 8 months.
  73. “The Dependence of Particle-Bubble Oscillations on Turbulence”, PI: DP Telionis, PP Vlachos, Sponsor: DOE, Center of Advanced Separation Technologies, Funding amount: \$38,000 (direct), Duration: 1 yr.
  74. “Flow Control Over Swept, Sharp-Edged Wings”: PI: DP Telionis and PP Vlachos, Sponsor: AFOSR Funding amount: \$60,000, Duration: 1 yr.

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75. “Compliance Matching Stents for Minimum Pressure Wave Reflections”, PI:PP Vlachos, Sponsor: Carilion Biomedical Institute, Funding amount: \$23,000 (direct), Duration: 1 yr.
  76. “Quantitative In-Vitro Hemodynamic Analysis of Stented Compliant Vessels”, PI: PP Vlachos, Sponsor: American Heart Association, Wake Forest University, Funding amount: \$20,000 (direct) Duration: 1 yr
  77. “Validation measurements of separated turbulent flows with active flow control”, PI: PP Vlachos, Sponsor: Aeroprobe, CIT, Funding amount: \$45,000 , Duration: 8 months.
  78. “An Omni Directional Roof Pressure Vent”, PI: J Jones, D. P. Telionis and P. P. Vlachos, Sponsor: CIT-Acrylife Inc, Funding amount: \$45,000, Duration: 6 months.
  79. “Frequency and Amplitude Independent Closed-Loop Virtual Aerodynamic Shaping”, PI: PP Vlachos and OK Rediniotis, Sponsor: AFOSR-SBIR. Phase-II, Funding amount: \$750,000, Duration: 2 yrs.
  80. “High Frequency, Time-Resolved Digital Particle Image Velocimetry System For Poly-dispersed Multi-Phase Flows”, PI: PP Vlachos (PI), Aeroprobe Corp, Sponsor: NIST, Phase-II SBIR, Funding amount: \$300,000, Duration: 2 yrs.
  81. “Active Skin for Turbulent Drag Reduction”, PI: PP Vlachos (PI) and OK Rediniotis, Sponsor: NASA, Phase-I SBIR, Total Amount: \$70,000, Duration: 6 months.
  82. “Frequency and Amplitude Independent Closed-Loop Virtual Aerodynamic Shaping”, PI: MD Zeiger, PP Vlachos and OK Rediniotis, Sponsor: AFOSR, Phase-I SBIR, Funding amount \$100,000, Duration: 9 months.
  83. “High-Frequency, Spatio-Temporal, Digital Particle Image Velocimetry System for Combustion-Induced Turbulent Flows”: PI: PP Vlachos (PI), Aeroprobe Corp., Sponsor: NIST, Phase-I SBIR. Co-Sponsor CIT, Total Amount: \$95,000, Duration: 6 months.

#### **PURDUE INTERNAL FUNDING (COMPLETED)**

84. Causally-driven Healthcare Science, Integrative Data Science Initiative, Purdue, PI: Elias Bareinboim, co-PI:Pavlos Vlachos Mohammad Adibuzzaman, \$265,000, 06/2018 - 05/2020.
85. Towing Tank Renovation: DL2 Program, Funding amount ~\$2,000,000

#### **VIRGINIA TECH INTERNAL FUNDING (COMPLETED)**

86. “ICTAS Center MBEDS (Multiscale Bio-engineered Devices and Systems”, PI: PP Vlachos and R. Davalos, Sponsor: VT ICTAS, Funding amount: ~\$375,000, Responsibility: ~50%, Duration: 5 yrs.
87. “Microfluidic Devices Inspired by Internal Insect Physiology”, PI: J. Socha et. al., Sponsor: VT ICTAS , Funding amount: ~\$300,000, Duration: 3 yrs.
88. “ICTAS Theme Area on non Invasive Cardiovascular Diagnostics”, PI: PP Vlachos (with 6 co-PIs), Sponsor: VT ICTAS, Funding amount: ~\$250,000, Responsibility:~15%, Duration: 18 mo
89. “Spatiotemporal dynamic microfluidic measurements “, PI: PP Vlachos, Sponsor: ASPIRES Funding amount: \$90,000, Duration: 2 yrs
90. “A High Speed DPIV System For Multi-Phase Flows” PI: DP Telionis. M. Hajj, AH Nayfeh and PP Vlachos, Sponsor: ASPIRES: Funding amount: \$55,000, Duration: 6 months.  
Teaching



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## **COURSES TAUGHT**

### **PURDUE UNIVERSITY**

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#### **Undergraduate**

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Fluid Mechanics (ME 309), 4 Credits:

Fall 2013, Spring 2014, Fall 2014, Spring 2015, Fall 2015, Fall 2016, Fall 2017 (Lab), Spring 2018 (Lab), Fall 2018 (Lab), Spring 2019 (Lab), Fall 2019 (Lab)

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#### **Graduate (3 credit)**

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ME597 Experimental Fluid Mechanics, Spring 2016, 2017

### **VIRGINIA TECH**

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#### **Undergraduate (3 credit)**

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Fluid Mechanics, Thermodynamics, Introduction to Thermofluids, Engineering Design, Undergraduate research.

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#### **Graduate (3 credit)**

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Biofluids, Fluid Mechanics, Experimental Fluid Mechanics, Advanced Methods in Experimental Fluid Mechanics, Interdisciplinary Research

## **COURSES DEVELOPED OR REVISED**

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### **ME309 Fluid Mechanics (Purdue)**

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Between Fall 2014 and Fall 2021, completely overhauled the entire experimental sequence of the class. The improvements included, development of new experiments, re-design and modernization of the experimental instrumentation, rewriting of the lab-manuals and procedures, developing new lecture recitations, grading rubrics and well-structured procedures for quality control of student evaluation and feedback. In addition, the lecture component of the class was augmented with over 50 video recordings of example problems and video recordings of the lab procedures.

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### **ME597/ME5984: Experimental Fluid Mechanics (Purdue/Virginia Tech)**

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Advanced fluids instrumentation and methods, optical diagnostics techniques, digital signal and image processing, data analysis and visualization are introduced. This course puts emphasis on the basics and fundamentals of the most popular experimental fluids methods with sufficient background on instrumentation and signal processing. The course targets junior level graduate students and is introducing them to the basics of experimental design and experimental fluid mechanics measurements in addition to a short introduction of philosophy of science and hypothesis testing. The course was first developed and taught at Virginia Tech. Upon joining Purdue, it was revised and introduced at Purdue.

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### **GRAD5154: Interdisciplinary research (Virginia Tech)**

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Co-developed a new course for the interdisciplinary graduate education program, investigating the principles, practices, implications and limitations of interdisciplinary research. The course

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adopts a liberal-arts teaching model, driven by discussion, focusing on argument formation and refutation. Assignments are aimed towards the formulation of simple research objectives emanating from complex problems such as grand challenges and development of research plans and representative research proposals.

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**ME6984: Advanced Methods in Experimental Fluid Mechanics (Virginia Tech)**

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Developed a course for the ME senior lever graduate students introducing state-of-the-art tools for experimental fluid mechanics measurements. Advanced instrumentation and methods, optical diagnostics techniques, digital signal and image processing, data analysis and presentation are addressed. The assignments within this class are primarily focused towards exposing the students to the various aspects of the research procedure through the specialization on advanced experimental methods for fluid mechanics. Namely, teaching, proposal writing, reviewing, conducting the research and continuously been evaluated by your peers as these are the intrinsic ingredients of the research enterprise. The students submit research proposals conduct insightful experiments and disseminate their results in a paper/presentation final project to their peers (class) in an attempt to simulate in the classroom the research/academia life environment.

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**SBES/ME/ESM 4984/5984: Cardiovascular Fluids Mechanics (Virginia Tech)**

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The students taking this course will be able to define and analyze physical fluid mechanics problems involving the cardiovascular system. This will involve manipulating the full Navier Stokes equations, incorporate additional necessary constitutive relations and by performing the appropriate assumptions and posing the required initial and boundary conditions result to a tractable problem that can be modeled analytically experimentally or numerically. The course will be offered to both senior undergraduate and graduate students. The material covered will be the same. However homework assignments and project assignments will be adjusted to reflect the student's level. For graduate level students, additional homework and projects that further the in-depth analysis and synthesis capability of the student it will be required.

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**ME3404: Fluid Mechanics (Virginia Tech)**

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In the Spring of 2004 the concept of in-class demonstrations was introduced. Fluid mechanics education is often hampered by the lack of direct physical observation and intuition by the students. The "in-class demonstration" assignment aims to trigger imagination, increase student participation and interaction and provide a hands-on, fluid mechanics experience. During the in-class demo assignment the students working in groups of three are asked to design and perform a zero budget short (5-10min) demonstration of a fluid mechanics principle. The demonstration is accompanied by an electronically submitted 1 page report.

In Fall of 2006, the in class demo assignment was reintroduced in a larger section fluids class (>80 students). The success of the assignment was assessed using a survey that indicated a positive response from the students.

In Fall 2006 the use of Tablet PC's for the instruction of a large fluids section was introduced. The instruction was designed to be a combination between pre-prepared PowerPoint slides and hand writing notes on the TabletPC screen in replacement of the traditional blackboard. Interactive exercises are explored and several multimedia resources are used to enhance the learning experience. Pre and post assessment surveys suggest that this method of instruction was more effective than the traditional approaches.

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## QUALIFYING EXAMS

### Purdue University

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Fluid Mechanics and Propulsion Area exam, Spring 2014, Fall 2014, Fall 2016  
Biomedical Engineering Quantitative Literature Assessment, Fall 2014

### Virginia Tech

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1. Mechanical Engineering Fluid Mechanics Spring '04, '06, '09 and Fall '05 '07 '08
2. School of Biomedical Engineering and Sciences '05-'11.

## STUDENT EVALUATIONS OF INSTRUCTION (ONLY MAJOR COURSES):

### Purdue University

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**Solberg award citation for instruction: 2015, fall semester; 2016, spring semester; 2017 spring semester, (voted at the top 10 best instructors by the Purdue School of Mechanical Engineering undergraduate students)**

Course	Term	Median Rating
ME309	Fall 2013	4.2
ME309	Spring 2014	4.4
ME309	Fall 2014	4.2
ME309	Spring 2015	4.4
ME309	Fall 2015	4.6
ME309	Fall 2016	4.7
	Total	4.4/5.00

### Virginia Tech

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Across all years and across all major courses, graduate and undergraduate average rating = 3.8/4

## DEVELOPMENT AND TEACHING EFFECTIVENESS

- Sept 15-18 2004: Participated in the ASME sponsored workshop, Excellence in Engineering Education (ExcEED) Faculty Teaching Workshop at Northeastern University September 16-18, 2004. This three-day intensive workshop (formerly called Essential Teaching Seminars) is co-sponsored by ASME, ASCE, AIChE, and IEEE. This workshop enhanced my art and craft of teaching, and increased my repertoire of techniques.
- Teaching Workshops:
  - Summer of 2006 I attended two Faculty Development Institute (Virginia Tech-FDI) seminars, first on Mathematica and second on LabView in order to incorporate these tools in my graduate level courses.
  - Summer of 2009 I attended a series of FDI workshops for the implementation of Scholar web environment within my teaching and graduate advising practices

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- Summer of 2009 I attended a workshop for JMP statistical package in order to incorporate these tools in my graduate level courses.
  - Fall 2006: Two instructional interventions were implemented for the Fluid Mechanics class. The instructional impact of both attempts was assessed by an end-of-semester survey. Some representative results are shown below. First, TabletPC instruction was introduced as a hybrid teaching tool, enhanced with multimedia resources (movies/pictures). Second intervention involved a formalized voluntary team assignment where the students were asked to choose a fluid mechanics principle taught during the semester and design, execute, present and report a “*zero-budget*” in-class demonstration. Approximately 60% of the students participated in this exercise. Based on the results of a follow up assessment survey both attempts were successful. These two concepts will be revisited and revised and will be implemented again in future semesters.

## **GRADUATE RESEARCH SUPERVISION**

### **SUMMARY OF GRADUATE STUDENT SUPERVISION:**

Completed PhD:	25
Completed MS:	30
Current PhD	10
Current MS	1
Current Committee member PhD/MS	14

## **POST DOCTORAL FELLOWS AND RESEARCH SCIENTISTS**

### **CURRENT**

1. Sayantan Bhattacharya (Purdue, 2019-present)
2. Brett A Meyers (Purdue, 2021-present)

### **PAST**

3. Jiacheng Zhang (Purdue, 2022-2023)
4. Javad Eshraghi (Purdue, 2022-2023)
5. Brian Jun (Purdue, 2021-May 2022)
6. Melissa Brindise (Purdue, 2019-2021)
7. Zhongwang Duo (Purdue, 2019-2021)
8. Kevin Buno (Purdue, 2019-2021)
9. Anna Elodie Kerlo, (Purdue University, 2014-2015)
10. Michal Kotak, (Purdue University, 2014)
11. John J Charonko (Virginia Tech, 2011-2013)
12. Christopher J Weiland (Virginia Tech, 2011)

## **PHD DISSERTATIONS DIRECTED**

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(partial list, include only the PhD dissertations serving as the major advisor or co-advisor, (\*) denotes co-advised)

1. Jiacheng Zhang, Purdue Graduation Spring 2022, “Data augmentation and enhancement for cardiovascular 4d flow MRI”
2. Javad Eshraghi, Purdue Graduation Spring 2022, “Methods and analysis of multiphase flow and interfacial phenomena in medical devices”
3. Adib Ahmadzadegan, Purdue Graduation Spring 2022, “Quantification of random processes: from diffusion to rheology” (\*)
4. Brian Jun, Purdue Graduation Summer 2021, “Microfluidic velocimetry for investigating molecular transport and cell migration” (\*)
5. Sheyashi Chakraborty, Purdue Graduation Spring 2021, “Non-invasive quantification of cardiovascular flow metrics in vertebrates”
6. Brett Mayers, Purdue Graduation Spring 2021, “Methods for echocardiographic Biomechanical measurements”
7. Lalit K. Rajendran, Purdue Graduation Spring 2021, “Development of image-based density diagnostics with background-oriented schlieren and application to plasma induced flow” (\*)
8. Soroush Aramideh, Purdue Graduation Fall 2019, “Complex Fluids in Porous Media: Pore-Scale to Field-Scale Computations”, (\*)
9. Sayantan Bhattacharya, Purdue Graduation Fall 2019, “Uncertainty Quantification in Particle Image Velocimetry”
10. Melissa Brindise, Purdue Graduation Fall 2019, “Developing Experimental Methods and Assessing Metrics to Evaluate Cerebral Aneurysm Hemodynamics”
11. Mathew Giarra Virginia Tech, Graduation Fall 2016, “The Signal in the Noise: Understanding and Mitigating Decorrelation in Particle Image Velocimetry”
12. Elizabeth (Voigt) Antoine, Virginia Tech, Graduation Summer 2014, “Mechanics and transport characterization of bioengineered tissue microenvironment platforms” (\*)
13. Jaime Raben Virginia Tech, Graduation Summer 2013, “Improvements in fluidic device evaluation using particle image velocimetry”
14. Samuel Raben Virginia Tech, Graduation Summer 2013, “Determination of three-dimensional time-varying flow structures”
15. Kelley Stewart, Virginia Tech, Graduation Spring 2011, “Hydrodynamics of Cardiac Diastole”
16. David Hubble, Virginia Tech, Graduation Spring 2011, “An experimental investigation of the mechanism of heat transfer augmentation by coherent structures” (co-chaired with Prof. Thomas Diller, Mechanical Engineering Dept. Virginia Tech) (\*)
17. Nickolas Cardwell, Virginia Tech, Graduation Fall 2010, “Investigation of Particle Trajectories for Wall Bounded Turbulent Two-Phase Flows” (co-chaired with Prof. Karen Thole, Mechanical and Nuclear Engineering Dept. Penn State University) (\*)
18. Chris Weiland, Virginia Tech, Graduation Spring 2010 Title: “Dynamics of the High-Speed Gas liquid Interfaces”
19. Michael R. Brady, Virginia Tech, Graduation Fall 2009 Title: “Multiphase Hydrodynamics in Flotation Systems”

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20. Karri Satya Prakash, Virginia Tech, Graduation Fall 2009 Title: “Laminar and Transitional Flow Disturbances in Diseased and Stented Arteries”
  21. John Charonko, Virginia Tech. Graduation Spring 2009 Title: “Studies of Stented Arteries and Left Ventricular Diastolic Dysfunction Using Experimental and Clinical Analysis and Data Augmentation”
  22. Andrew Gifford, PhD Graduation Spring 2009 Title: “The Physical Mechanism of Heat Transfer Augmentation in Stagnating Flows Subject to Freestream Turbulence and Related Studies” (co-chaired with Prof. T. Diller Mechanical Engineering) (\*)
  23. Alicia Williams Virginia Tech. PhD Graduation Fall 2008 Title: “The Hydrodynamics of Ferrofluid Aggregates”
  24. Olga Pierrakos, Virginia Tech. PhD Graduation Spring 2006. Title: “Vortex Dynamics of Left Ventricular Flows”
  25. Ali Etebari, Virginia Tech. PhD Graduation Spring 2006 Title: “Wall Shear Stresses in Cardiovascular Flows”

### **MS THESES DIRECTED**

1. Pranav Monav “Cavitation in vortex and mixing in stratified fluids” Spring 2021
2. Tianqi Guo “Axisymmetric wall jet development in confined jet impingement” Spring 2016
3. Harris Syed Hassan, “Entrainment in a free surface plunging jet” Fall 2015
4. Natalya Vorobtsova, “Effects of vessel tortuosity on coronary hemodynamics: an idealized and patient-specific computational study” Fall 2014
5. Tyler Michael, “Design and Evaluation of Portable Hydro Electric Energy Harvesting Platforms”, Fall, 2014
6. Brett Meyers, “Feasibility of Echocardiographic Particle Image Velocimetry for evaluation of cardiac left ventricular filling function”, Fall, 2014
7. Zhenyu Xue, “Signal to noise ratio, uncertainty and error estimation for particle image velocimetry”, Fall, 2014
8. Cassie Niebel “Dispersive Characteristics of Left Ventricle Filling Waves” Fall 2012
9. Drew Brady “Entrainment characteristics of turbulent round jets submerged in water” Summer II 2011.
10. Justin Dominic, “Experimental Study of Wall Shear Stress Modification by Surface Coating: Pressure Drop Measurements in a Rectangular Channel” Summer I 2011
11. Daniel Holden, “Flying snakes: Aerodynamics of body cross-sectional shape” Spring 2011, (co-chaired with Prof. Jake Socha, Engineering Science and Mechanics Dept. Virginia Tech)
12. Daniel Cooper, “Feasibility of Passive Acoustic Detection of Coronary Artery Disease Utilizing Source Separation”, Dec 2010.
13. Elizabeth Voigt, “Hydrodynamic Characterization of an Arterial Flow Bioreactor” Virginia Tech, Jul. 2010
14. Kelley Steward, “A Color M-Mode Echocardiogram Investigation of the Hydrodynamics of Left Ventricular Diastolic Dysfunction”, Virginia Tech, Oct. 2008

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15. David Griffiths, "Development of Ionic Polymer Metallic Composites as Sensors", Virginia Tech, Sept. 2008
  16. Sam Raben, "Near wall high resolution particle image velocimetry and data reconstruction for high speed flows" Virginia Tech, May 2008
  17. Adric Eckstein, "Development of Robust Correlation Algorithms for Image Velocimetry Using Advanced Filtering" Virginia Tech Dec 2007
  18. Alicia Williams, "Mixing at Low Reynolds Numbers by Vibrating Cantilevered Ionic Polymers" Virginia Tech May 2007
  19. Hugh Hill, "2D CFD Simulation of a Flow Control Inlet Guide Vane" Virginia Tech. Jan 2007
  20. Chris Weiland, "Modification of Blade-Vortex Interactions Using Leading Edge Blowing" Virginia Tech. Dec 2006
  21. Jerrod Ewing. "Development of a New Direct Measurement Thin-Film Heat Flux Array" Virginia Tech Dec 2006
  22. Michael Brady, "Novel, Subpixel Resolution Schemes For Particle Sizing and Particle Tracking Velocimetry" Virginia Tech, Nov 2006
  23. Vassilis Vlachakis, Turbulent Characteristics in a Rushton Stirring Vessel: A Numerical Investigation. Virginia Tech, July 2006
  24. John Charonko, "A Nondimensional Scaling Parameter for Predicting Pressure Wave Reflection in Stented Arteries" Virginia Tech March 2005
  25. Mian Hussain, "Time-Resolved Analysis of Circulation Control over Supercritical Airfoil using Digital Particle Image Velocimetry (DPIV)" Virginia Tech Dec 2004
  26. Jason Carneal, "Integration and Validation of Flow Image Quantification (Flow-IQ) System" Virginia Tech. Sept 2004.
  27. Saami Yazdani, "Complex Flow Patterns In Stented and Bifurcating Arteries" Virginia Tech Nov 2003.
  28. Claude Abiven, "A Hybrid Dynamically Adaptive, Super Spatio-Temporal Resolution Digital Particle Image Velocimetry Technique For Multi-Phase Flows". Virginia Tech 2002.
  29. Ali Etebari, "Development of a Virtual Scientific Visualization Environment for the Analysis of Complex Flows" Virginia Tech 2002.
  30. Olga Pierrakos "Hemodynamic Flow Characterization of St. Jude Medical Bileaflet Mechanical and Biological Heart Valve Prostheses in a Left Ventricular Model via Digital Particle Image Velocimetry" Virginia Tech 2002

#### **SPECIAL ACHIEVEMENTS OF ADVISEES**

1. Sayantan Bhattacharya, PhD, graduate advisee 2013-2019
  - a. Estus H. and Vashti L. Magoon Award for Excellence in Teaching for 2018
  - b. Ward A. Lambert Graduate Teaching Fellowship for Spring-Fall 2017
  - c. The 2018 Summer Research Grant for the School of Mechanical Engineering
2. Melissa Brindise, PhD, graduate advisee 2014-2019
  - a. American Heart Association Pre-Doctoral Fellowship for 2017
  - b. Estus H. and Vashti L. Magoon Award for Excellence in Teaching for 2018

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- c. Ward A. Lambert Graduate Teaching Fellowship for Fall-Spring 2017-2019
  - d. The 2017 Summer Research Grant for the School of Mechanical Engineering
  3. Elizabeth Antoine (Voigt), MS/PhD, graduate advisee 2008-2012
    - a. DOD graduate student fellowship (declined)
    - b. Claire Luce Booth Graduate Fellowship
    - c. Fulbright (1 year in TUD)
    - d. ICTAS Scholar (declined)
    - e. NASA Space Grand, 2010, 2011
    - f. 2011 Paul E. Torgersen Graduate Student Research Excellence Award 1st Place MS Poster Presentations
    - g. Whitaker Foundation international post-doctoral fellowship
  4. Beasley Beverly, undergraduate advisee 2002-2004,
    - a. National Science Foundation Graduate Fellowship
  5. Belden Jesse undergraduate advisee 2004-2006
    - a. 1<sup>st</sup> place 2005 Virginia Tech undergraduate research symposium. Currently graduate student at ME and Ocean Engineering Dept, MIT.
  6. Brady Michael, undergraduate and graduate advisee 2000-2009,
    - a. ESM Dan Pletta award for Best Senior Design 2001
  7. Charonko John, undergraduate and graduate advisee 2001-2009,
    - a. 2008 Paul E. Torgersen Graduate Student Research Excellence Award 3<sup>rd</sup> Place PhD Presentations
    - b. 1 of only 6 graduate students to represent Virginia Tech to the Commonwealth's Governor and Legislators for the annual graduate education forum.
    - c. Paul E. Torgersen Graduate Student Research Excellence Award 3<sup>rd</sup> Place MS Posters
    - d. ESM Dan Pletta award for Best Senior Design Award 2002
    - e. Graduated as top (4.0) in the College of Engineering.
  8. Cooper B. Daniel
    - a. 2010 Paul E. Torgersen Graduate Student Research Excellence Award 1<sup>st</sup> Place MS Poster Presentations
  9. Drew Brady
    - a. 2011 Paul E. Torgersen Graduate Student Research Excellence Award 1st Place MS Presentations
  10. Eckstein Adric undergraduate and graduate advisee 2005-2008
    - a. 2008 Paul E. Torgersen Graduate Student Research Excellence Award 3<sup>rd</sup> Place MS Poster Presentations
    - b. Outstanding Paper in Fluid Mechanics Award, Measurement Science and Technology, 2009
  11. Etebari Ali undergraduate and graduate advisee 1999-2005
    - a. Paul E. Torgersen Graduate Student Research Excellence Award 1<sup>st</sup> Place PhD Posters
  12. Niebel Cassie, graduate advisee 2010-present,



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- a. National Science Foundation Graduate Fellowship
  - b. NASA Space Grand 2011
13. Karri Satya Prakash graduate advisee 2005-2009
- a. 2008 Paul E. Torgersen Graduate Student Research Excellence Award 2<sup>nd</sup> Place PhD Presentations
14. Peter Stephen, undergraduate advisee 2007-2008
- a. 2008 Mechanical Engineering Outstanding Scholar, David R. Shorb Memorial Honor Award.
15. Pakdel Zhara, undergraduate advisee 2004-2005,
- a. National Science Foundation Graduate Fellowship
16. Pierrakos Olga, undergraduate and graduate advisee 1999-2005,
- a. NSF CAREER Recipient
  - b. NAE Postdoctoral fellowship
  - c. Advance Fellowship (2004-2005).
  - d. Paul E. Torgersen Graduate Student Research Excellence Award 2005 2<sup>nd</sup> Place PhD Presentations
  - e. SBES 2005 Annual Grad Student Symposium
  - f. GE Fellowship (2002-2004)
  - g. P.E.O. Scholar, Idagrace Guy Endowed Scholar (2003-2004) Nominated International Award, only 10% of applicants selected
  - h. Graduate Teaching Assistant Commendation Award (2005)
17. Raben Sam undergraduate and graduate advisee 2005-present
- a. 2008 Paul E. Torgersen Graduate Student Research Excellence Award 2<sup>nd</sup> Place MS Poster Presentations
  - b. 1<sup>st</sup> place 2005 Virginia Tech undergraduate research symposium
18. Stewart Kelley, graduate advisee 2006-present
- a. Fall 2008 Commencement Ceremony Graduate Student Speaker
  - b. 2008 Paul E. Torgersen Graduate Student Research Excellence Award 1<sup>st</sup> Place MS Poster Presentations
  - c. National Science Foundation Graduate Fellowship
19. Williams Alicia, undergraduate and graduate advisee 2004-2008
- a. National Science Foundation Graduate Fellowship
  - b. 2007 ASME Fluids Engineering Division Moody Award
20. 2008 Best Senior Design Project-Stent Design Team (7 undergraduate students)

## **DISSERTATIONS AND THESIS IN PROGRESS**

### **PHD STUDENTS**

**Purdue University (\* co-advice)**

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1. Derakhshandeh, Rozhin	Title TBA,	Qualifying completed
2. Sourav Das	Title TBA	Qualifying completed
3. Faezah Masomi	Title TBA	Qualifying completed
4. Rudra Sethu Viji	Title TBA	Qualifying completed
5. Shailee Mitra	Title TBA	Qualifying completed
6. Luis Carlos Sanjuan	Title TBA	Qualifying completed
7. Ruhi Sharmin	Title TBA	Qualifying completed
8. Wesley Holt	Title TBA	Qualifying completed
9. Milad Tavakolian,	Title TBA	
10. Reza Babakhani Galangashi	Title TBA	
11. Pranjal Anand	Title TBA	
12. Deerajkumar Parthipan,	Title TBA	
13. Abhishek Singh,	Title TBA	

## PROFESSIONAL AND ACADEMIC SERVICE ACTIVITIES

### ACADEMIC SERVICE

#### Purdue University (select list)

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- Director, Regenstrief Center for Health Care Engineering.
- President's Fellow for research development, 2018-2020, Office of the Executive Vice President for Research
- Purdue Engineering Initiative in Engineering Medicine, Purdue College of Engineering, 2021-present
- Area Chair, Mechanical Engineering, Biomedical Research 2020-present
- Area Chair, Mechanical Engineering, Fluids Mechanics and Propulsion, 2014-2017
- Mechanical Engineering Leadership Team, 2014-2017

#### Committees

- PEI
- MDH
- Lillian Gilbreth Postdoctoral Fellowship (LGPF) Selection Committee
- Purdue Center for Cancer Research Director, Search Committee, 2021
- ME Honors and Awards, 2020-present
- School of Mechanical Engineering Primary Committee, 2013-present
- ME Facilities Committee, 2020-2021
- ME Instructional Labs Committee, 2014-2021
- ME Global Engagement Committee, 2014-2021
- BME Qualifying Exam Committee, 2014-present
- Strategic Planning Committee 2016-2018

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- Graduate Application Review Committee 2013-2017
  - Faculty Search Committee, 2013-2014
  - Program Internal Review Committee, 2014
  - Chair Faculty Search Committee (Thermofluids), 2014-2015

#### **Virginia Tech (select list)**

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- University Committee for Reconciliation, 2011-2013
- Promotion and Tenure Committee, Member, Dept. of Mechanical Engineering, 2011-2013
- Faculty Senate, Mechanical Engineering Dept. Representative, 2010-2013
- Promotion and Tenure Committee, Member, School of Biomedical Engineering and Sciences, 2010-2013
- Member, Research and Graduate Education Strategic Planning Committee, Mechanical Engineering, 2010-2013
- Member, Graduate Student Recruitment Committee, Mechanical Engineering, 2009-2013
- Member Faculty Search Committee 2010-2011 Engineering Science and Mechanics (two positions)
- Member, Faculty Activity Report Evaluation Committee, Mechanical Engineering, 2009-2010
- Member, Fiscal, Management and Administrative Strategic Planning Committee, Mechanical Engineering, 2009-present
- Co-Chair, 2007-2008 Faculty Search Committee, Mechanical Engineering (6 positions, 5 hired, 1 minority, 1 endowed)
- Member Department Head Search Committee 2007-2008 Aerospace and Ocean Engineering
- Chair 2006-2007 Faculty Search Committee, area Turbomachinery, Mechanical Engineering (1 position, 1 hire)
- Member DCR Committee 2004-2005, Mechanical Engineering
- Chair 2006-2007 Faculty Search Committee, area Combustion, Mechanical Engineering (1 position offered, successfully hired 2 candidates, one of which a minority)
- Member Faculty Search Committee 2004-2005 Mechanical Engineering
- Member Graduate Committee 2004-2007 School of Biomedical Engineering and Sciences

#### **PROFESSIONAL BOARDS**

- **AXIN**
- **IDOH**
- Board of Directors, Boost4Bio. Boost4Bio is a flagship project initiative for the Biomedical Sciences Research Center "Alexander Fleming", with EU support.
- Clinical and Transactional Sciences Institute (CTSI) WISE Indiana Advisory Board

#### **ENTREPRENEURIAL ACTIVITIES**

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## Startups

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- Founder and CEO, Cordian Technologies Inc
  - i. This startup aims to develop and commercialize echocardiography analysis technologies to facilitate a more robust and accurate diagnosis and management of heart failure. Cordian has been on-board with a venture capital studio and is getting ready for a seed-funding round.

## EDITORIAL ACTIVITIES

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### Editorial Boards

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- Associate Editor, International Journal of Multi-phase Flows (Elsevier) 2017-present
- Associate Editor, ASME Journal of Fluids Engineering (completed 4 year tenure)
- Reviewer for National Academies of Sciences, Engineering, and Medicine 2020. *A Strategic Vision for Biological Threat Reduction: The U.S. Department of Defense and Beyond*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25681>.

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### Journal Reviewer (selected)

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1. AIAA Journal,
2. American Journal of Physiology
3. Annals of Biomedical Engineering,
4. Artificial Organs,
5. ASME Journal of Biomechanical Engineering,
6. ASME Journal of Fluids Engineering,
7. Biomechanics and Modeling in Mechanobiology,
8. Biorheology,
9. Cardiovascular Engineering and Technology,
10. Circulations: Heart Failure,
11. Experiments in Fluids,
12. Experimental Thermo-Fluid Sciences,
13. International Journal of Multi-Phase Flows,
14. International Journal of Heat and Fluid Flow,
15. Journal of the American College of Cardiology,
16. Journal of the American College of Cardiology: Imaging,
17. Journal of Atomization,
18. Journal of Applied Mechanics,
19. Journal of Biomechanics,
20. Journal of Biorheology,
21. Journal of Engineering Mechanics,
22. Journal of Fluids Engineering,
23. Journal of Fluid Mechanics,

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24. Journal of Fluids and Structures,
  25. Journal of Heat and Fluid Flow,
  26. Journal of Heat Transfer,
  27. Journal of Medical Devices,
  28. Journal of Non-Linear Dynamics,
  29. Journal of Physics D: Applied Physics,
  30. Journal of Fluid Mechanics,
  31. Journal of Thermophysics and Heat Transfer
  32. IEEE Transactions of Industrial Electronics,
  33. Measurement Science and Technology,
  34. Medical & Biological Engineering and Computing,
  35. Medical Engineering and Physics,
  36. Micro-Nano-Fluidics,
  37. Nature Communications,
  38. Physics of Fluids,
  39. Proceedings of the Royal Society Interface,
  40. Sensors,
  41. Science

## **PROFESSIONAL SOCIETIES**

- IEEE, Institute of Electrical and Electronics Engineers
- RSNA, Radiological Society of North America
- AHA, American Heart Association
- AAAS American Association for the Advancement of Science
- ASEE American Society of Engineering Education
- ASME (American Soc. of Mech. Eng.)
  - Fluids Engineering Division.
  - Bio-Engineering Division.
- APS (American Physics Society), Fluids Dynamics Division
- AIAA (American Inst. of Aeronautics and Astronautics).
- Technical Chamber of Greece.

## **TECHNICAL COMMITTEES**

- APS (American Physics Society) Nominating Committee 2018-present
- APS (American Physics Society) Media & Science Relations Committee 2016-2018
- APS (American Physics Society) Fluid Dynamics Division, Acrivos Award Selection Committee 2014-2016

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- ASME Fluids Engineering Division, Honors and Awards Committee 2020-present
  - ASME Fluids Engineering Division, Fluid Measurement and Instrumentation Technical Committee 2008-present, member since 2000.
    - Vice chair, 2008-2010
    - Chair 2010-2012
  - ASME Fluids Engineering Division, Fluid Mechanics Technical Committee 2000-present
  - ASME Fluids Engineering Division, Multiphase Flows Technical Committee 2000-present
  - ASME Bioengineering Division, Biofluids Technical Committee 2001-present

### **PROPOSAL PANELIST**

- NASA Biofluids (S04), Panel Reviewer
- NSF CTS Hydraulics and Fluid Dynamics, Biofluids panel reviewer 2006.
- NSF CBET MRI panel reviewer 2007.
- NSF CBET CAREER panel reviewer 2007.
- MIT Sea Grant Consortium reviewer 2009
- NSF SBIR Biomedical Devices Panel I 2009
- NSF SBIR Biomedical Devices Panel I 2010
- NIH Scientific reviewer, Atherosclerosis and Inflammation of the Cardiovascular System Study Section, 2010
- NSF SBIR Biomedical Devices Panel I 2011 (spring)
- NSF SBIR Biomedical Devices Panel II 2011 (fall)
- American Heart Association (National) Spring 2013
- American Heart Association (National) Fall 2013
- NSF CBET CAREER panel reviewer 2013
- American Heart Association (National) 2012-present
- Vice Chair, Bioengineering Clinical Research review committee, American Heart Association 2013-2015
- Chair, Bioengineering Clinical Research review committee, American Heart Association 2016-2018
- NIH, Bold New Bioengineering Methods for Heart, Lung, Blood and Sleep Disorders and Diseases, Fall 2017 Panel
- AHA, IPA Panel, 2020

### **TENURE AND PROMOTION DOSSIERS REVIEWER AND LETTER WRITER**

1. Brigham Young University
2. Cornell University
3. Georgia Tech
4. Northwestern School of Medicine

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5. Ohio State University
  6. Penn State University
  7. Rutgers University
  8. Technion University (Israel)
  9. Trinity College, Dublin (Ireland)
  10. TU Delft (Netherlands)
  11. University of Bristol (UK)
  12. University of Florida
  13. University of Ioannina (Greece)
  14. University of Minnesota
  15. University of Missouri
  16. University of New Hampshire
  17. University of Tel-Aviv (Israel)
  18. University of Thessaly (Greece)
  19. Utah State University
  20. Virginia Tech
  21. University of Waterloo

### **CONFERENCE/SYMPOSIA ORGANIZATION (PARTIAL LIST - SELECTED)**

- 2023 Symposium on Particle Image Velocimetry, Local and International Organizing Committee
- 2022 APS, DFD Organizing Committee
- 2021 Symposium on Particle Image Velocimetry, Co-Chair and International Organizing Committee
- 2019 Symposium on Particle Image Velocimetry, International Organizing Committee
- SES 2014, Organizing Committee and session organizer
- 4<sup>th</sup> Particle Image Velocimetry Challenge (2014) Workshop, (co-organizer)
- Inspired and co-organized the Annual Virginia Tech Fluid Mechanics symposium since 2006-2012.
- Workshop/tutorial on Particle Image Velocimetry (3 day/40 attendees), University of Maryland, May 2012
- 1<sup>st</sup> PIV uncertainty workshop: Inspired and co-organized the first PIV uncertainty workshop with international attendance (May 2011).
- Co-organized the first focused session in the DFD APS meeting 2011 on PIV uncertainty
- Co-organized a mini-symposium on Cardiac Fluid Mechanics with clinical translational focus, at the APS DFD meeting 2011.
- Mini-symposium Co-organizer: Cardiac Fluid Dynamics: Translating Fundamental Insights into Clinical Practice, APS, DFD 2011

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- Symposium organizer, Measurement and Instrumentation Forum AJK Summer Meeting, Hamamatsu, Japan 2011.
  - Symposium organizer, Fundamentals and Perspectives in Fluid Mechanics AJK Summer Meeting, Hamamatsu, Japan 2011.
  - 1<sup>st</sup> PIV Uncertainty Workshop, co-organized with B. Smith (USU) and Hugh McElroy (DOE-INL).
  - Symposium on Diagnostics in Thermofluid Systems, organizer, ASME IMECE, Vancouver, Canada 2010.
  - Session chair, Measurement and Instrumentation Forum, ASME Fluids Engineering Summer Meeting, Montreal, Canada 2010.
  - Symposium organizer, Measurement and Instrumentation Forum ASME Fluids Engineering Summer Meeting, Montreal, Canada 2010.
  - Session chair, Fundamentals and Perspectives in Fluid Mechanics Symposium, ASME Fluids Engineering Summer Meeting, Montreal, Canada 2010.
  - Symposium organizer, Fundamentals and Perspectives in Fluid Mechanics ASME Fluids Engineering Summer Meeting, Montreal, Canada 2010.
  - Session chair, APS, FDD Minneapolis, MN, Nov 2009
  - Session chair, Measurement and Instrumentation Forum, ASME Fluids Engineering Summer Meeting, Veil, CO 2009.
  - Symposium organizer, Measurement and Instrumentation Forum ASME Fluids Engineering Summer Meeting, Veil, CO 2009.
  - Session chair, Fundamentals and Perspectives in Fluid Mechanics Symposium, ASME Fluids Engineering Summer Meeting, Veil, CO 2009.
  - Symposium organizer, Fundamentals and Perspectives in Fluid Mechanics ASME Fluids Engineering Summer Meeting, Veil, CO 2009.
  - Session chair, Fundamentals and Perspectives in Fluid Mechanics Symposium, ASME Fluids Engineering Summer Meeting, Jacksonville, FL 2008.
  - Symposium organizer, Fundamentals and Perspectives in Fluid Mechanics ASME Fluids Engineering Summer Meeting, Jacksonville, FL 2008.
  - Session chair, APS, FDD Salt Lake City, UT, Nov 2007
  - Session chair, Measurement and Instrumentation Forum ASME Fluids Engineering Summer Meeting, San Diego, CA 2007.
  - Session chair, Fundamentals and Perspectives in Fluid Mechanics Symposium, ASME Fluids Engineering Summer Meeting, San Diego, CA 2007.
  - Symposium organizer, Fundamentals and Perspectives in Fluid Mechanics ASME Fluids Engineering Summer Meeting, San Diego, CA 2007.
  - Symposium organizer, Fluids Engineering Summer Meeting, Miami, FL 2006.
  - Symposium organizer, Fluids Engineering Summer Meeting, Houston, TX 2005.
  - Session chair, Fluids Engineering Summer Meeting, Houston, TX 2005.
  - Session chair, Fluids Engineering Summer Meeting, Charlotte, NC, July 2004.



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- Session chair, Summer Bioengineering Meeting, Veil, CO, July 2004