

Philip A. Yecko

Physics Department
The Cooper Union for the Advancement of Science and Art
New York, New York USA

October 30, 2017

+1-212-353-4316
philip.yecko@cooper.edu
engfac.cooper.edu/yecko

Appointments

- **Physics Department** The Cooper Union for the Advancement of Science and Art
Associate Professor 2014–present
- **Department of Mathematical Sciences** Montclair State University
Associate / Assistant Professor 2005 – 2014
- **Department of Astronomy** Columbia University
Assistant Professor, Biosphere 2 Center 2000 – 2005
- **Department of Physics** Trinity College Dublin
Lecturer, Computational Physics 1999 – 2000
- **Institut Jean la Rond d’Alembert** Université Paris VI, France
CIES Postdoctoral Fellow 1998 – 1999
- **Department of Physics** University of Florida
Postdoctoral Associate 1996 – 1998
- **Geophysical Fluid Dynamics Institute** Florida State University
Postdoctoral Associate 1995 – 1996

Education

- **Columbia University** New York, NY
Ph.D. Astronomy 1995
- **Massachusetts Institute of Technology** Cambridge, MA
S.B. Physics 1988

Academic Visits

- **New York University** Courant Institute of Mathematical Sciences
Applied Mathematics Laboratory Nov. 2011 – Sep. 2012
- **Massachusetts Institute of Technology** Department of Mathematics
Lecturer, Applied Mathematics Sep. 2004 – Sep. 2005

Awards & Honors

Invited Researcher, GFD program, Woods Hole Oceanographic Institute 2016-2011, 2007
Invited Scientist, Aspen Center for Physics 2002, 1997
Fellow, GFD program, Woods Hole Oceanographic Institute 1992

Grants

- **3D Multiphysics Simulation of Multi-phase Magnetic Fluids (PI)** NSF
Computational Mathematics (RUI) DMS-1620158 9/2016 – 8/2019
– Algorithm development and simulations of magnetic fluids, applied to drug delivery
- **Improved Vehicle Autonomy in Geophysical Flows (co-PI)** NSF
Sensors, Dynamics and Control (RUI) CMMI-1462823 7/2015 – 6/2018
– Collaborative with three other universities. Robotic vehicles merge flow data and models to optimally collect ocean data; experiments, simulations and mathematical models.
- **Transport of Inertial Particles in Stochastic Flows (co-PI)** NSF
Computational Mathematics (RUI) DMS-1418956 7/2014 – 6/2017
– Simulations and experiments of inertial transport in stochastic and time-dependent flows.
- **Multiscale Modeling of Magnetic Fluids (PI)** NSF
Computational Mathematics (RUI) DMS-1016383 9/2010 – 08/2014
– Numerical simulations, models and experiments on magnetic fluids with internal structure, applied to drug delivery in blood vessels, cell sorting and microfluidic devices
- **An Imaging System for the Study of Complex Fluids (co-PI)** NSF
Major Research Instrumentation (MRI) CBET-1229113 9/2012 – 8/2014
– Acquisition of LaVision PIV / PTV system and high-speed camera for experiments.
- **Acquisition of Scientific Computing Capacity (co-PI)** NSF
Major Research Instrumentation (MRI-R2) DMS-0959461 9/2010 – 8/2011
– Supported acquisition of 128 core Opteron Cluster for CFD and multiphase simulations.

Teaching Experience

Electricity and Magnetism (Trinity College Dublin)	2000-1999
Fluid Mechanics (Trinity College Dublin)	2000
Order & Disorder in Nature: Introduction to Nonlinear Dynamics (Columbia)	2004-2000
Lagrangian and Hamiltonian Mechanics (Columbia)	2004,2003
Waves, Optics and Modern Physics (Columbia)	2004-2001
Astrophysics of the Solar System (Columbia)	2004-2001
Numerical Methods for Multiphase Flows, Doctoral (Univ. Napoli Federico II, Italy)	2009
Advanced Computing with Matlab, Graduate (Montclair)	2014,2010
Applied Mathematics Continuous, Graduate (Montclair)	2007
Mathematical Computing, Graduate (Montclair)	2013,2009
Partial Differential Equations (Montclair)	2013,2010,2008
Ordinary Differential Equations (Montclair)	2014,2010,2008
Vector Calculus (Montclair)	2013
Fluid Mechanics (Montclair)	2011,2009,2007
Complex Variables (Montclair)	2006
Linear Algebra (Montclair)	2006,2005
Calculus I & II (Montclair)	2013-2005
Physics Lab: Optics & Measurement	2017-2014
Optics & Modern Physics	2017-2014
Flow Visualization	2017
Advanced Fluid Mechanics	2017

Publications

Books

O. Regev, O. Umurhan and P. Yecko, *Modern Fluid Dynamics for Physics and Astrophysics*, Springer-Verlag, May 2016. (*Reviewed in Physics Today, May 2016.*)

Peer-Reviewed Journal Articles

26. A. Cali, W.-K. Lee, A.D. Trubatch and P.A. Yecko, Flow anisotropy due to thread-like nanoparticle agglomerations in dilute ferrofluids, *submitted to Fluids, August 2017*
25. S. Bna, S. Manservisi, R. Scardovelli, P.A. Yecko and S. Zaleski, VOFI – a library to initialize the volume fraction scalar field, *Computer Physics Communications* 200, pp291-299, 2016
24. H. Grant, R. Scardovelli, A.D. Trubatch and P.A. Yecko, Height function based Volume of Fluid code for simulations of multiphase magnetic fluids, *Computers and Fluids* 113, pp112-118, 2015
23. S. Bna, S. Manservisi, R. Scardovelli, P.A. Yecko and S. Zaleski, Numerical integration of implicit functions for the initialization of the VOF function, *Computers and Fluids* 113, pp42-52, 2015.
22. A. Mukherjee, A. Vaidya and P.A. Yecko, Laminar shear in a ferrofluid: stability studies, *Magnetohydrodynamics* 49(3/4), pp505-511, 2013
21. E. Forgoston, L. Billings, P.A. Yecko, I. Schwartz, Set-based corral control in stochastic dynamical systems: Making almost invariant sets more invariant, *Chaos* v.21(1), 013316, 2011
20. P.A. Yecko, W.-K. Lee, A.D. Trubatch and M. Vieira. Drag enhancement due to macro-chains in uniformly magnetized ferrofluids, *Journal of Magnetism and Magnetic Materials* v.323(10), pp1288-1292, 2011
19. A. Mukherjee, W. Childress and P.A. Yecko, Taylor-Couette flow of ferrofluid: spin field and spin boundary condition effects, *Physics Procedia* v.9, pp156-161, 2010
18. W.-K. Lee, R. Scardovelli, A.D. Trubatch and P.A. Yecko, Numerical, experimental and theoretical investigation of bubble aggregation and deformation in magnetic fluids, *Physical Review E* v.82, 016302, 2010
17. P.A. Yecko, Effect of normal and parallel magnetic fields on the stability of interfacial flows of magnetic fluids in channels, *Physics of Fluids* v22, 022103, 2010
16. P.A. Yecko, Stability of layered channel flow of magnetic fluids, *Physics of Fluids* v21, 034102, 2009
15. M. Korlie, A. Mukherjee, B. Nita, J. Stevens, A.D. Trubatch and P.A. Yecko, Modelling bubbles and droplets in magnetic fluids, *Journal of Physics: Condensed Matter* v20(20), 204143, 2008
14. M. Korlie, A. Mukherjee, B. Nita, J. Stevens, A.D. Trubatch and P.A. Yecko, Analysis of flows of ferrofluid under simple shear, *Magnetohydrodynamics* v44(1), pp51-59, 2008
13. P.A. Yecko, Disturbance growth in two-fluid channel flow: the role of capillarity, *International Journal of Multiphase Flow* v34(3), pp272-282, 2008
12. T. Boeck, J. Li, E. Lopez-Pages, P.A. Yecko and S. Zaleski, Ligament Formation in Sheared Liquid-Gas Layers, *Theoretical and Computational Fluid Dynamics* v21, pp 59-76, 2007

11. A. Cosmas & P. Yecko, Discovery of Eclipsing Binary GSC 2007:761 and Misclassification of delta Scuti SAO 83225, *International Bullentin of Variable Stars* 5659, p1, Nov. 2005
10. P.A. Yecko and S. Zaleski, Transient growth in two-phase mixing layers, *Journal of Fluid Mechanics* v528, pp43-52, 2005
9. P.A. Yecko, Accretion disk instability revisited: Transient dynamics of rotating shear flow, *Astronomy and Astrophysics* v425, p385, 2004
8. P.A. Yecko and M. Rossi, Transient Growth and Instability in Rotating Boundary Layers, *Physics of Fluids* v16(7), p2322, 2004
7. P.A. Yecko, S. Zaleski and J.-M. Fullana, Viscous Modes in Two-Phase Mixing Layers, *Physics of Fluids* v14(12), p4115, 2002
6. P.A. Yecko and S. Zaleski, Two-phase shear instability: waves, fingers and drops, *Annals of the New York Academy of Sciences* v898, p127, 2000
5. Z. Kollath, J.-P. Beaulieu, J.R. Buchler and P.A. Yecko, Nonlinear Beat Cepheid models, *Astrophysical Journal Letters* v502, pL55, 1998
4. P.A. Yecko, Z. Kollath and J.R. Buchler, Turbulent convective Cepheid models: linear properties, *Astronomy and Astrophysics* v336, p553, 1998
3. P.A. Yecko and S.P. Meacham, Buoyancy driven rotating boundary currents, *Annals of the New York Academy of Sciences* v848, p114, 1998
2. J.R. Buchler, P.A. Yecko and Z. Kollath, The nature of strange modes in classical variable stars, *Astronomy and Astrophysics* v326, pp669-683, 1997
1. P.A. Yecko, Vorticity and mixing in disks, *Annals of the New York Academy of Sciences* v773, p95, 1995

Conference Proceedings and Book Chapters (Peer-reviewed)

15. M. Ani Hsieh, H. Hajieghrary, D. Kularatne, C.R. Heckman, E. Forgoston, I.B. Schwartz and P.A. Yecko, Small and Adrift with Self-Control: Using the Environment to Improve Autonomy, in *Robotics Research, Springer Proceedings in Advanced Robotics 3*, 2018.
14. C. Salafia, D. Thomas, A.D. Trubatch and P.A. Yecko, Elementary modelling of coiling effects on blood flow in the umbilical cord, Placenta 36(9):A31. International Federation of Placenta Associations Conference, September 2015.
13. M. Michini, K. Mallory, D. Larkin, M.A. Hsieh, E. Forgoston and P.A. Yecko, An Experimental Testbed for Multi-Robot Tracking of Manifolds and Coherent Structures in Flows, in *Proceedings of the 6th Annual Dynamic Systems and Control Conference (DSCC 2013)* Palo Alto, California, October 2013
12. P.A. Yecko, A.D. Trubatch and W.-K. Lee, Interfacial Magnetophoresis in Magnetic Fluids, *Proceedings of 7th International Conference on Multiphase Flow (ICMF 2010)* Tampa, May-June 2010
11. P.A. Yecko and J. Pohlmeier (MSU student), Non-normal pulsation, in *Nonlinear Stellar Hydrodynamics and the Pulsations of Cepheids*, Eds. M.J. Goupil and N. Nardetto, EDP Sciences, 2009

10. T. Boeck, P.A. Yecko, A. Bague and S. Zaleski, Instability in two-phase mixing layers, *Proceedings of the 6th International Conference on Multiphase Flow (ICMF 2007)* Leipzig Germany, June 2007
9. P.A. Yecko, Optimal Disturbance Structure and Development on a Sheared Interface, *Proceedings of the Institute of Liquid Atomization and Spray Systems (ILASS Americas 2004)* Arlington, VA, May 2004
8. P.A. Yecko, Disturbance Growth in Primary Atomization, *Proceedings of the International Congress of Liquid Atomization and Spray Systems (ICLASS 2003)* Sorrento, Italy, July 2003
7. P.A. Yecko, Disturbance growth in primary atomization: three-dimensionality, transient amplification and non-parallel flow effects, *Proceedings of the Institute of Liquid Atomization and Spray Systems (ILASS-Americas 2003)* Monterey CA, May 2003
6. P.A. Yecko and S. Zaleski, Instability development in two-phase shear flows: primary breakup, *Proceedings of the Institute of Liquid Atomization and Spray Systems (ILASS-Europe 1999)*, Toulouse France, July 1999
5. J.R. Buchler, P.A. Yecko, Z. Kollath and M.-J. Goupil, Turbulent convection in pulsating stars, in *Stellar structure: theory and tests of convective energy transport*, ASP Conf. Series v173, p141, 1999
4. A. Bracco, A. Provencale, E.A. Spiegel and P.A. Yecko, Spotted disks, in *Theory of Black Hole Accretion Disks*, Eds. M. Abramowicz, G. Björnsson and J. Pringle, Cambridge Univ. Press, 1999
3. P.A. Yecko and Z. Kollath, Strange Cepheids driven by the κ mechanism, in *A Half Century of Stellar Pulsation*, ASP Conf. Series, v135, p94, 1998
2. Z. Kollath and P.A. Yecko, Turbulent Convective Cepheid models, in *Pulsating Stars Recent developments in theory and observation*, Eds. M. Takeuti and D. Sasselov, Universal Academic Press, Tokyo, p225, 1998
1. Z. Kollath, J.R. Buchler and P.A. Yecko, Strange modes in Classical Variable Stars, in *Pulsating Stars Recent developments in theory and observation*, Eds. M. Takeuti and D. Sasselov, Universal Academic Press, Tokyo, p195, 1998

Student Theses

- **Modeling the Curvature of a Ferrofluid Interface Using Height Functions**
Holly Timme (now Grant), M.S. Applied Mathematics *August 2012*
- **Magnetoviscous Effects of Particle Threads in Magnetized Ferrofluid**
Alexander Cali, M.S. Applied Mathematics *June 2014*
- **Modeling Magnetic Separation of Oil Spill Clean Up**
Kofi James, M.S. Mathematics Education *August 2014*
- **Models of Magnetic Drug Targeting**
Vincent Bianco, M.S. Mechanical Engineering *expected May 2018*

Service

- Member of American Physical Society, Division of Fluid Dynamics; SIAM Dynamical Systems
- Refereed papers for the following journals:
 - Journal of Computational Physics
 - ACTA Mechanica
 - Journal of Fluid Mechanics
 - Physics of Fluids
 - Physica A
 - Computers and Fluids
 - International Journal of Multiphase Flow
 - European Journal of Mechanics - B/Fluids
 - SIAM Journal of Applied Mathematics
 - IMA Journal of Applied Mathematics
 - Nonlinear Processes in Geophysics

Other Research Experience

- **Advanced Photon Source** Argonne National Laboratory
Awarded 3 General User Proposals *2009-2013*
 - GUP-11966, 20418 & 27551, each a 72 hour beamtime award for x-ray phase contrast imaging
- **Science Honors Innovation Program (SHIP)** Montclair State University
College of Science and Mathematics *September 2010 – present*
 - Director of this innovative research-immersion program for junior-senior science majors; 12 student annual cohort, each receives \$10,000 funding to support their research. Cohort 4 began September 2013. Over 50 conference presentations and 8 student-driven publications to date. Director organizes students and mentors, recruits applicants, works with MSU fundraisers and directly with donors (Roche, Merck, Celgene), writes funding proposals; in excess of \$500,000 to date since its September 2010 inception.