

German M. Drazer
Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey
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I. EDUCATION

- 1999 Ph.D. in Physics,
Universidad de Cuyo and Instituto Balseiro, Bariloche, Argentina.
Research Area: Transport in porous media; *Advisor:* Marta Rosen.
- 1994 Licenciado in Physics (equivalent to M.Sc.)
Universidad de Cuyo and Instituto Balseiro, Bariloche, Argentina.
Research Area: Pattern formation in reaction-diffusion systems;
Advisor: Horacio S. Wio
- 1988-1991 Undergraduate Student in Electrical Engineering
School of Engineering, University of Buenos Aires, Argentina.

II. PROFESSIONAL EXPERIENCE

- 2012-Present Associate Professor, Mechanical and Aerospace Engineering.
Rutgers, The State University of New Jersey.

Rutgers Affiliations:
Engineering Research Center for Structured Organic Particulate Systems
Institute for Advanced Materials, Devices and Nanotechnology
- 2005-2012 Assistant Professor, Johns Hopkins University
Chemical & Biomolecular Engineering

JHU Affiliations:
CEAFM - Center for Environmental & Applied Fluid Mechanics
INBT - Institute for NanoBioTechnology
- 1999-2005 Research Associate,
The Benjamin Levich Institute for Physico-Chemical Hydrodynamics,
City College of New York, City University of New York.
Advisors: Andreas Acrivos and Joel Koplik.

III. HONORS AND AWARDS

- 2010 National Science Foundation CAREER Award
"Deterministic and stochastic transport of suspended particles in periodic systems: fundamentals and applications in separation sciences"
- 2000 J. J. Giambiagi Award for outstanding doctoral thesis in experimental physics 1998/1999, presented by the Argentine Physical Society.
- 2000-2002 Postdoctoral Research Fellow of the National Council of Scientific and Technical Investigations (CONICET, Argentina).

1995-1999 Doctoral Research Fellow (1995-1999) National Council of Scientific and Technical Investigations (CONICET, Argentina).

1991-1994 Fellowship for undergraduate Studies, Instituto Balseiro and National Council of Atomic Energy (CNEA, Argentina).

IV. PROFESSIONAL ACTIVITIES

Organizing Committee:

64th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, 2011.

Chaired sessions:

ITP 2012. 19th International Symposium, Exhibit & Workshops on Electro- and Liquid Phase-separation Techniques:

- Miniaturization I.

86th ACS Colloids and Surface Science Symposium 2012:

- Microfluidics I: Polymers in Microfluidics.

- Microfluidics II: Separation and Capture.

- Microfluidics III: Colloids in Microfluidics.

- Microfluidics IV: Drops and Bubbles in Microfluidics.

- Microfluidics V: Fabrication and General.

AICHe 2011: - Microfluidic and Microscale Flows I & II.

- Judge Poster Session in Fluid Mechanics.

AICHe 2009: - Particulate Systems I & II.

AICHe 2007: - Dynamics and Modeling of Particulate Systems I & II.

- Poster Session in Fluid Mechanics.

Reviewer for the following journals (23)

Asia-Pacific J. Chem. Eng.

J. Colloid Interf. Sci.

Nature Phys.

Biomicrofluidics

J. Fluid Mech.

Phys. A

Chem. Phys. Lett.

J. Heat Transf.

Phys. Scripta

Comput. Math. Appl.

J. Nanopart. Res.

Phys. Rev. Lett.

Electrophoresis

J. Micromech. Microeng.

Phys. Rev. E

Europ. J. Mech. – B/Fluids

J. Rheol.

Phys. Fluids

Int. J. Multiphas. Flow

Lab chip

Transport Porous Med.

J. Phys. D: Appl. Phys.

Microfluid. Nanofluid.

Book Review:

2nd Edition, "Analysis of Transport Phenomena", W. Deen, Oxford University Press. (2 chapters)

Proposal Reviewer / Panelist:

- Department of Energy (DOE): Office of Basic Energy Sciences (BES).
- Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant Applications.
- National Science Foundation, Engineering Division (NSF).

- National Science Foundation, Engineering Division, CAREER Panel (NSF).
- Department of Defense (DoD/EPSCoR Program).
- Petroleum Research Foundation, American Chemical Society (ACS).
- The Accelerated Translational Incubator Pilot (ATIP) Program, Johns Hopkins Institute for Clinical and Translational Research (ICTR), NIH's Clinical and Translational Science Award (CTSA) consortium.
- Ministerio de Ciencia, Tecnología e Innovación Productiva, Agencia Nacional de Promoción Científica y Tecnológica, Fondo para la Investigación Científica y Tecnológica, Argentina.

V. PUBLICATIONS

(*: graduate in the lab; †: undergraduate student in the lab; ☒: corresponding author)

1. *"Analysis of the trajectory of a sphere moving through a constriction"* by Sumedh Risbud, Mingxiang Luo, Joelle Frechette, and German Drazer, submitted *Physics of Fluids* (2012).
2. *"Vector separation of particles and cells using an array of slanted open cavities"*, J. A. Bernate*, L. Chengxun, L. Lagae, K. Konstantopoulos and G. Drazer☒, submitted *Lab on a chip* (2012).
3. *"Gravity Driven Deterministic Lateral Displacement for Particle Separation in Microfluidic Devices"*, R. Devendra* and G. Drazer☒, in press *Analytical Chemistry* (2012).
4. *"Trajectory and distribution of non-Brownian suspended particles moving past a fixed spherical or cylindrical obstacle"*, S. R. Risbud* and G. Drazer☒, accepted *J. Fluid Mech.* (2012).
5. *"Force driven separation of drops by deterministic lateral displacement"*, T. Bowman*, J. Frechette☒ and G. Drazer☒, *Lab chip* **12**, 2903 (2012).
6. *"Stochastic and Deterministic Vector Chromatography of Suspended Particles in 1D-Periodic Potentials"*, J. Bernate* and G. Drazer☒, *Phys. Rev. Lett.* **108**, 214501 (2012).
Selected for publication in: *Virtual J. Nanoscale Sci. & Tech.* 25, 23 (2012)
7. *"Microbioreactors to manipulate oxygen tension and shear stress in the microenvironment of vascular stem and progenitor cells"*, H. E. Abaci, R. Devendra*, R. Soman, G. Drazer☒ and S. Gerecht☒, *Biotech. App. Biochem.* **59**, 97 (2012).
8. *"Microbioreactors for long-term cell culture in controlled oxygen microenvironments"*, H. E. Abaci, R. Devendra*, Q. Smith†, S. Gerecht☒ and G. Drazer☒, *Biomed. Microdevices* **14**, 145 (2012).
9. *"Irreversibility and pinching in deterministic particle separation"*, M. Luo, F. Sweeney†, S. Risbud*, G. Drazer☒ and J. Frechette☒, *App. Phys. Lett.* **99**, 064102 (2011).
Selected for publication in: *Virtual J. Nanoscale Sci. & Tech.* 24, 9 (2011).
10. *"Partition Induced Vector Chromatography in Microfluidic Devices"*, J. Bernate*, G. Drazer☒, *J. Colloids Interface Sci.* **356**, 341 (2011).

11. “*Transport of Brownian particles confined to a weakly corrugated channel*”, X. Wang and G. Drazer[□], *Phys. Fluids* **22**, 122004 (2010).
12. “*Nanoscale simulations of directional locking*”, J. Koplik, G. Drazer[□], *Phys. Fluids* **22**, 052005 (2010).
13. “*Adaptation to oxygen deprivation in cultures of human embryonic stem cells, endothelial progenitor cells and umbilical vein endothelial cells*”, R. Truitt, E. Luong, G. Drazer, S. Gerecht[□], *Am J Physiol Cell Physiol* **298**, C1527 (2010).
14. “*Directional locking and the role of short-range interactions in deterministic hydrodynamics separations*”, T. Iracki*, M. Balvin*, E. Sohn†, G. Drazer[□], J. Frechette[□], *Phys. Rev. Lett.* **103**, 078301 (2009).
Selected for publication in: *Virtual J. Nanoscale Sci. & Tech.* 20, 08 (2009).
15. “*Transport properties of Brownian particles confined to a narrow channel by a periodic potential*”, X. Wang, G. Drazer[□], *Phys. Fluids.* **21**, 102002 (2009).
Selected for publication in: *Virtual J. Nanoscale Sci. & Tech.* 20, 16 (2009).
(Top 20 most downloaded articles from Physics of Fluids in October 2009)
16. “*Separation of suspended particles in microfluidic systems by directional-locking in periodic fields*”, J. Herrmann†, M. Karweit, G. Drazer[□], *Phys. Rev. E* **79**, 061404 (2009).
17. “*Directional locking and deterministic separation in periodic arrays*”, J. Frechette, G. Drazer[□], *J. Fluid Mech.* **627**, 379 (2009).
18. “*Hydrodynamic Interactions in Dissipative Particle Dynamics*”, Z. Li and G. Drazer[□], *Phys. Fluids* **20**, 103601 (2008).
19. “*Separation of suspended particles by arrays of obstacles in microfluidic devices*”, Z. Li, G. Drazer[□], *Phys. Rev. Lett.* **98**, 050602 (2007).
Selected for publication in:
Virtual J. Nanoscale Sci. & Tech. 15, 07 (2007);
Virtual J. Biological Phys. Research. 13, 04 (2007);
20. “*Fluid enhancement of particle transport in nanochannels*”, Z. Li, G. Drazer[□], *Phys. Fluids* **18**, 117102 (2006).
Selected for publication in: *Virtual J. Nanoscale Sci. &Tech.* 14, 21 (2006).
21. “*Flow channeling in a single fracture induced by shear displacement*”, H. Auradou, G. Drazer, A. Boschan, J.P. Hulin[□] and J. Koplik[□], *Geothermics* **35**, 576 (2006).
22. “*Lattice-Boltzmann Method for Non-Newtonian Fluid Flows*”, S. Gabbanelli, G. Drazer, J. Koplik[□], *Phys. Rev. E* **72**, 046312 (2005).
23. “*Hysteresis, force oscillations and non-equilibrium effects in the adhesion of spherical nanoparticles to atomically smooth surfaces*”, G. Drazer[□], B. Khusid, J. Koplik and A. Acrivos, *Phys. Rev. Lett.* **95** 016102 (2005).
Selected for publication in: *Virtual J. Nanoscale Sci. & Tech.* **12**, #02 (2004).
24. “*Permeability anisotropy induced by shear-displacement in fractures*”, H. Auradou, G. Drazer, J. P. Hulin[□] and J. Koplik[□],

- Water Resour. Res. **41**, W09423 (2005).
25. “*Wetting and particle adsorption in nanoflows*”,
G. Drazer[□], B. Khusid, J. Koplik and A. Acrivos, Phys. Fluids **17** 017102 (2005).
Selected for publication in: Virtual J. Nanoscale Sci. & Tech. **10**, #24 (2004).
 26. “*Microstructure and velocity fluctuations in sheared suspensions*”,
G. Drazer, J. Koplik, B. Khusid and A. Acrivos[□], J. Fluid Mech. **511**, 237-263 (2004).
 27. “*Self-Affine Fronts in Self-Affine Fractures: Large and Small-Scale Structure*”,
G. Drazer, J. Koplik[□], H. Auradou and J.P. Hulin[□], Phys. Rev. Lett. **92**, 014501 (2004).
 28. “*Adsorption Phenomena in the Transport of a Colloidal Particle through a Nanochannel Containing a Partially Wetting Fluid*”,
G. Drazer[□], J. Koplik[□], B. Khusid[□] and A. Acrivos[□], Phys. Rev. Lett. **89**, 244501 (2002);
Selected for publication in: Virtual J. Nanoscale Sci. & Tech. **6**, #24 (2002);
 29. “*Transport in rough self-affine fractures*”,
G. Drazer[□] and J. Koplik[□], Phys. Rev. E, **66**, 026303 (2002).
 30. “*Deterministic and stochastic behaviour of non-Brownian spheres in sheared suspensions*”, G. Drazer, J. Koplik, B. Khusid and A. Acrivos[□],
J. Fluid Mech. **460**, 307-335 (2002).
 31. “*Tracer dispersion in two-dimensional rough fractures*”,
G. Drazer and J. Koplik[□], Phys. Rev. E, **63**, 056104 (2001).
 32. “*Exact time-dependent solutions for anomalous diffusion with absorption*”,
G. Drazer[□], H. S. Wio and C. Tsallis, Granular Matter, **3**, 105 (2001).
 33. “*Permeability of self-affine rough fractures*”,
G. Drazer and J. Koplik[□], Phys. Rev. E, **62**, 8076 (2000).
 34. “*An analytical study of stochastic resonance in a monostable non-harmonic system*”,
D. Strier[□], G. Drazer and H.S. Wio, Phys. A, **283**, 234 (2000).
 35. “*Stable-unstable crossover in non-Newtonian radial Hele-Shaw flow*”,
S. Obernauer[□], G. Drazer and M. Rosen, Phys. A, **283**, 167 (2000).
 36. “*Anomalous transport in activated carbon porous samples: power-law trapping-time distributions*”, G. Drazer[□], M. Rosen and D. Zanette, Phys. A, **283**, 161 (2000).
 37. “*Anomalous diffusion with absorption: Exact time-dependent solutions through a nonextensive thermostatistical Ansatz*”,
G. Drazer[□], H. S. Wio[□] and C. Tsallis[□], Phys. Rev. E, **61**, 1417 (2000).
 38. “*Experimental evidence of power-law trapping-time distributions in porous media*”,
G. Drazer[□] and D. H. Zanette, Phys. Rev. E, **60**, 5858 (1999).
 39. “*Exact expression for the diffusion propagator in a family of time-dependent anharmonic potentials*”, J. A. Giampaoli, D. E. Strier, C. Batista, G. Drazer, H. S. Wio[□],
Phys. Rev. E, **60**, 2540 (1999).
 40. “*Tracer dispersion in double porosity activated carbon packings*”, G. Drazer, L. Bruno,
R. Chertcoff, M. Rosen[□] and J. P. Hulin, Chem. Eng. Sci., **19**, 4137 (1999).
 41. “*Concentration dependence of diffusion-adsorption rate in activated carbon*”,
G. Drazer, L. Bruno, R. Chertcoff, M. Rosen[□], Chem. Eng. Sci., **19**, 4285 (1999).

42. "Tracer dispersion in double porosity porous media with nonlinear adsorption", G. Drazer, R. Chertcoff, L. Bruno, M. Rosen[□], *Physica A*, **257**, 371, (1998).
43. "Global Stability of stationary Patterns for activator-inhibitor system with fast inhibitor: the non-equilibrium potential", G. Drazer and H. S. Wio[□], *Physica A*, **240**, 571, (1997).
44. "Space-Time Transformations within the Path-Integral Approach to Stochastic Processes", C. D. Batista, G. Drazer, D. Reidel, H. S. Wio[□], *Phys. Rev. E*, **54**, 86, (1996).

Conference and Workshop Publications:

45. "Multiscale Modeling of Nanoflows", G. Drazer, B. Khusid, J. Koplik and A. Acrivos, *Nanotech 2005* **1**, 587, Computational Publications.
46. "Adsorption phenomena in particle transport through a fluid-filled nanochannel", G. Drazer, B. Khusid, J. Koplik and A. Acrivos, *Nanotech 2003* **1**, 142, Computational Publications.
47. "Squeezing flow of particles and large molecules suspended in a liquid through nanochannels", A. Acrivos, B. Khusid, J. Koplik and G. Drazer, *Nanotech 2002* **1**, 66, and **2**, 97, Computational Publications.
48. "Dispersion in activated carbon packed beds: adsorbent double porosity media", G. Drazer, L. Bruno, R. Chertcoff, M. Rosen, *Fundam. of Adsorption VI*, 727, Elsevier, 1998.

VI. PATENTS

- *Microfluidic settling velocity based separation of synthetic and biological particles*, J. Bernate, C. Liu, L. Lagae, G. Drazer, Current status: Patent Pending (2012) (#61532499).

VII. RESEARCH HIGHLIGHTS

- "Next Generation: Separation Two Ways. Researchers designed a microfluidics chip to separate cells using gravity and a force field", *The Scientist* (June 2012).
- Futurity.org, "Tiny 'speed bumps' detect cancer cells" (June 2012).
- JHU News Releases, "Tiny 'Speed Bump' Device Could Sort Cancer Cells" (June 2012).
- C&E News and ACS Digital Services created and posted two videos explaining experiments from our lab in their YouTube channel: "LEGOs Show What Happens In Tiny Separations" (July 2011).
- *Scientific American*, "Thinking Outside of the Toy Box: 4 Children's Gizmos That Inspired Scientific Breakthroughs" (March 2010).
- CNET News, "Researchers model nano-sized world--with Legos" (September 2009).
- National Science Foundation, "LEGO Toy Helps Researchers Learn What Happens on Nanoscale" (August 2009).
- *Wired.com*, "Replicating Nanoscale Microfluidic Arrays with LEGO" (August 2009).
- *About.com*, "LEGOs Meet Big Science" (August 2009).

- Daily Tech, “Johns Hopkins Researchers Raid Toybox to Study Microfluidic Physics” (August 2009).
- JHU News Releases, “LEGOs Help Researchers Learn What Happens Inside Lab-on-a-Chip Devices” (August 2009).
- *Other press reporting on our Separations work:* Biotech Daily, e! Science News, Eureka Alert!, Meridian Institute, Nano Patents and Innovations, NanoWerk, PhysOrg, PRODUCT Design & Development, R&D Magazine, Science Codex, Science Daily, Smart Planet, World News.
- *Other press reporting on our LEGO® work:* Analytica-World, The Art of Science, Azom, Betabanen, Bionity, BrightSurf.com, bmore, ChemEurope, C2W, Earth-Stream, eBioNews, EE|Times, Eureka Alert!, FastCompany, First Scienc, Futurity, GEN, Huliq, IMDb, Innovations Report, Inside Science, Inside engineer, ISA, Lab Spaces, Nanotechwire, Nanowerk, Newstin, OfficialWire, Pagina 9, Physics Central, PhysOrg.com, Popular Science, Product D&D, redOrbit, R&D Magazine, Science Codex, Science Daily, Scientific Computing, The JHU Gazette, Times of the Internet, tonic, UPI, VWN, X-Journals, ZD Net.
- *Interview:* Comments in Phys. Rev. Focus **26**, 16 (2010) on the work by former postdoctoral student Zhigang Li: “*Focus: Fluid Pump without Moving Parts*”.

VIII. PRESENTATIONS

Invited seminars and conference presentations

1. “*Microfluidic Devices for Blood Fractionation and Detection of Circulating Tumor Cells*”, Mid-Atlantic Chapter of the American Association of Physicists in Medicine Annual Fall Meeting, Virginia, September 2012. (**Plenary Lecture**)
2. “*Transport of suspended particles in periodic systems: Applications in separation microfluidic devices*”, Chemical and Biomolecular Engineering Department, University of Pennsylvania, April 2012.
3. “*Transport of suspended particles in periodic systems: Applications in separation microfluidic devices*”, Mechanical and Aerospace Engineering Departments, Rutgers University, March 2012.
4. “*Transport of suspended particles in periodic systems: Applications in separation microfluidic devices*”, Center for Environmental and Applied Fluid Mechanics, Johns Hopkins University, February 2012.
5. “*Deterministic & Stochastic Transport of Suspended Particles in Periodic Systems: Fundamentals and Applications in Microfluidics for Separation Sciences*”, IMEC, Leuven, Belgium, August 2011.
6. “*Microfabrication Of Anisotropic Media For Particle Separation Devices*”, 23rd Canadian Congress of Applied Mechanics, Vancouver, BC, Canada, June, 2011.
7. “*Deterministic & Stochastic Transport of Suspended Particles in Periodic Systems: Fundamentals and Applications in Microfluidics for Separation Sciences*”, Department of Chemical Engineering, Lehigh University, September 2010.

8. *"Phase-locking in the transport of suspended particles through periodic systems"*, 45th Annual Technical Meeting, Society of Engineering Science, Illinois, 2008.
9. *"Transporte en Microfluidos y las Ecuaciones Diferenciales Ordinarias en un Toro Bidimensional"*, IV Congreso Internacional de Matemática Aplicada a la Ingeniería, Buenos Aires, Argentina, 2008.
10. *"Transport Phenomena in Nanochannels, Department of Mechanical Engineering"*, University of Michigan, Ann Arbor, Michigan, May 19, 2005.
11. *"Transport Phenomena at Molecular Scales, Department of Mechanical Engineering"*, University of British Columbia, Vancouver, Canada, March 30, 2005.
12. *"Transport Phenomena in nanoflows, Department of Chemical and Biomolecular Engineering"*, Department of Chemical & Biomolecular Engineering, Johns Hopkins University, Maryland, March 21, 2005.
13. *"Particle transport in nanoflows"*, TRI/Princeton, New Jersey, January 20, 2005.
14. *"Wetting and Particle Adsorption in Nanoflows"*, Chemical, Biomedical, and Materials Engineering, Stevens Institute of Technology, New Jersey, November 3, 2004.
15. *"The use of Molecular Simulations in the study of Micro/Nano fluidics: Progress, Applications, and Challenges"*, Pan-American Advanced Studies Institutes on Micro Electro Mechanical systems (MEMS), Bariloche, Argentina, June 21-30, 2004.
16. *"Stochastic Phenomena in Suspension Flows, Materials and Construction Research Division"*, National Institute of Standards and Technology, Maryland, April 29, 2004.
17. *"Transport of a colloidal particle through a fluid-filled nanochannel: wetting-controlled adsorption"*, Mechanical Engineering Department, University of Connecticut, March 23, 2004.
18. *"Adsorption phenomena in the transport of a colloidal particle through a fluid-filled nanochannel"*, Nanofabrication Research Lab., Bell Labs Lucent Technologies, March 2004.
19. *"Adsorption phenomena in the transport of a colloidal particle through a fluid-filled nanochannel"*, Chemical Engineering Department, University of California, Santa Barbara, 2004.
20. *"Adsorption and transport of colloidal particles in nanochannels"*, University of Buenos Aires, Buenos Aires, August 13, 2003.
21. *"Transport in Rough Fractures"*, Schlumberger-Doll Research, Connecticut, January 22, 2003.
22. *"Stochastic Phenomena in Particle-Laden Flows"*, Department of Chemical Engineering, Lehigh University, Pennsylvania, November 20, 2002.
23. *"Stochastic Phenomena in Particle-Laden Flows"*, Department of Chemical Engineering, City College of the City University of New York, New York, October 21, 2002.
24. *"Shear-induced diffusion in suspensions"*, Fluides, Automatique & Systemes Thermiques, University of Paris Sud, Paris, France, May 31 2002.

25. “Shear-Induced Structure and Diffusion in Suspensions of Solid Spheres by Numerical Simulations”, Levich Institute Fluid Mechanics Series, City College of the City University of New York, New York, 2002.
26. “*Experimental evidence of power-law trapping-time distributions in porous media*”, Levich Institute Fluid Mechanics Series, City College of the City University of New York, New York, March 28, 2000.

Contributed Presentations @ National & International Meetings

(Underline indicates speaker; □ indicates posters.)

27. “*A DNS study of the deterministic vector chromatography of flexible and rigid particles over slanted open cavities*”, J. A. Bernate, H. Zhao, G. Drazer, E. G. Shaqfeh, Society of Rheology 84th Annual Meeting, California, 2013.
28. “Three dimensional open cavity flow for the continuous separation of suspended particles”, J. A. Bernate, C. Paul, C. Liu, L. Lagae, K. Konstantopoulos, Z. Gagnon and G. Drazer, 65th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, 2012.
29. “*Vector Separation of Particles Using an Array of Slanted Ramps*”, J. A. Bernate, S. R. Risbud and G. Drazer, Annual AIChE Meeting, Pittsburgh, 2012.
30. □ “*Vector Separation of Suspended Particles Using an Array of Slanted Open Cavities*”, J. A. Bernate, L. Chengxun, L. Lagae, K. Konstantopoulos and G. Drazer, Annual AIChE Meeting, Pittsburgh, 2012.
31. □ “*Effect of Inertia On Particle Trajectories Around a Spherical Obstacle*”, S. R. Risbud, M. Luo, J. Frechette and G. Drazer, Annual AIChE Meeting, Pittsburgh, 2012.
32. “*Direct Force Measurement Between Chemically Patterned Heterogeneous Surfaces*”, C. M. Pick, G. Drazer, J. Frechette, Annual AIChE Meeting, Pittsburgh, 2012.
33. □ “*Force Driven Separation of Particles and Drops by Deterministic Lateral Displacement*”, R. Devendra and G. Drazer, Annual AIChE Meeting, Pittsburgh, 2012.
34. “*Microfluidic separation devices using periodic stationary media*”, G. Drazer, ITP 2012—19th International Symposium, Exhibit & Workshops on Electro- and Liquid Phase-separation Techniques, Baltimore, 2012.
35. “*Pinching of particle trajectories in a non-Brownian setting*”, S. R. Risbud, M. Luo, J. Frechette, G. Drazer, 86th Colloid and Surface Science Symposium, American Chemical Society, June 2012.
36. “*Direct force measurement between surfaces coated with cationic polyelectrolyte via microcontact printing*”, C. M. Pick, G. Drazer, J. Frechette, 86th Colloid and Surface Science Symposium, American Chemical Society, June 2012.
37. “*Vector chromatography of suspended particles in 1D-periodic systems*”, J. Bernate, G. Drazer, 86th Colloid and Surface Science Symposium, American Chemical Society, June 2012.

38. □ “*Deterministic lateral displacement in isotropic microfluidic systems*”, R. Devendra, T. Feng, R. A. Passaro, G. Drazer, 86th Colloid and Surface Science Symposium, American Chemical Society, June 2012.
39. “*Transport of suspended particles in periodic systems: Applications in separation microfluidic devices*”, G. Drazer, 86th Colloid and Surface Science Symposium, American Chemical Society, June 2012.
40. “*Continuous blood fractionation using an array of slanted grooves*”, J. Bernate, L. Chengxun, L. Lagae, G. Drazer, 64th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, 2011.
41. “*Particle motion near cylindrical flow-obstacles in microfluidic devices*”, B. Mustin, G. Drazer, B. Stoeber, 64th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, 2011.
42. “*Analysis of pinching in deterministic particle separation*”, S. Risbud, M. Luo, J. Frechette, G. Drazer, 64th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, 2011.
43. “*Migration of suspended particles and topological defects within a nematic liquid crystal in anisotropic microfluidic devices*”, N. Flower, R. Devendra, J. B. Rovner, R. L. Leheny, and G. Drazer, 64th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, 2011.
44. “*Gravity driven separation based on lateral displacement in anisotropic microfluidic media*”, R. Devendra, G. Drazer, 64th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, 2011.
45. “*The Role of Irreversible Forces On Deterministic Lateral Displacement and Other Microfluidic Separation Methods*”, M. Luo, S. Risbud, J. Frechette, G. Drazer, Annual AIChE Meeting, Minnesota, 2011.
46. “*Stochastic and Deterministic Vector Separation of Suspended Particles In 1D Periodic Free-Energy Landscapes*”, J. Bernate, G. Drazer, Annual AIChE Meeting, Minnesota, 2011.
47. “*Deterministic Lateral Displacement In Anisotropic Media for Particle Separations In Microfluidic Devices*”, R. Devendra, G. Drazer, Annual AIChE Meeting, Minnesota, 2011.
48. “*Determining the effect of oxygen tension on vascular cell responses*”, Abaci E. H., Truitt R., Tan S., Nuzumlali S., Devendra R. , Drazer G., Gerecht S., 4th International Conference on Tissue Engineering, Greece, 2011.
49. “*Transport of Brownian Particles Confined to a Weakly Corrugated Channel*”, X. Wang, G. Drazer, Annual AIChE Meeting, Salt Lake City, 2010.
50. “*Microfabrication of Anisotropic Media for Particle Separation Devices*”, R. Devendra, G. Drazer, Annual AIChE Meeting, Salt Lake City, 2010.
51. “*Partition-Induced Vector Chromatography (PIVC) in Microfluidic Devices: Experiments and Simulations*”, J. A. Bernate, C. Riche, G. Drazer, Annual AIChE Meeting, Salt Lake City, 2010.

52. □ “*On the Minimum Separation Attained During the Motion of a Sphere Past a Fixed Spherical or Cylindrical Obstacle*”,
S. Risbud, G. Drazer, Annual AIChE Meeting, Salt Lake City, 2010.
53. “*The Biased Transport of Brownian Particles Spatially Confined to a Narrow "Channel" by a Periodic Potential*”,
X. Wang, G. Drazer, Annual AIChE Meeting, Nashville, 2009.
54. “*Partition Induced Vector Separation in Microfluidic Devices*”,
J. A. Bernate, G. Drazer, Annual AIChE Meeting, Nashville, 2009.
55. “*Vector Separation In Chemically Patterned Microfluidic Devices*”,
J. A. Bernate, G. Drazer, K. J. Stebe, Annual AIChE Meeting, Philadelphia, 2008.
56. □ “*Directional Locking and Deterministic Separation in Periodic Arrays*”,
G. Drazer, J. Frechette, Annual AIChE Meeting, Philadelphia, 2008.
57. “*Hydrodynamic Interactions In Dissipative Particle Dynamics*”,
Z. Li and G. Drazer, Annual AIChE Meeting, Salt Lake City, 2007.
58. “*Separation of Suspended Particles by Asymmetric Arrays of Obstacles in Microfluidic Devices*”, Z. Li and G. Drazer, Annual AIChE Meeting, San Francisco, 2006.
59. “*The effect of fluid density on the transport of particles in nanochannels*”,
Z. Li and G. Drazer, American Physical Society, March Meeting 2006.
60. “*Hysteresis, force oscillations and non-equilibrium effects in the adhesion of nanoparticles to atomically smooth surfaces*”,
G. Drazer, J. Koplik, B. Khusid and A. Acrivos,
Annual AIChE Meeting, Cincinnati, Ohio, October 30-November 4, 2005.
61. “*Multiscale Modeling of Nanoflows*”,
G. Drazer, A. Acrivos, B. Khusid and J. Koplik,
2005 NSTI Nanotechnology Conference, Anaheim, California, May 8-12, 2005.
62. “*Anisotropic transport in self-affine fractures*”,
G. Drazer, J. Koplik, J. P. Hulin and H. Auradou,
57th Annual Meeting of the Division of Fluid Dynamics, Seattle, November 21-23, 2004.
63. “*Permeability and Tracer Transport in Self-affine Fractures*”, G. Drazer and J. Koplik,
Research Symposium on “Flow and Transport: characterization and Modeling from Pore to Reservoir Scales”, organized by the Geosciences Research Program, Office of Basic Energy Sciences, Department of Energy, Gaithersburg, September 25-25, 2004.
64. “*Velocity fluctuations in non-Brownian suspensions undergoing simple shear flows*”,
A. Acrivos, G. Drazer, J. Koplik and B. Khusid, XXI International Congress of Theoretical and Applied Mechanics, Warsaw, Poland, 15-21 August, 2004.
65. “*Velocity fluctuations in sheared suspensions of neutrally buoyant, non-Brownian spheres*”, G. Drazer, J. Koplik, B. Khusid and A. Acrivos, 56th Annual Meeting of the Division of Fluid Dynamics, New Jersey, November 23-25, 2003.

66. *“Microstructure and Velocity Fluctuations in Sheared Suspensions”*,
G. Drazer, B. Khusid, J. Koplik and A. Acrivos,
Annual AIChE Meeting, San Francisco, California, November 16-21, 2003.
67. *“Flow of nanometer-size spheroids through a fluid-filled cylindrical tube”*,
G. Drazer, B. Khusid, J. Koplik and A. Acrivos,
Annual AIChE Meeting, San Francisco, California, November 16-21, 2003.
68. *“The translocation of a particle through a flow-filled nanochannel”*,
G. Drazer, J. Koplik, A. Acrivos and B. Khusid, 7th US National Congress on
Computational Mechanics, Albuquerque, New Mexico, July 27-31, 2003.
69. *“Trapping of a colloidal particle in fluid-filled nanochannels”*,
G. Drazer, J. Koplik, A. Acrivos and B. Khusid, Second M.I.T. Conference on
Computational Fluid and Solid Mechanics, Massachusetts, June 17-20, 2003.
70. *“Transport properties of a narrow self-affine fracture”*, H. Auradou, G. Drazer, J. P.
Hulin and J. Koplik, European Geophysical Society, American Geophysical Union,
European Union of Geosciences, Joint Assembly, Nice, France, April 06-11, 2003.
71. *“Adsorption Phenomena in the Transport of a Colloidal Particle through a Nanochannel
Containing a Partially Wetting Fluid”*,
G. Drazer, J. Koplik, A. Acrivos and B. Khusid, 88th Statistical Mechanics Conference,
Rutgers University, New Jersey, December 15-17, 2002.
72. *“Adsorption of colloidal particles traveling through a nanochannel containing a partially
wetting fluid”*, G. Drazer, B. Khusid, J. Koplik and A. Acrivos, 55th Annual Meeting of
the Division of Fluid Dynamics, Texas, November 24-26, 2002.
73. *“Flow of Particles Through A Fluid-filled Nanochannel”*, G. Drazer, B. Khusid, J. Koplik
and A. Acrivos, Annual AIChE Meeting, Indianapolis, Indiana, November 3-8, 2002.
74. *“Squeezing flow of particles and large molecules suspended in a liquid through
nanochannels”*, A. Acrivos, B. Khusid, J. Koplik and G. Drazer, 1st International
Conference and School Nanoscale/Molecular Mechanics, Hawaii, May 12-17, 2002.
75. *“Transport properties of self-affine rough fractures”*, G. Drazer and J. Koplik, 54th
Annual Meeting of the Division of Fluid Dynamics, California, November 18-20, 2001.
76. *“Dynamic simulation of sheared suspensions of non-Brownian spheres”*,
A. Acrivos, G. Drazer, B. Khusid, J. Koplik and M. Marchioro,
73rd Annual Meeting of The Society of Rheology, Maryland, October 21-25, 2001.
77. *“Transport properties of self-affine two-dimensional rough fractures”*,
G. Drazer and J. Koplik, 53rd Annual Meeting of the Division of Fluid Dynamics,
Washington, DC, November 19 - 21, 2000.
78. *“Stability crossover in non-Newtonian radial Hele-Shaw flow”*, S. Obernauer, G. Drazer
and M. Rosen, 13th MEDYFINOL conference and 6th Latin American Workshop on
Nonlinear Phenomena, Huerta Grande, Córdoba, Argentina, October 12-16, 1999.
79. *“Anomalous transport in activated carbon porous samples: power-law trapping-time
distributions”*, G. Drazer, M. Rosen and D. Zanette, 13th MEDYFINOL conference and

- 6th Latin American Workshop on Nonlinear Phenomena, Huerta Grande, Córdoba, Argentina, October 12-16, 1999.
80. “*Signal-to-noise ratio enhancement in monostable systems*”, G. Drazer, D. E. Strier and H. S. Wio, Workshop on the Dynamics of Nonequilibrium Systems, ICTP, Trieste, Italy, August 16-27, 1999.
 81. □ “*Exact results for stochastic resonance in a monostable system*”, G. Drazer, D. Strier and H.S. Wio, 13th MEDYFINOL conference and 6th Latin American Workshop on Nonlinear Phenomena, Huerta Grande, Córdoba, Argentina, October 12-16, 1999.
 82. “*Dispersion in activated carbon packed beds: adsorbent double porosity media*”, G. Drazer, R. Chertcoff, L. Bruno, M. Rosen, Fundamental of Adsorption VI, Giens, France, May 1998.
 83. □ “*Hydrodynamic dispersion in an adsorbent porous medium*”, S. Gurevich, N. Nerone, G. Drazer, R. Chertcoff, M. Rosen, 83rd National Meeting of Physics, La Plata, Argentina, September 1998.
 84. □ “*Transit time distributions of a tracer in activated carbon porous media*”, R. Chertcoff, L. Bruno, G. Drazer, M. Rosen, V International symposium on recent advances in mechanics and physics of fluids, Tunuyan, Argentina, November 1997.
 85. □ “*Tracer dispersion in double porosity porous media with nonlinear adsorption*”, G. Drazer, R. Chertcoff, L. Bruno, M. Rosen, 11th MEDYFINOL conference and 4th Latin American Workshop on Nonlinear Phenomena, Canela, Brasil, October 1997.
 86. □ “*Hydrodynamic dispersion in activated carbon double porosity media*”, G. Drazer, M. Rosen, 82nd National meeting of Physics, San Luis, Argentina, September 1997.
 87. □ “*Determination of radioactive-tracer transit-time distributions in activated carbon porous samples through dispersion measurements*”, G. Drazer, R. Chertcoff, L. Bruno, M. Rosen, 82nd National meeting of Physics, San Luis, Argentina, September 1997.
 88. □ “*Complementary methods to measure adsorption in activated carbons*”, S. Boeykens, L. Bruno, G. Drazer, N. Temprano, X National physicochemical conference, Tucuman, Argentina, April 1997.
 89. □ “*Diffusion-adsorption experiments in activated carbon grains*”, G. Drazer, R. Chertcoff, L. Bruno, M. Rosen, S. Gabbanelli, X National physicochemical conference, Tucuman, Argentina, April 1997.
 90. □ “*Non-Gaussian Tracer Dispersion in Double-Porosity Media*”, G. Drazer, L. Bruno, R. Chertcoff, M. Rosen, 10th MEDYFINOL conference, Tucuman, Argentina, September 1996.
 91. □ “*Tracer flow in activated carbon porous samples*”, L. Bruno, G. Drazer, R. Chertcoff, M. Rosen, 81st National meeting of Physics, Tandil, September 1996.
 92. “*Space-Time transformations within the path integral approach to stochastic processes*”, C. D. Batista, G. Drazer, D. Reidel, H. S. Wio, 9th MEDYFINOL conference and 4th Latin American workshop on nonlinear Phenomena, Bariloche, September 1995.

93. □ “*Adsorption influence on the dispersion process in activated carbon porous samples*”, L. Bruno, G. Drazer, R. Chertcoff, 80th National meeting of Physics, Bariloche, Argentina, October 1995.
94. “*Global Stability and stationary spatial-structures in an activator-inhibitor system in the fast inhibitor limit, non-equilibrium potentials*”, G. Drazer, H. S. Wio, 80th National meeting of Physics, Bariloche, Argentina, October 1995.

Contributed Presentations @ Local & Regional Meetings

(□ indicates poster; ① indicates 2 minutes sound-bite)

95. “*Vector Chromatography of Suspended Particles in 1D-periodic systems*”, J. Bernate, CEAFM-Burgers Research Symposium, University of Maryland, College Park, May 2012.
96. ① “*Separation Mechanisms in Anisotropic Microfluidic Devices*”, R. Devendra, G. Drazer, Mid-Atlantic Soft Matter Workshop (MASM7), University of Pennsylvania (2011).
97. ① “*Minimum distance attained by a sphere moving past a spherical or a cylindrical obstacle*”, S. Risbud, G. Drazer, Mid-Atlantic Soft Matter Workshop (MASM7), University of Pennsylvania (2011).
98. □ “*Fabrication of microbio reactors with controlled oxygen microenvironments for cancer cells*”, R. Devendra, H. Abaci, S. Gerecht and G. Drazer, NanoBio Symposium 2011, Institute NanoBioTechnology, Johns Hopkins University.
99. □ “*Microfluidic Vector Separation of Flowing Cells in a Periodic Array of Trenches*”, J. Bernate, G. Drazer, NanoBio Symposium 2011, Institute NanoBioTechnology, Johns Hopkins University.
100. □ “*Role of Pinching in Deterministic Particle Separation*”, M. Luo, F. Sweeney, S. Risbud, G. Drazer and J. Frechette, NanoBio Symposium 2011, Institute NanoBioTechnology, Johns Hopkins University.
101. □ “*Partition induced vector separation in microfluidic devices*”, J. A. Bernate, C. Riche, G. Drazer, NanoBio Symposium 2009, Institute NanoBioTechnology, Johns Hopkins University.
102. ① “*Partition-Induced Vector Chromatography in Microfluidic Devices: Theory and Simulations*”, J. Bernate, G. Drazer, Mid-Atlantic Soft Matter Workshop (MASM6), Georgetown University (2010).
103. ① “*Transport of Brownian particles in a channel*”, X. Wang, G. Drazer, Mid-Atlantic Soft Matter Workshop (MASM6), Georgetown University (2010).
104. □ “*Irreversible Interactions of a Cylindrical Obstacle on Particle Separation*”, F. Sweeney, M. Luo, G. Drazer, J. Frechette, 2010 AIChE Regional Conference, Mid-Atlantic, Johns Hopkins University.
105. □ “*Partition Induced Vector Chromatography (PIVC) of Brownian Particles*”, C. Riche, J. Bernate, G. Drazer, 2010 AIChE Regional Conference, Mid-Atlantic, Johns Hopkins University.

106. ① “*Transport properties of Brownian particles confined to a narrow channel by a periodic potential*”, X. Wang, G. Drazer, Mid-Atlantic Soft Matter Workshop (MASM5), Johns Hopkins University, 2009.
107. ① “*Partition Induced Vector Chromatography in Microfluidic Devices*”, J. A. Bernate, G. Drazer, Mid-Atlantic Soft Matter Workshop (MASM5), Johns Hopkins University, 2009.
108. ① “*Separation Mechanism in Microfluidics*”, R. Devendra, G. Drazer, Mid-Atlantic Soft Matter Workshop (MASM5), Johns Hopkins University, 2009.
109. ① “*Particle separation in chemically patterned microfluidic devices*”, J. A. Bernate, G. Drazer, Mid-Atlantic Soft Matter Workshop (MASM2), University of Pennsylvania, 2008.
110. □ “*Separation of suspended species in microdevices*”, T. Iracki, M. Balvin, J. Bernate, R. Devendra, J. Frechette, G. Drazer, NanoBio Symposium 2008, Institute NanoBioTechnology, Johns Hopkins University.
111. □ “*Separation and detection of suspended species in micro/nanofluidics: Brownian Ratchets*”, Z. Li, R. Devendra, G. Drazer, J. Frechette, NanoBio Symposium 2007, Institute NanoBioTechnology, Johns Hopkins University.

IX. RESEARCH SUPERVISION

Postdoctoral Fellows

- Zhigang Li (Fall 2005-Spring 2007)
Ph.D. in Mechanical Engineering, Delaware University.
Current Position: Associate Professor @ University of Science and Technology Hong Kong.
- Xinli Wang (Fall 2008-Spring 2010)
Ph. D. in Applied Mathematics, New Jersey Institute of Technology.
Current Position: Assistant Professor @ University of South Carolina Upstate.

Ph. D. Students

- Jorge Bernate, Chemical & Biomolecular Engineering, 2006-2012.
Current Position:
Postdoctoral researcher @ Stanford University (Advisor: Prof. E. S. G. Shaqfeh).
- Raghavendra Devendra, Chemical & Biomolecular Engineering, 2006-2012.
- Sumedh Risbud, Chemical & Biomolecular Engineering, 2008-Present.
Expected graduation: Summer 2013.
- Christian Pick, Chemical & Biomolecular Engineering, 2008-Present.
Primary Advisor: Prof. Frechette (Chemical & Biomolecular Engineering)
Expected graduation: Summer 2013.

M. S. E. Students @ Rutgers University

- Mingliang Jang, Mechanical and Aerospace Engineering, 2012-Present.

M. S. E. Students @ Johns Hopkins University

- Timothy J. Bowman, Chemical & Biomolecular Engineering, 2012-Present.
co-advised with Prof. Frechette (Chemical & Biomolecular Engineering)
- Manuel Balvin, Chemical & Biomolecular Engineering, 2006-2008.
Thesis: "Separations via Directional Locking in Deterministic Hydrodynamics"
co-advised with Prof. Frechette (Chemical & Biomolecular Engineering)
Current Position: Electronics Engineer at NASA Goddard Space Flight Center.

Undergraduate Students

- W. Herrick, Chemical & Biomolecular Engineering, 2006-2008.
Current Position: Graduate student, Chemical Engineering, University of Massachusetts.
- J. Herrmann, Chemical & Biomolecular Engineering, 2006-2008.
co-advised with Prof. Karweit (Chemical & Biomolecular Engineering)
First author in publication #16.
Current Position: Engineer, Novatech.
- Y-C. Chuang, Chemical & Biomolecular Engineering, 2006-2009.
Current Position:
Graduate student, Chemical & Biomolecular Engineering, University of Pennsylvania.
- J. Zhao, Chemical & Biomolecular Engineering, 2006-2007.
- P. Chandrasekhar, Mechanical Engineering, 2007.
- C. Riche, Chemical & Biomolecular Engineering, 2007-2010.
Current Position: Graduate student, Chemical Engineering and Materials Science,
University of Southern California.
- D. Tonkinson, Chemical & Biomolecular Engineering, 2008.
- M. Wang, Chemical & Biomolecular Engineering, 2008-2009.
- S. Sohn, Chemical & Biomolecular Engineering, 2008-2010.
co-advised with Prof. Frechette (Chemical & Biomolecular Engineering).
- K. Dockeney, Chemical & Biomolecular Engineering, 2009-2010.
co-advised with Prof. Frechette (Chemical & Biomolecular Engineering).
- F. Sweeney, Chemical & Biomolecular Engineering, 2009-2010.
co-advised with Prof. Frechette (Chemical & Biomolecular Engineering)
- M. Gardner, Chemical & Biomolecular Engineering, Spring 2011.
co-advised with Prof. Frechette (Chemical & Biomolecular Engineering).
- C. Hudson, Chemical & Biomolecular Engineering, 2011.
- R. Passaro, Chemical & Biomolecular Engineering, 2011-2012.
- T. C. Feng, Chemical & Biomolecular Engineering, 2011-Present.
- N. Flower, Chemical & Biomolecular Engineering, 2011-Present.
co-advised with Prof. Leheny (Physics and Astronomy).

- N. Seelam, Chemical & Biomolecular Engineering, 2012-Present.
co-advised with Prof. Frechette (Chemical & Biomolecular Engineering).
- Siqi Du, Department of Mechanical Engineering, Tsinghua University, Summer 2012.

Visiting Undergraduate Students

- A. Irungu, University of Maryland Baltimore County.
NanoBioTech REU Program (REU @ INBT); Summer 2010.
- Q. Smith, University of New Mexico,
NanoBioTech REU Program (REU @ INBT); Summer 2010.
co-advised with Prof. Gerecht (Chemical & Biomolecular Engineering).

High-School Students:

- Gerardo Camarena-Gomez, Baltimore Polytechnic Institute (Fall 2011-Spring 2012).
- M. Ekey, Baltimore Polytechnic Institute (Fall 2010-Spring 2011).
- E. Gutierrez, Baltimore Polytechnic Institute (Fall 2008-Spring 2009).
- E. Andino, Baltimore Polytechnic Institute (Fall 2007-Spring 2008).
- Y. Chung, WISE Student, Garrison Forest High School (Fall 2007).
- C. Fitzpatrick, WISE Student, Garrison Forest High School (Fall 2006-Spring 2007).

Awards granted to graduate and undergraduate students in the lab:

T. Bowman	2012 Elenora Streb Muly award for Undergraduate Research.
S. Sohn	2010 Technological Fellowship from Center Educational Resources, JHU. "Lab-on-a-chip Simulation"
	2010 Elenora Streb Muly award for Undergraduate Research.
K. Dockeney	2010 Elenora Streb Muly award for Undergraduate Research.
J. Bernate	2009 George M. L. Sommerman Engineering Graduate Teaching Assistant Award for outstanding performance as a teaching assistant.
C. Riche	2009 Provost's Undergraduate Research Award.
Y-C. Chuang	2008 Provost's Undergraduate Research Award.
J. Herrmann	2007 Technological Fellowship from Center Educational Resources, JHU. "Illustrating Transport Phenomena with Flash Animation".