

# Curriculum Vitae

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## Education

- May 2010 **PhD** in Applied Mathematics, Brown University, USA  
*Advisors:* George E. Karniadakis & Bruce Caswell  
Thesis: Multiscale Modeling of Blood Flow and Soft Matter
- May 2007 **Master of Science** in Applied Mathematics, Brown University, USA  
*Advisors:* George E. Karniadakis & Bruce Caswell
- Aug 2004 **Master of Science** in Aerospace Engineering, **Minor** in High Performance Computing, Pennsylvania State University, USA  
*Advisor:* Deborah A. Levin
- June 2002 **Bachelor of Science** in Mathematics, **Minor** in Computer Science, Novosibirsk State University, Russia

## Research experience

- Feb 2010 - present Postdoc, Institute of Complex Systems, Forschungszentrum Juelich, Supervisor: Gerhard Gompper
- Sep 2004 - Jan 2010 Research Assistant, Division of Applied Mathematics, Brown University, Advisors: George E. Karniadakis & Bruce Caswell
- Sep 2002 - Aug 2004 Research Assistant, Department of Aerospace Engineering, Pennsylvania State University, Advisor: Deborah A. Levin

## Awards and fellowships

- Mar 2011 2011 Nicholas Metropolis Award for Outstanding Doctoral Thesis Work in Computational Physics
- Mar 2011 - Feb 2013 Humboldt Research Fellowship for Postdoctoral Researchers
- May 2010 The David Gottlieb Memorial Award 2010, excellence in graduate study, Brown University
- Sep 2009 - Jan 2010 Simon Ostrach fellowship, Brown University
- Sep 2004 - May 2005 Academic fellowship, Brown University

## Teaching experience

- Jan 2009 - May 2009 Teaching Assistant, Division of Applied Mathematics,  
Brown University, Course: Introduction to Computing Sciences
- Sep 2008 - Dec 2008 Teaching Assistant, Division of Applied Mathematics,  
Brown University, Course: Statistical Inference I
- Jan 2007 - May 2007 Teaching Assistant, Division of Applied Mathematics,  
Brown University, Course: Methods of Applied Mathematics I
- Sep 2005 - May 2006 Mathematics Resource Center Tutor, Department of Mathematics,  
Brown University

## Publications

### Articles in peer-reviewed journals

1. D. A. Fedosov, W. Pan, B. Caswell, G. Gompper, and G. E. Karniadakis. Predicting human blood viscosity in silico. *Proceedings of the National Academy of Sciences USA*, submitted, 2011.
2. X. Shi, G. Lin, J. Zou, and D. A. Fedosov. A lattice Boltzmann fictitious domain method for modeling red blood cell deformation in flow. *Journal of Biomechanics*, submitted, 2011.
3. D. A. Fedosov, H. Lei, B. Caswell, S. Suresh, and G. E. Karniadakis. Multiscale modeling of red blood cell mechanics and blood flow in malaria. *PLoS Computational Biology*, submitted, 2011.
4. D. A. Fedosov, B. Caswell, and G. E. Karniadakis. A wall-shear-stress based model for adhesive dynamics of red blood cells in malaria. *Biophysical Journal*, submitted, 2011.
5. W. Pan, D. A. Fedosov, B. Caswell, and G. E. Karniadakis. Predicting dynamics and rheology of blood flow: A comparative study of multiscale and low-dimensional models of red blood cells. *Microvascular Research*, submitted, 2011.
6. H. Lei, D. A. Fedosov, and G. E. Karniadakis. Time-dependent and outflow boundary conditions for Dissipative Particle Dynamics. *Journal of Computational Physics*, in press, 2011.
7. D. A. Fedosov, B. Caswell, S. Suresh, and G. E. Karniadakis. Quantifying the biophysical characteristics of Plasmodium-falciparum-parasitized red blood cells in microcirculation. *Proceedings of the National Academy of Sciences USA*, 108, 35-39, 2011.
8. D. A. Fedosov, B. Caswell, A. S. Popel, and G. E. Karniadakis. Blood flow and cell-free layer in microvessels. *Microcirculation*, 17, 615-628, 2010.

9. D. A. Fedosov, B. Caswell, and G. E. Karniadakis. A multiscale red blood cell model with accurate mechanics, rheology, and dynamics. *Biophysical Journal*, 98(10), 2215-2225, 2010.
10. D. A. Fedosov, B. Caswell, and G. E. Karniadakis. Systematic coarse-graining of spectrin-level red blood cell models. *Computer Methods in Applied Mechanics and Engineering*, 199, 1937-1948, 2010.
11. D. A. Fedosov, B. Caswell, and G. E. Karniadakis. Steady shear rheometry of dissipative particle dynamics models of polymer fluids in reverse Poiseuille flow. *Journal of Chemical Physics*, 132(14), 144103, 2010.
12. D. A. Fedosov and G. E. Karniadakis. Triple-decker: Interfacing atomistic-mesoscopic-continuum flow regimes. *Journal of Computational Physics*, 228(4), 1157-1171, 2009.
13. W. Pan, D. A. Fedosov, B. Caswell, and G. E. Karniadakis. Hydrodynamic interactions for single dissipative-particle-dynamics particles and their clusters and filaments. *Physical Review E*, 78(4), 046706, 2008.
14. D. A. Fedosov, B. Caswell, and G. E. Karniadakis. Dissipative particle dynamics simulation of depletion layer and polymer migration in micro- and nanochannels for dilute polymer solutions. *Journal of Chemical Physics*, 128(14), 144903, 2008. Selected for publication in *Virtual Journal of Nanoscale Science & Technology*, 17(17), April 28 2008.
15. D. A. Fedosov, I. V. Pivkin, and G. E. Karniadakis. Velocity limit in DPD simulations of wall-bounded flows. *Journal of Computational Physics*, 227(4), 2540-2559, 2008.
16. A. A. Alexeenko, D. A. Fedosov, D. A. Levin, S. F. Gimelshein, and R. J. Collins. Transient heat transfer and gas flow in a MEMS-based thruster. *Journal of Microelectromechanical Systems*, 15(1), 181-194, 2006.
17. A. A. Alexeenko, D. A. Fedosov, D. A. Levin, S. F. Gimelshein, and R. J. Collins. Performance analysis of microthrusters based on coupled thermal-fluid modeling and simulation. *Journal of Propulsion and Power*, 21(1), 95-101, 2005.
18. T. Ozawa, D. A. Fedosov, D. A. Levin, and S. F. Gimelshein. Quasi-classical trajectory modeling of OH production in direct simulation Monte Carlo. *Journal of Thermophysics and Heat Transfer*, 19(2), 235-244, 2005.

## Book chapters

1. D. A. Fedosov, I. V. Pivkin, W. Pan, M. Dao, B. Caswell, and G. E. Karniadakis. Multiscale modeling of hematologic disorders. In *Modelling of physiological flows* edited by D. Ambrosi, A. Quarteroni, and G. Rozza, Springer, in press, 2011.
2. D. A. Fedosov. Blood cells and blood flow. Lecture manuscript of the 42nd IFF Spring School organized by J. K. G. Dhont, G. Gompper, P. Lang, D. Richter, M. Ripoll, D. Willbold, and R. Zorn, Juelich, Germany, 2011.

3. D. A. Fedosov, B. Caswell, and G. E. Karniadakis. Dissipative particle dynamics modeling of red blood cells. In *Computational Hydrodynamics of Capsules and Biological Cells* edited by C. Pozrikidis, CRC Press, Inc., Boca Raton, FL, 2010.

### Articles in conference proceedings

1. D. A. Fedosov, B. Caswell, and G. E. Karniadakis. Multiscale modeling of blood flow in cerebral malaria. *Proceedings of ASME 2010 First Global Congress on NanoEngineering for Medicine and Biology*, NEMB, 2010.
2. D. A. Fedosov, B. Caswell, and G. E. Karniadakis. Coarse-grained red blood cell model with accurate mechanical properties, rheology and dynamics. *Proceedings of the Engineering in Medicine and Biology Society, EMBC, 2009 Annual International Conference of the IEEE*, 2009.
3. D. A. Fedosov, B. Caswell, and G. E. Karniadakis. Dissipative particle dynamics simulation of polymer- and cell-wall depletion in micro-channels. *Proceedings of the XV International Congress on Rheology: The Society of Rheology 80th Annual Meeting*, AIP Conference Proceedings, 1027(1), 612-614, 2008.
4. D. A. Fedosov, B. Caswell, and G. E. Karniadakis. Reverse Poiseuille flow: The numerical viscometer. *Proceedings of the XV International Congress on Rheology: The Society of Rheology 80th Annual Meeting*, AIP Conference Proceedings, 1027(1), 1432-1434, 2008.
5. D. A. Fedosov, S. V. Rogazinsky, M. I. Zeifman, M. S. Ivanov, A. A. Alexeenko, and D. A. Levin. Analysis of numerical errors in the DSMC method. *Proceedings of the Rarefied Gas Dynamics: 24th International Symposium on Rarefied Gas Dynamics*, AIP Conference Proceedings, 762(1), 589-594, 2005.
6. T. Ozawa, D. A. Fedosov, and D. A. Levin. Modeling of OH product distributions using QCT-MD and BL models in a bow shock. *Proceedings of the Rarefied Gas Dynamics: 24th International Symposium on Rarefied Gas Dynamics*, AIP Conference Proceedings, 762(1), 902-907, 2005.
7. T. Ozawa, D. A. Fedosov, D. A. Levin, and S. F. Gimelshein. Use of quasi-classical trajectory methods in the modeling of OH production mechanisms in DSMC. *42nd AIAA Aerospace Sciences Meeting*, AIAA Paper 2004-0336, 2004.
8. A. A. Alexeenko, D. A. Levin, D. A. Fedosov, S. F. Gimelshein, and R. J. Collins. Coupled thermal-fluid modeling of micronozzles for performance analysis. *39th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, AIAA Paper 2003-4717, 2003.
9. A. A. Alexeenko, D. A. Levin, D. A. Fedosov, S. F. Gimelshein, R. J. Collins. Coupled thermal-fluid analyses of microthruster flows. *41st Aerospace Sciences Meeting and Exhibit*, AIAA Paper 2003-0673, 2003.

## Research interests

- rheology and dynamics of complex and biological fluids and suspensions
- mesoscopic simulations of complex fluids and biological systems
- red blood cells and blood flow modeling in health and disease
- multiscale modeling bridging atomistic-mesoscopic-continuum scales
- numerical rheometry
- mesoscopic methods (e.g., Dissipative Particle Dynamics)
- high-performance computing

## Reviews for

- Biophysical Journal
- Journal of Computational Physics
- Journal of Microfluidics and Nanofluidics
- Journal of Macromolecules

## Professional memberships

2009 - present	Member of the American Physical Society
2009 - 2010	Member of the Engineering in Medicine and Biology Society
2009 - 2010	Member of the Institute of Electrical and Electronics Engineers
2008 - 2010	Member of the Society for Industrial and Applied Mathematics
2004 - 2010	Member of the American Mathematical Society
2006 - 2010	Member of the Society of Rheology
2002 - 2004	Member of the American Institute of Aeronautics and Astronautics

## References

1. Prof. Gerhard Gompper, Institute of Complex Systems, ICS-2, Forschungszentrum Juelich, 52425 Juelich, Germany, tel: +49(2461)61-4012, email: g.gompper@fz-juelich.de.
2. Prof. George E. Karniadakis, Division of Applied Mathematics, Brown University, 182 George Street, Providence, RI 02914, tel: +1(401)863-1217, email: gk@dam.brown.edu.
3. Prof. Bruce Caswell, Division of Engineering, Brown University, 182 Hope Street, Providence, RI 02914, tel: +1(401)863-1448, email: caswell@cfm.brown.edu.

## Conferences

1. APS March Meeting 2011, Dallas, TX, March 2011, presentation "*Nicholas Metropolis Award Talk for Outstanding Doctoral Thesis Work in Computational Physics: Computational biophysics and multiscale modeling of blood cells and blood flow in health and disease*".
2. 75th Annual Meeting of the DPG and DPG Spring Meeting, Dresden, Germany, March 2011, presentation "*Blood flow and blood cell interactions and migration in microvessels*".
3. 42nd IFF Spring School, Juelich, Germany, February 2011, lecture "*Blood cells and blood flow*".
4. 63rd Annual Meeting of the APS Division of Fluid Dynamics, Long Beach CA, November 2010, presentations "*Blood flow and blood cell interactions and migration in microvessels*", "*A comparison of multi-scale and low-dimensional models of red blood cells*", "*Effects of fibrinogen on RBC aggregation and rouleux formation*", and "*Occlusion of small vessels by malaria-infected red blood cells*".
5. International Soft Matter Conference 2010, Granada Spain, July 2010, presentation "*Blood flow and blood cell interactions and migration in microcirculation*".
6. CECAM workshop on trends in computational hemodynamics, Lausanne Switzerland, May 2010.
7. 62nd Annual Meeting of the APS Division of Fluid Dynamics, Minneapolis MN, November 2009, presentation "*Multiscale modeling of blood flow in cerebral malaria*".
8. 81st Annual Meeting of The Society of Rheology, Madison WI, October 2009, presentation "*A numerical simulation study of rheology and dynamics of healthy red blood cells and parasitized by Plasmodium falciparum*".
9. 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Minneapolis MN, September 2009, presentation "*Coarse-grained red blood cell model with accurate mechanical properties, rheology and dynamics*".
10. Fifth International Workshop on Meshfree Methods for Partial Differential Equations, Bonn Germany, August 2009, presentation "*Triple-decker: Interfacing atomistic-mesosopic-continuum flow regimes*".
11. 10th US National Congress on Computational Mechanics, Columbus OH, July 2009, presentation "*Multiscale modeling of blood flow in cerebral malaria*".
12. SIAM Conference on Computational Science and Engineering, Miami FL, March 2009, presentations "*Multiscale modeling in complex fluids and soft matter*" and "*Unsteady 3D flow simulations in cranial arterial tree*".

13. SIAM Conference on the Life Sciences, Montreal, QC Canada, August 2008, presentation "*Triple-decker: Interfacing atomistic-mesosopic-continuum flow regimes in biological fluids*" and poster "*A stochastic molecular dynamics method for multiscale modeling of blood platelet phenomena*".
14. Meeting of Society of Rheology, Salt Lake City UT, October 2007, presentation "*DPD simulation of depletion layer and polymer migration in micro- and nanochannels for dilute polymer solutions*".
15. 5th Annual Workshop on Charm++ and its Applications, Parallel Programming Lab, University of Illinois at Urbana-Champaign, April 2007.
16. Meeting of Society of Rheology, Portland ME, October 2006.
17. 3rd International Conference for Mesoscopic Methods in Engineering and Science, Hampton VA, July 2006, presentation "*Reynolds number limit in DPD simulations of wall-bounded flows*".