

Aleksandar Donev

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Education and Degrees

- September 2006* **Princeton University**, Princeton, NJ
Ph.D., Program in Applied and Computational Mathematics
Dissertation title: *Jammed Packings of Hard Particles*
Advisor: Professor Salvatore Torquato, Chemistry Department
Received the 2005/2006 *Ray Grimm Memorial Prize in Computational Physics*
- May 2001* **Michigan State University**, East Lansing, MI
Bachelor of Science, Physics
Honors (GPA 4.0), with one semester of graduate Teaching Assistant fellowship

Work and Research Experience

- August 2010 - present*
Assistant Professor of Mathematics, New York University, New York, NY
Courant Institute of Mathematical Sciences
Teaching: Graduate level Numerical Methods, Scientific Computing, seminar on Coarse-Grained Models of Materials
Research: Fluctuating hydrodynamics [37, 36, 35, 34]
Funding: NSF Division of Mathematical Sciences
- August 2009 - July 2010*
Luis W. Alvarez Postdoctoral Fellow, Lawrence Berkeley National Laboratory, Berkeley, CA
Center for Computational Sciences and Engineering (<https://ccse.lbl.gov>)
Supervisor: Dr. John Bell
Research project: Particle, continuum and hybrid algorithms for fluctuating hydrodynamics [33, 31, 28]
- August 2006 - July 2009*
Distinguished Lawrence Postdoctoral Fellow, Lawrence Livermore National Laboratory, Livermore, CA
High Performance Computational Materials Science and Chemistry Group
Supervisors: Dr. Vasily Bulatov and Dr. Berni Alder
Research projects: Irradiation damage in metals and alloys [32, 29], Hydrodynamics of polymer chains in solution [26, 27, 30], Parallel event-driven Kinetic Monte Carlo algorithms [25]
- September 2001 - June 2006*
Graduate Assistant in Research, Princeton University, Princeton, NJ
Princeton Institute for the Science and Technology of Materials
Advisor: Professor Salvatore Torquato, Chemistry Department
Research projects: Jammed packings of hard particles (primary) [20, 24, 10, 5, 15, 8, 16, 18, 13, 23, 22, 7, 14, 9, 11, 21, 19], Design of multifunctional materials via topology optimization (secondary) [4, 17, 6, 12, 3]

September 1999 - August 2001

Research and Teaching Assistant, Michigan State University, East Lansing, MI
Condensed Matter Theory, Department of Physics and Astronomy
Advisor: Professor Phillip M. Duxbury, Department of Physics and Astronomy
Research project: Convex network optimization for grain-boundary materials [2, 1]
Duties: Teaching assistant for Physics Computations and Computational Physics

Professional Activities

- Mentor** Mentored research projects of undergraduate students Josh Burton (won Senior Thesis Prize, Princeton University, 2005) and Jack Amadeo (S.U.R.E. summer program, Courant, Sumer 2011), as well as graduate students Monica Skoge (Princeton, 2005), Anton de la Fuente (Lawrence Berkeley Labs, 2010), Florencio Balboa (visitor, Courant, 2011). Supervising several master thesis projects and Ph.D. thesis research of Steven Delong and co-advising Thomas Fai at Courant (ongoing).
- Reviewer** Reviewed more than 75 research articles submitted to *Physical Review* and *J. Computational Physics*, and other international journals.
- Fortran Committee** Participated actively in the development of revisions of the Fortran programming language (Fortran 2003, Fortran 2008) as a member of the J3 Fortran committee since 2002.

Selected Conference Participation

- **CCP2011**, invited talk at the Conference on Computational Physics, Gatlinburg, Tennessee, October 30th – November 3rd, 2011.
- **Invited talk**, workshop on Multiscale Modeling of Simple and Complex Liquid Flow Using Particle-Continuum Hybrids, ZCAM, Zaragoza, Spain, October 5th-7th, 2011.
- **DSFD2011**, 20th International Conference on Discrete Simulation of Fluid Dynamics, Fargo, August 8-12, 2011
Invited talk on *Numerical Methods for Fluctuating Hydrodynamics*
- **ICIAM2011**, Congress on Industrial and Applied Mathematics, July 18 – 22, 2011, Vancouver, BC, Canada
Organized a minisymposium on *Fluctuating Hydrodynamics: Fluid Mechanics at Small Scales* and
Invited presentation in symposium on *Computational Modeling of Multiscale Systems*.
- **Plenary speaker**, AMS von Neumann Symposium on Multimodel and Multialgorithm Coupling for Multiscale Problems, July 4 - 7, 2011 Snowbird, Utah, USA
A Hybrid Particle-Continuum Method Coupling a Fluctuating Fluid with Suspended Structures
- **Keynote presentation**, XXVI Inter University Seminar on Mathematical Sciences Research (SIDIM), University of Puerto Rico at Humacao, February 25, 2011
A Hybrid Particle-Continuum Approach to Hydrodynamics at Small Scales
- **Invited talk**, workshop on *Multiscale simulation of heterogeneous materials and coupling of thermodynamic models* at the Thermotechnical Institute at K. U. Leuven, Belgium, from January 12-14th, 2011.
- **MS10**, SIAM Meeting on Mathematical Aspects of Materials Science, Philadelphia, PA, May 23-26, 2010
Organized a two-session minisymposium on *Coarse-Grained Stochastic Models in Soft Condensed Matter*.
- **Invited participation**, workshop on Numerical Analysis of Multiscale Computations at the Banff International Research Station in Banff Canada from December 6th-11th, 2009, as well as workshop on Computational Multiscale Methods at the Mathematisches Forschungsinstitut Oberwolfach, Germany, June 14th - June 20th, 2009.
- **CSE09**, SIAM Conference on Computational Science and Engineering, Miami, FL, March 2-6, 2009
Organized a three-session minisymposium on *Multiscale Methods for Hydrodynamics at the Micro and Nano-Scales*.
- **AMS09**, special session on Scientific Computing and Advanced Computing
AMS Joint Math Meetings in Washington, DC, January 8th, 2009
Asynchronous Event-Driven Particle Algorithms in Computational Materials Science

Publications

- [1] A. Donev, J. Rockwell, and D. ben Avraham. Generalized von smoluchowski model of reaction rates, with reacting particles and a mobile trap. *J. Stat. Phys.*, 95(1-2):97–112, 1999.
- [2] A. Donev, C. E. Musolff, and P. M. Duxbury. Random manifolds in non-linear resistor networks: applications to varistors and superconductors. *J. Phys. A: Math. Gen.*, 35:L327–L333, 2002.
- [3] S. Torquato, S. Hyun, and A. Donev. Multifunctional optimal composite microstructures: Simultaneous transport of heat and electricity. *Phys. Rev. Lett.*, 89(26):266601, 2002.
- [4] A. Donev and S. Torquato. Energy-Efficient Actuation in Infinite Lattice Structures. *J. Mech. Phys. Solids*, 51(8):1459–1475, 2003.
- [5] S. Torquato, A. Donev, and F. H. Stillinger. Breakdown of Elasticity Theory for Jammed Hard-Particle Packings: Conical Nonlinear Constitutive Theory. *Int. J. Solids Structures*, 40(25):7143 – 7153, 2003.
- [6] S. Torquato, S. Hyun, and A. Donev. Optimal design of manufacturable three-dimensional composites with multifunctional characteristics. *J. Appl. Phys.*, 94(9):5748–5755, 2003.
- [7] A. Donev, I. Cisse, D. Sachs, E. A. Variano, F. H. Stillinger, R. Connelly, S. Torquato, and P. M. Chaikin. Improving the Density of Jammed Disordered Packings using Ellipsoids. *Science*, 303:990–993, 2004.
- [8] A. Donev, F. H. Stillinger, P. M. Chaikin, and S. Torquato. Unusually Dense Crystal Packings of Ellipsoids. *Phys. Rev. Lett.*, 92:255506, 2004.
- [9] A. Donev, S. Torquato, F. H. Stillinger, and R. Connelly. A Linear Programming Algorithm to Test for Jamming in Hard-Sphere Packings. *J. Comp. Phys.*, 197(1):139–166, 2004.
- [10] A. Donev, S. Torquato, F. H. Stillinger, and R. Connelly. Comment on "Jamming at zero temperature and zero applied stress: The epitome of disorder". *Phys. Rev. E*, 70:043301, 2004.
- [11] A. Donev, S. Torquato, F. H. Stillinger, and R. Connelly. Jamming in Hard Sphere and Disk Packings. *J. App. Phys.*, 95(3):989, 2004.
- [12] S. Torquato and A. Donev. Minimal surfaces and multifunctionality. *Proc. Royal Soc. London*, 460(2047):1849 – 1856, 2004.
- [13] A. Donev, S. Torquato, and F. H. Stillinger. Neighbor List Collision-Driven Molecular Dynamics Simulation for Nonspherical Particles: I. Algorithmic Details II. Applications to Ellipses and Ellipsoids. *J. Comp. Phys.*, 202(2):737–764, 765–793, 2005.
- [14] A. Donev, S. Torquato, and F. H. Stillinger. Pair Correlation Function Characteristics of Nearly Jammed Disordered and Ordered Hard-Sphere Packings. *Phys. Rev. E*, 71:011105, 2005.
- [15] A. Donev, S. Torquato, and F. H. Stillinger. Unexpected Density Fluctuations in Jammed Disordered Sphere Packings. *Phys. Rev. Lett.*, 95(9):090604, 2005.
- [16] W. Man, A. Donev, F. H. Stillinger, M. Sullivan, William B. Russel, D. Heeger, S. Inati, S. Torquato, and P. M. Chaikin. Experiments on Random Packing of Ellipsoids. *Phys. Rev. Lett.*, 94:198001, 2005.
- [17] S. Torquato, A. Donev, A. G. Evans, and C. J. Brinker. Manufacturable extremal low-dielectric, high-stiffness porous materials. *J. Appl. Phys.*, 97:124103, 2005.
- [18] P. M. Chaikin, A. Donev, W. Man, F. H. Stillinger, and S. Torquato. Some Observations on the Random Packing of Hard Ellipsoids. *Ind. Eng. Chem. Res.*, 45(21):6960–6965, 2006.

- [19] A. Donev, J. Burton, F. H. Stillinger, and S. Torquato. Tetratic Order in the Phase Behavior of a Hard-Rectangle System. *Phys. Rev. B*, 73:054109, 2006.
- [20] A. Donev, F. H. Stillinger, and S. Torquato. Do Binary Hard Disks Exhibit an Ideal Glass Transition? *Phys. Rev. Lett.*, 96(22):225502, 2006.
- [21] M. Skoge, A. Donev, F. H. Stillinger, and S. Torquato. Packing Hyperspheres in High-Dimensional Euclidean Spaces. *Phys. Rev. E*, 74:041127, 2006.
- [22] A. Donev, R. Connelly, F. H. Stillinger, and S. Torquato. Underconstrained Jammed Packings of Hard Ellipsoids. *Phys. Rev. E*, 75:051304, 2007.
- [23] A. Donev, F. H. Stillinger, and S. Torquato. Calculating the Free Energy of Nearly Jammed Hard-Particle Packings Using Molecular Dynamics. *J. Comp. Phys.*, 225:509–527, 2007.
- [24] A. Donev, F. H. Stillinger, and S. Torquato. Configurational Entropy of Binary Hard-Disk Glasses: Nonexistence of an Ideal Glass Transition. *J. Chem. Phys.*, 127:124509, 2007.
- [25] A. Donev. Asynchronous event-driven particle algorithms. *SIMULATION: Transactions of The Society for Modeling and Simulation International*, 85(4):229–242, 2008.
- [26] A. Donev, A. L. Garcia, and B. J. Alder. Stochastic Event-Driven Molecular Dynamics. *J. Comp. Phys.*, 227(4):2644–2665, 2008.
- [27] A. Donev, A. L. Garcia, and B. J. Alder. Stochastic Hard-Sphere Dynamics for Hydrodynamics of Non-Ideal Fluids. *Phys. Rev. Lett.*, 101:075902, 2008.
- [28] A. Donev, A. L. Garcia, and B. J. Alder. A Thermodynamically-Consistent Non-Ideal Stochastic Hard-Sphere Fluid. *J. of Statistical Mechanics: Theory and Experiment*, 2009(11):P11008, 2009.
- [29] T. Oettel, V. V. Bulatov, A. Donev, M. H. Kalos, G. H. Gilmer, and B. Sadigh. First-Passage Kinetic Monte Carlo Method. *Phys. Rev. E*, 80(6):066701, 2009. [arXiv:0905.3575](https://arxiv.org/abs/0905.3575).
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- [31] A. Donev, J. B. Bell, A. L. Garcia, and B. J. Alder. A hybrid particle-continuum method for hydrodynamics of complex fluids. *SIAM J. Multiscale Modeling and Simulation*, 8(3):871–911, 2010.
- [32] A. Donev, V. V. Bulatov, T. Oettel, G. H. Gilmer, B. Sadigh, and M. H. Kalos. A First-Passage Kinetic Monte Carlo Algorithm for Complex Diffusion-Reaction Systems. *J. Comp. Phys.*, 229(9):3214–3236, 2010. [arXiv:0905.3576](https://arxiv.org/abs/0905.3576).
- [33] A. Donev, E. Vanden-Eijnden, A. L. Garcia, and J. B. Bell. On the Accuracy of Explicit Finite-Volume Schemes for Fluctuating Hydrodynamics. *CAMCOS*, 5(2):149–197, 2010.
- [34] A. Donev, A. L. Garcia, Anton de la Fuente, and J. B. Bell. Diffusive Transport by Thermal Velocity Fluctuations. *Phys. Rev. Lett.*, 106(20):204501, 2011.
- [35] A. Donev, A. L. Garcia, Anton de la Fuente, and J. B. Bell. Enhancement of Diffusive Transport by Nonequilibrium Thermal Fluctuations. *J. of Statistical Mechanics: Theory and Experiment*, 2011:P06014, 2011.
- [36] F. Balboa Usabiaga, J. Bell, R. Delgado-Buscalioni, A. Donev, T. Fai, B. E. Griffith, and C. S. Peskin. Staggered Schemes for Incompressible Fluctuating Hydrodynamics. Submitted to *J. Comp. Phys.*, 2011.
- [37] A. Donev and E. Vanden-Eijnden. Temporal Integrators for Fluctuating Hydrodynamics. In preparation, 2012.