

Nikolaos K. Voulgarakis

Education

- Ph.D. Physics, University of Crete, Department of Physics, Greece. “*Nonlinear Localization in Model Systems and Materials,*” Advisor: Professor George P. Tsironis, 2003
- M.S. Condensed Matter Physics, University of Crete, Department of Physics, Greece, 2001
- B.Sc. Physics, University of Crete, Department of Physics, Greece, 1998

Professional Experience

- 2012-present Assistant Professor, Department of Mathematics, Washington State University, Tri-Cities
- 2007-2012 Postdoctoral Research, Department of Chemical Engineering, University of California, Berkeley
- 2005-2007 Postdoctoral Research, Center for Nonlinear Studies, Los Alamos National Laboratory
- 2003-2005 Visiting Lecturer, Department of Physics, University of Crete, Greece

Awards and Honors

- National Scholarship Foundation Award for outstanding performance in the first year of the graduate program, 1999
- University of Crete Award for outstanding performance in the second year of the graduate program, 2001
- Full time scholarship from the Institute of Electronic Structure and Laser (I.E.S.L) of the Foundation for Research and Technology-Hellas (FO.R.T.H) and the University of Crete for postgraduate and Ph.D. studies, 1998-2003

Research Interests

- Numerical Analysis
- Multiphysics/Multiscale Modeling
- Stochastic Processes
- Molecular and Fluid Dynamics
- Nonlinear Dynamics

Application areas include:

- Fluid-structure interaction
- Gene and drug Delivery
- Complex fluids

- Cell dynamics
- Localization and coherent transfer of energy in biomolecules

Publications (* denotes undergraduates as co-authors)

“Fluctuating hydrodynamics for multiscale modeling and simulation: Energy and heat transfer in molecular fluids,” B. Shang, N. K. Voulgarakis, and J-W. Chu, J. Chem. Phys., **137**, 044117 (2012)

“Fluctuating Hydrodynamics for Multiscale Simulation of Inhomogeneous Fluids - Mapping All-Atom Molecular Dynamics to Capillary Waves,” B. Shang, N. K. Voulgarakis, and J-W. Chu, J. Chem. Phys., **135**, 044111 (2011)

“Modeling the Viscoelasticity and Thermal Fluctuations of Fluids at the Nanoscale,” N. K. Voulgarakis, S. Satish*, and J-W. Chu, Molecular Simulation, **131**, 552 (2010)

“Dendrimers as Gene Delivery Vectors: Cell Membrane Attachment,” N. K. Voulgarakis, K. Ø. Rasmussen, P. M. Welch, J. Chem. Phys. **130**, 155101 (2009)

“Modeling the Nanoscale Viscoelasticity of Fluids by Bridging non Markovian Fluctuating Hydrodynamics and Molecular Dynamics Simulations,” N. K. Voulgarakis, S. Satish*, and J-W. Chu, J. Chem. Phys, **131**, 234115 (2009)

“Bridging Fluctuating Hydrodynamics and Molecular Dynamics Simulations of Fluids,” N. K. Voulgarakis and J.-W. Chu, J. Chem. Phys, **130**, 134111 (2009)

“Ares et al. Reply,” S. Ares; N. K. Voulgarakis, K. O. Rasmussen, and A. R. Bishop, Phys. Rev. Lett., **102**, 029602 (2009)

“Pre-melting Dynamics of DNA and its Relation to Specific Functions,” B. Alexandrov, N. K. Voulgarakis, K. Ø. Rasmussen, A. Usheva, and A. R. Bishop, J. Phys.: Condens. Matter, **21**, 034107 (2009)

“Opening Rates of DNA Hairpins: Experiment and Model,” J. Hanne, G. Zocchi, N. K. Voulgarakis, A. R. Bishop, and K. Ø. Rasmussen, Phys. Rev. E **76**, 011909 (2007)

“Sequencing DNA by dynamic Force Spectroscopy: Limitations and prospects,” N. K. Voulgarakis, A. Redondo, A. R. Bishop, and K. Ø. Rasmussen, Nano Lett., **6**, 1483 (2006)

“Probing the Mechanical Unzipping of DNA,” N. K. Voulgarakis, A. Redondo, A. R. Bishop, and K. Ø. Rasmussen, Phys. Rev. Lett., **96**, 248101 (2006)

“Bubble Nucleation and Cooperativity in DNA melting,” S. Ares, N. K. Voulgarakis, K. Ø. Rasmussen, and A. R. Bishop, *Phys. Rev. Lett.*, **94**, 035504 (2005)

“Temperature-Dependent Signatures of Coherent Vibrational Openings in DNA,” N. K. Voulgarakis, G. Kalosakas, K. Ø. Rasmussen, and A. R. Bishop, *Nano Lett.*, **4**(4), 629 (2004)

“Computational Investigation of Intrinsic Localization in Crystalline Si,” N. K. Voulgarakis, G. Hadjisavvas, P. C. Kelires, and G. P. Tsironis, *Phys. Rev. B*, **69**, 113201 (2004)

“Thermally Induced Coherent Vibrations in DNA,” K. Ø. Rasmussen, G. Kalosakas, N. K. Voulgarakis, A. R. Bishop, C. H. Choi, and A. Usheva, *Proceedings of SPIE - The International Society for Optical Engineering*, **5467**, 235 (2004)

“Polaronic Electron Transfer in β -sheet Protein Models,” N. K. Voulgarakis, D. Hennig, H. Gabriel, and G. P. Tsironis, *J. Phys.: Condens. Matter*, **13**, 9821 (2001)

“Multiquanta Breather Model for PtCl,” N. K. Voulgarakis, G. Kalosakas, A. R. Bishop, and G. P. Tsironis, *Phys. Rev. B*, **64**, R020301, (2001)

“Stationary and Dynamical Properties of Polarons in the Anharmonic Holstein Model,” N. K. Voulgarakis and Tsironis, *Phys. Rev. B*; **63**, 014302 (2001)

“Energy Relaxation in Discrete Nonlinear Lattices,” A. Bikaki*, N. K. Voulgarakis*, S. Aubry, and G. P. Tsironis, *Phys. Rev. E*, **59**, 1234 (1999)

Patents

“Methods for Personalizing Drug Delivery from a Dental Drug Release Apparatus,” S. Satish*, A.J. Bhatnagar*, A.T. Yiu, and N. K. Voulgarakis, U.S. Patent Application No. 61/300,451 (Filed Feb 2, 2010)

Press Releases

ScienceDaily, May 13, 2009, *“First Large-scale Computer Simulation Of Gene Therapy”* (<http://www.sciencedaily.com/releases/2009/04/090429152430.htm>)

Biomedical Computation Review, Fall, 2009, *“Modeling a Gene Therapy Delivery Vehicle”* (<http://biomedicalcomputationreview.org/5/4/5.pdf>)

VerticalNews Physics, May 26th, 2009, *“Study results from University of California update understanding of chemical physics”* (<http://www.verticalnews.com/newsletters/Physics-Week/2009-05-26/61784PH.html>)

Los Alamos National Lab. NewsLetter, December 4, 2006, *“Unzipping the Molecule of Life”* (<http://www.lanl.gov/news/newsletter/120406.pdf>)

Referee for Peer-Reviewed Journals

- Biophysical Journal
- Nano Letters
- Physical Review Letters
- Physical Biology
- Physics Letters A
- Physical Review E

Talks

“Coupling Fluctuating Hydrodynamics with Molecular Dynamics at the Nanoscale,” APS March Meeting 2011, Dallas, TX, 2011

“Coupling Molecular and Field Mechanics for Multiscale Modeling of Soft Matter,” Tufts University, Department of Physics, February 16, 2011

“A Combined Fluctuating Hydrodynamics and Molecular Dynamics Method for Simulating Complex Molecular Systems at the Nanoscale,” AIChE Annual Meeting, Salt Lake City, UT, 2010

“Unzipping DNA,” University of Pittsburgh, Medical School, November 15, 2006

“Mechanical Denaturation of DNA,” Cornell University, Medical School, November 7, 2006

“Dynamics of Double Stranded DNA,” International Annual Workshop "Dynamics Days Europe 2006" Greece, September 25-29, 2006

“Unzipping DNA,” University of California, Department of Physics, Los Angeles (UCLA) September 20 2006

“Dynamics of Double Stranded DNA,” The 2nd International Workshop on "The Nanoelectronics and Dynamics of DNA" Maui, HI, August 20-22, 2006

“Energy Localization in PtCl,” University of Zurich, Department of Physics, February 20, 2004