

# Curriculum Vitae

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## Objective:

Faculty position for teaching and research in the field of computational and mathematical biology and biophysics.

## Education:

- Ph.D. in Physics (Candidate in Physics and Mathematics) (1998),  
Moscow State Engineering Physics Institute (MEPhI)  
Technical University, Russia
- M.S. in Solid State Physics (1995), MEPhI, Russia

## Employment:

- (2001-2003) Postdoctoral Associate with Professor Hans Othmer,  
Department of Mathematics, University of Minnesota  
Instructor in Precalculus
- (1999-2001) Postdoctoral Associate with Professor James D. Gunton,  
Physics Department, Lehigh University  
Teaching Assistant, Laboratory instructor
- (1997-1998) Graduate student, Research and Teaching Assistant,  
Department of Physics and Technical Application of Superconductivity, MEPhI  
Fellowship of Genius Student Program of Samsung Electronics Corporation

## Research experience:

Biophysics, Mathematical Biology, Computational Solid State Physics, Statistical Physics with an emphasis on large scale computations

*Particular topics:* Cell motility; Intercellular and intracellular signaling; Gas-liquid and liquid-solid phase transitions; free energy functionals; Superconductivity, high-temperature superconductivity, vortex system in high-temperature superconductors (HTSC), phase transitions and dynamics of vortex system in HTSC with defects.

## Modeling and computational experience:

### 1. *Modeling*

- continuum and discrete models of cell motility
- stochastic effects in intracellular and intercellular calcium signaling in hepatocytes. Deterministic models of calcium oscillations (Goldbetter et al., Chay et al., Sneyd et al. and such as)
- liquid-solid and liquid-gas phase transitions (as foundation for studying nucleation and growth of metastable phases) including structural order parameters
- vortex lines (lattice) in high-Tc superconductors with defects, dynamics of vortex lattice, current-voltage characteristics. Percolation model.

### 2. *Computational background*

Monte Carlo and molecular dynamics on canonical and grand canonical ensembles, constant pressure ensembles; biasing techniques to sample infrequent events; histogram reweighting technique; supercomputing experience (Parallel processing Workshop at Pittsburgh Supercomputing Center); numerical integration of PDEs, ODEs, stochastic modeling of PDEs with/without intercellular diffusion.

## Publications:

- "A model of fibroblast motility on substrates with different rigidities", M.E. Gracheva and H.G. Othmer (in preparation)
- "A continuum model of motility in amoeboid cells", M.E. Gracheva and H.G. Othmer, *Bulletin of Math. Biology*, (2003) (accepted)
- "The role of noise in some physical and biological systems", J.D. Gunton, R. Toral, C. Mirasso and M.E. Gracheva, chapter in book "*Recent Research Developments in Applied Physics*", eds. M. Kawasaki, N. Ashgriz, R. Anthony (2003)
- "Intercellular communication via intracellular calcium oscillations", M.E. Gracheva and J.D. Gunton, *J. of Theor. Biology* **221**(4), p. 513-518 (2003)
- "Stochastic simulation of intercellular calcium spiking in hepatocytes", M.E. Gracheva, R. Toral and J.D. Gunton, *J. Theor. Biology* **212**, p. 111-125 (2001)
- "Coarse-grained Ginzburg-Landau free energy for Lennard-Jones systems", M.E. Gracheva, J.M. Rickman and J.D. Gunton, *J. Chem. Phys.* **113**(9), p. 3525-3529 (2000)
- "Phase transitions in a two-dimensional vortex system with defects: Monte Carlo simulation", V.A. Kashurnikov, I.A. Rudnev, M.E. Gracheva and O.A. Nikitenko, *J. of Exp. and Theor. Physics* **117**, p. 196 (2000)
- "Phase transitions in a two-dimensional vortex lattice with defects: Monte Carlo simulation", I.A. Rudnev, V.A. Kashurnikov, M.E. Gracheva and O.A. Nikitenko, *Physica C* **332**, p. 383 (2000)
- "Vortex lattice melting in layered HTSC in the field of defects", M.E. Gracheva, V.A. Kashurnikov, I.A. Rudnev and O.A. Nikitenko, *Low Temperature Physics* **25**(10), p.765 (1999)

- "Dynamics of vortex lattice in the current state in high-temperature superconductors: Monte Carlo method", M.E. Gracheva, V.A. Kashurnikov, I.A. Rudnev, *Low Temperature Physics* **25(2)**, p.105 (1999)
- "Phase diagram of layered HTSC: simulation by means of Monte Carlo method", M.E. Gracheva, V.A. Kashurnikov, I.A. Rudnev, *Physics of low-dimensional structures* **9/10**, p. 202-208 (1998)
- "Monte Carlo simulation of phase transitions in the vortex system of high-temperature superconductors", M.E. Gracheva, M.V. Katargin, V.A. Kashurnikov and I.A. Rudnev, *Low Temperature Physics* **23(11)**, p.863 (1997)
- "Features of the melting dynamics of a vortex lattice in a high-Tc superconductor in the presence of pinning centers", M.E. Gracheva, V.A. Kashurnikov and I.A. Rudnev, *J. of Exp. and Theor. Physics Letters* **66**, p.269-274, (1997)
- "Monte-Carlo simulation of the two-dimensional vortex lattice melting in high-temperature superconductors with defects", M.E. Gracheva, V.A. Kashurnikov and I.A. Rudnev, *Physics of low-dimensional structures* **8/9**, p. 125-134 (1997)

#### References:

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 Lehigh University, PA  
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3). Prof. Jeffrey M. Rickman  
 Department of Material Science  
 Lehigh University, PA  
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4). Prof. Larry F. Gray  
 Department of Mathematics  
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