CURRICULUM VITAE

Alexandre V. Morozov

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CITIZENSHIP

Russian (US permanent resident)

LANGUAGES

Russian (native), English (native-like), French (basic)

EDUCATION

Ph.D. in Physics

University of Washington, Seattle, USA, February 2003 [**Biological Physics**]
Advisor: Prof. David Baker

M.Sc. in Physics

University of Washington, Seattle, USA, 1997

Honors Diploma in Physics (equivalent to M.Sc.)

Rostov State University, Rostov-on-Don, Russia, 1995 [**Condensed Matter Theory**]
Advisors: Prof. Vedrinskii R.V., Prof. Kraizman V.L.

EXPERIENCE

September 2007 - present

Assistant Professor,
Department of Physics & Astronomy and BioMaPS Institute for Quantitative Biology, Rutgers University, Piscataway, New Jersey, USA
Research Area: *Biological Physics*

September 2007 - August 2008

Visiting Professor,
Center for Studies in Physics and Biology, The Rockefeller University, New York, USA
Research Area: *Biological Physics*

September 2003 - August 2007

Postdoctoral Fellow/Associate,
Center for Studies in Physics and Biology, The Rockefeller University, New York, USA, Laboratory of Prof. Eric Siggia
Research Area: *Biological Physics, Computational Structural Biology, and Bioinformatics*
"Development of computational methods to study chromatin structure, predict transcription factor binding specificities, and model evolution of transcriptional regulation in eukaryotes"

March 2003 - August 2003

Postdoctoral Fellow,
Howard Hughes Medical Institute, University of Washington, Seattle, USA, Laboratory of Prof. David Baker
Research Area: *Computational and Theoretical Biophysics*
"Analysis and improvement of empirical potential functions for macromolecular simulations using quantum mechanical methods"

1999 - February 2003

Predoctoral Research Assistant,
Howard Hughes Medical Institute, University of Washington, Seattle, USA, Laboratory of Prof. David Baker
Research Area: *Computational and Theoretical Biophysics*
Thesis: "Free energy functions in protein stability and folding kinetics"
Date: February 2003

1996 - 1999

Graduate Teaching Assistant,
Department of Physics, University of Washington, Seattle, USA

1993 - 1995

Diploma (M.Sc.) Thesis Research,
Department of Theoretical Physics, Rostov State University, Rostov-on-Don, Russia, Laboratory of Prof. Vedrinskii R.V.
Research Area: *Condensed Matter Theory*
Thesis: "$M_{4,5}$ absorption spectra in cubic and tetragonal phases of crystalline $KNbO_3$"
Date: July 1995

GRANTS & FELLOWSHIPS

- Alfred P. Sloan Research Fellowship, 2009-2011
- R01 grant (HG004708) from National Institutes of Health (NIH), 2009 - 2013, "Biophysical Models for Prediction and Design of Eukaryotic Chromatin Structure" (Principal Investigator)
- Leukemia and Lymphoma Society Fellowship, 2005-2008
- IPAM Travel Fellowship, 2006
- New Focus Student Travel Grant, 2003
- PMMB Travel Scholarship, 2002
- J.Soros Undergraduate Student Stipend, 1994-1995

PATENTS

- Russian Federation patent #2076440, registered 03.27.1997 in the State Patent Registry
- "Chemosensory arrays", US patent application 12/960157, filed 12.03.2010

TEACHING

Spring 2008, 2009, 2010	**Phys 567:** Physics of Living Matter
Spring 2011	**Phys 406:** Introduction to Solid State Physics

PUBLICATIONS

Research Papers:

1. Haq, O., Andrec, M., **Morozov, A.V.** & Levy, R.M. (2011). Correlated electrostatic mutations provide a reservoir of stability in HIV protease. *to be submitted*

2. Haldane, A., Manhart, M. & **Morozov, A.V.** (2011). Inferring fitness functions from distributions of transcription factor binding sites in *Saccharomyces cerevisiae*. *to be submitted*

3. Manhart, M., Haldane, A. & **Morozov, A.V.** (2011). Stochastic theory of molecular evolution in the strong selection limit. *submitted*

4. Tsitron, J., Ault, A.D., Broach, J.R. & **Morozov, A.V.** (2011). Quantitative decoding of complex chemical mixtures with sensor arrays. PLoS Comp. Biol., *in revision*

5. Chereji, R. & **Morozov, A.V.** (2011). Statistical mechanics of nucleosomes constrained by higher-order chromatin structure. J. Stat. Phys., *in press*

6. Chereji, R., Tolkunov, D., Locke, G. & **Morozov, A.V.** (2011). Statistical mechanics of nucleosome ordering by chromatin-structure-induced two-body interactions. Phys. Rev. E Rapid Comm. 83, 050903(R).

7. Tolkunov, D., Zawadzki, K., Elfving, N., **Morozov, A.V.** & Broach, J.R. (2011). Chromatin remodelers clear nucleosomes from intrinsically unfavorable sites to establish nucleosome-depleted regions at promoters. Mol. Biol. Cell 22, 2106–2118.

8. Locke, G., Tolkunov, D., Moqtaderi, Z., Struhl, K. & **Morozov, A.V.** (2010). High-throughput sequencing reveals a simple model of nucleosome energetics. Proc.Nat.Acad.Sci. 107, 20998–21003.

9. Zawadzki, K.A., **Morozov, A.V.** & Broach, J.R. (2009). Chromatin-dependent transcription factor accessibility rather than nucleosome remodeling predominates during global transcriptional restructuring in *Saccharomyces cerevisiae*. Mol. Biol. Cell 20, 3503–3513 (highlighted in InCytes from MBC, August 2009).

10. Haq, O., Levy, R.M., **Morozov, A.V.** & Andrec, M. (2009). Pairwise and higher-order correlations among drug-resistance mutations in HIV-1 subtype B protease. BMC Bioinformatics 10(Suppl 8), S10.

11. **Morozov, A.V.**, Fortney, K., Gaykalova, D.A., Studitsky, V.M., Widom, J. & Siggia, E.D. (2009). Using DNA mechanics to predict *in vitro* nucleosome positions and formation energies. Nucl.Acids Res. 37, 4707–4722.

12. **Morozov, A.V.** & Siggia, E.D. (2007). Connecting protein structure with predictions of regulatory sites. Proc.Nat.Acad.Sci. 104, 7068–7073.

13. Foat, B.C., **Morozov, A.V.** & Bussemaker, H.J. (2006). Statistical mechanical modeling of genome-wide transcription factor occupancy data by MatrixREDUCE. Bioinformatics 22, e141–e149.

14. **Morozov, A.V.**, Tsemekhman, K. & Baker, D. (2006). Electron density redistribution accounts for half the cooperativity of α helix formation. J.Phys.Chem. B Lett. 110, 4503–4505.

15. **Morozov, A.V.**, Havranek, J.J., Baker, D. & Siggia, E.D. (2005). Protein-DNA binding specificity predictions with structural models. Nucl.Acids Res. 33, 5781–5798.

16. Misura, K., **Morozov, A.V.** & Baker, D. (2004). Analysis of anisotropic side-chain packing in proteins and application to high-resolution structure prediction. J.Mol.Biol. 342, 651–664.

17. **Morozov, A.V.**, Kortemme, T., Tsemekhman, K. & Baker, D. (2004). Close agreement between the orientation dependence of hydrogen bonds observed in protein structures and quantum mechanical calculations. Proc.Nat.Acad.Sci., 101, 6946–6951.

18. **Morozov, A.V.**, Misura, K., Tsemekhman, K. & Baker, D. (2004). Comparison of quantum mechanics and molecular mechanics dimerization energy landscapes for pairs of ring-containing amino acids in proteins. J.Phys.Chem. B, 108, 8489–8496.

19. Tsai, J., Bonneau, R., **Morozov, A.V.**, Kuhlman, B., Rohl, C.A. & Baker, D. (2003). An improved protein decoy set for testing energy functions for protein structure prediction. Proteins: Str.,Func.,Gen., 53, 76–87.

20. Gray, J.J., Moughon, S., Kortemme, T., Schueler-Furman, O., Misura, K., **Morozov, A.V.** & Baker, D. (2003). Protein-protein docking predictions for the CAPRI experiment. Proteins: Str.,Func.,Gen., 52, 118–122.

21. **Morozov, A.V.**, Kortemme, T. & Baker, D. (2003). Evaluation of models of electrostatic interactions in proteins. J.Phys.Chem. B 107, 2075–2090.

22. Kortemme, T., **Morozov, A.V.** & Baker, D. (2003). An orientation-dependent hydrogen bonding potential improves prediction of specificity and structure for proteins and protein-protein complexes. J.Mol.Biol. 326, 1239–1259.

23. Alm, E., **Morozov, A.V.**, [1] Kortemme, T. & Baker, D. (2002). Simple physical models connect theory and experiment in protein folding kinetics. J.Mol.Biol. 322, 463–476.

24. **Morozov, A.V.** (2002). Two-frequency mutual coherence function of electromagnetic waves in random media: a path-integral variational solution. J.Opt.Soc.Am. A 19, 2074–2084.

25. Vedrinskii, R.V., Taranukhina, A.I., Bugaev, L.A., Kraizman, V.L., **Morozov, A.V.**, Wendland, C., Hasselkaml, D. & Scharmann, A. (1996). Bond length determination for transition atoms by shallow level EELFS. Surface Science, 352-354, 32–35.

Review Papers:

1. **Morozov, A.V.** (2011). Sequence determinants of histone-DNA binding preferences. Phys. Life Rev. 8, 62–63. [**comment**]

2. Bai, L. & **Morozov, A.V.** (2010). Gene regulation by nucleosome positioning. Trends Genet. 26, 476–483. [**reviewed**]

3. Tolkunov, D. & **Morozov, A.V.** (2010). Genomic studies and computational predictions of nucleosome positions and formation energies. Adv.Prot.Chem.Struc. Biol. 79, 1–57.

4. **Morozov, A.V.** & Kortemme, T. (2005). Potential functions for hydrogen bonds in protein structure prediction and design. Adv.Prot.Chem. 72, 1–38.

Theses:

- Free energy functions in protein structural stability and folding kinetics.
  Ph.D. Thesis, University of Washington, Seattle, USA.

- $M_{4,5}$ absorption spectra in cubic and tetragonal phases of crystalline $KNbO_3$.
  Diploma Thesis, Rostov State University, Rostov-on-Don, Russia.

Conference and Workshop Presentations:

1. CECAM conference. Coarse-Grain Mechanics of DNA: Part II From electrons to oligomers, Lausanne, Switzerland, August 2011 (invited talk) [*scheduled*]

2. MBI Workshop 5: Mathematical and experimental approaches to dynamics of protein-DNA interactions, Ohio State University, March 2010 (invited talk)

[1] EA & AVM contributed equally to this work

3. 102nd Statistical Mechanics conference, Rutgers University, December 2009 (invited talk)

4. Workshop on "Evolutionary Genetics and Genomics at Rutgers", Rutgers University, October 2009 (invited talk)

5. ASBMB special symposium on "Systems Biology for Biochemists", October 2009 (invited talk)

6. eCheminfo InterAction meeting at Bryn Mawr College on "Advances in Drug Discovery Informatics", October 2009 (invited talk)

7. RosettaCON, August 2009 (invited talk)

8. DIMACS workshop on "Identifying genetic signatures for the evolution of complex phenotypes", June 2009 (invited talk)

9. Albany 2009: The 16th Conversation, June 2009 (contributed talk + poster)

10. Annual APS March Meeting, March 2009 (invited talk)

11. The 6th annual BioMaPS Summer School on "Chromatin Structure and Gene Regulation", June 2008 (invited talk)

12. Annual APS March Meeting, March 2008 (invited talk)

13. IPAM SEWS4 workshop: Search and Knowledge Building for Biological Datasets, 2007 (invited talk)

14. 39th Symposium on the Interface: Computing Science and Statistics (Systems Biology), 2007 (invited talk)

15. New York Academy of Sciences session on "Biophysical models of gene regulation", 2007 (invited talk)

16. CSHL Meeting on Systems Biology: Global Regulation of Gene Expression, 2007 (poster)

17. 14th Annual International Conference on Intelligent Systems for Molecular Biology (ISMB 2006) (reviewed paper, published in Bioinformatics (2006) 22, e141–e149)

18. CSHL Meeting on Systems Biology: Global Regulation of Gene Expression, 2006 (poster)

19. CSHL Meeting on Systems Biology: Global Regulation of Gene Expression, 2005 (contributed talk)

20. 15th Meeting of Methods in Protein Structure Analysis, 2004 (poster)

21. 87th OSA Annual Meeting & Laser Science XIX, 2003 (contributed talk)

22. 7th Johns Hopkins Folding Meeting, 2003 (poster)

23. Annual APS March Meeting, 2003 (poster)

24. PMMB Mathematics and Molecular Biology VII, 2002 (poster)

25. 15th European Conference on Surface Science, 1995 (poster)

Seminars and Colloquia:

1. Cold Spring Harbor Laboratory, Laurel Hollow, NY (U.S.A.), Quantitative Biology seminar, May 2011

2. Institute of Physics, Polish Academy of Sciences (Poland), March 2011

3. University of Massachusetts Medical School, Worcester, MA (U.S.A.), December 2010

4. Bar-Ilan University (Israel), Department of Physics, November 2010

5. Weizmann Institute of Science (Israel), Faculty of Physics, November 2010

6. Hebrew University (Israel), Hadassah Medical School, November 2010

7. Villanova University, Villanova, PA (U.S.A.), Department of Physics colloquium, April 2010

8. New York University, New York, NY (U.S.A.), Department of Computer Science colloquium, December 2009

9. New York University, New York, NY (U.S.A.), Biophysics seminar, Department of Chemistry, November 2009

10. Weill Cornell Medical College, New York, NY (U.S.A.), Department of Physiology, June 2009

11. Rutgers University, Piscataway, NJ (U.S.A.), Department of Mathematics, April 2009

12. Princeton University, Princeton, NJ (U.S.A.), PICASso "Successes of Computational Science" seminar, December 2007

13. Northwestern University, Evanston, IL (U.S.A.), BMBCB seminar, October 2007

14. MIT Department of Mathematics & Theory of Computation Group at CSAIL: Bioinformatics Seminar, April 2007

15. Engelhardt Institute of Molecular Biology RAS (Russian Academy of Sciences), Moscow (Russia), June 2006

16. Institute of Protein Research RAS (Russian Academy of Sciences), Pushchino (Moscow region, Russia), June 2006

17. Brown University, Providence, RI (U.S.A.), CCMB, 2005

18. University of California, San Francisco, CA (U.S.A.), Department of Biopharmaceutical Sciences, 2005

19. Cornell University, Ithaca, NY (U.S.A.), Department of Chemistry, 2004

20. Rutgers University, Piscataway, NJ (U.S.A.), Department of Chemistry, 2004

21. University of Milano-Bicocca, Milan (Italy), Graduate School of Chemistry, 2003

Lectures:

1. University of California, San Francisco, 2005. "Density Functional Theory with Applications to Chemistry and Biology".

Organizer:

1. The 6th Annual BioMaPS Summer School on "Chromatin Structure and Gene Regulation", 2008

Editor:

1. Frontiers in Bioinformatics and Computational Biology, Associate Editor

2. PLoS Computational Biology, Guest Editor

Program Committee member:

1. 19th International conference on Intelligent Systems for Molecular Biology & 10th European Conference on Computational Biology, 2011

2. 18th International conference on Intelligent Systems for Molecular Biology, 2010

Reviewer for:

Journals

Physical Review Letters, Physical Review B, Physical Review E,

Nature: Structural and Molecular Biology,

Proceedings of the National Academy of Sciences,

Genome Research, PLoS Computational Biology,

Journal of Statistical Physics,

Bioinformatics, Nucleic Acids Research, Genome Biology,

Biopolymers, Journal of Physical Chemistry, Physical Biology,

Proteins: Structure, Function and Bioinformatics,

Journal of Bioinformatics and Computational Biology,

International Journal of Biological Macromolecules,

Journal of Computer-Aided Molecular Design, Biochemistry,

BMC Structural Biology, Journal of Molecular Biology,

Journal of Molecular Graphics and Modelling.

Grants

US-Israel Binational Science Foundation, 2010

Bankhead-Coley Cancer Research Program, Florida Department of Health, 2010

Horizon Breakthrough grants, Netherlands Genomics Initiative, 2009

Challenge grants, National Institutes of Health, 2009