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BORN: Tbilisi, USSR.

CONTACT INFORMATION:

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EDUCATION:

- **B.S., Physics**, 1992, Moscow Institute of Physics and Technology, Russia. Honors. Advisor: S. S. Gershtein
- **M.S., Physics**, 1994, Moscow Institute of Physics and Technology, Russia. Honors. Advisors: G. Jikia & S. S. Gershtein
- **Ph.D., Physics**, 1999, Boston University, USA. Advisor: H. E. Stanley

EMPLOYMENT & TEACHING EXPERIENCE:

- (1) NIH postdoctoral Fellow, Department of Chemistry and Chemical Biology, Harvard University. Fall 1999 - present.
- (2) Research Assistant, Physics Department, Boston University. Summer 1994; Spring 1997 - Fall 1999.
- (3) Teaching Assistant, Physics Department, Boston University. Fall 1994 - Spring 1997.
- (4) Research Assistant, Institute for High Energy Physics, Russia. Fall 1991- Spring 1994.
- (5) Teacher, Moscow Institute of Physics and Technology, Special Physics and Mathematics High School. Fall 1988 - Spring 1990.

HONORS & OTHER ACTIVITIES:

- (1) ACS Petroleum Research Fund grant to H. E. Stanley (I was a principal author of this proposal). 2001 — 2003.
 - (2) NSF Young Scientist Award for STATPHYS XXI, 2001.
 - (3) Harvard University nominee for the Burroughs Wellcome Fund Career Award, 2001.
 - (4) NIH postdoctoral fellowship (1F32 GM20251-01). 1999 – present.
 - (5) British Petroleum Amoco research grant. 1999 — 2001.
 - (6) NSF Student Award for STATPHYS XX, 1998.
 - (7) NIH molecular biophysics predoctoral traineeship (GM08291-09). 1998-1999.
 - (8) British Petroleum research grant. (I was a principal author of this proposal.) 1998.
 - (9) NSF Student Award for STATPHYS XIX, 1995.
 - (10) "Red Diploma" 1994 (in Former USSR "Red Diploma" is awarded for outstanding achievements).
 - (11) Recipient of Honorary Stipend, Moscow Institute of Physics and Technology; 1990-1994.
- Further information: *Who's Who in America*.

REVIEWER:

Physics Review Letters, Physics Review E, Physica A, European Physics Journal B, Journal of Chemical Physics, Biomolecular Engineering, Proteins: Structure, Function, and Genetics, Biosystems, Journal of Molecular Biology.

RESEARCH EXPERIENCE:

1997 – present: Protein evolution (with E. I. Shakhnovich and L. A. Mirny, and the advice of A. Murzin and D. Vitkup); theoretical protein engineering (with E. I. Shakhnovich); protein folding kinetics and thermodynamics by means of computer simulations (with E. I. Shakhnovich, H. E. Stanley, S. V. Buldyrev,

F. Ding, and J. M. Borreguerro); structural determinants of protein folding kinetics (with M. Karplus, M. Vendruscolo, F. Ding, L. Li, and E. I. Shakhnovich).

1998 – present: Prediction and optimization of oil recovery (with J. S. Andrade Jr., S. V. Buldyrev, S. Havlin, P. R. King, Y. Lee, G. Paul, and H. E. Stanley).

1999 – present: Hierarchical organization of complex systems (with G. Malescio, S. V. Buldyrev, and H. E. Stanley).

1994 – 1999: Small sequence repeats in coding and non-coding DNA and mechanisms of their formations (with S. Buldyrev, H. E. Stanley, and S. Havlin); clumping of oligonucleotides in DNA sequences (with S. Buldyrev, H. E. Stanley, S. Havlin, R. Stanley, and advice of M. Frank-Kamenetskii and R. Wells).

1998: Cell motility (fibroblast: theoretical and experimental work) (with S. Erramilli, M. Hong, A. Jeung, T. I. Smith, H. A. Schwettman, and P. Huie).

1993 – 1994: The single top-quark production and V_{tb} Cabbibo - Kabayashi - Maskawa matrix element measurement in high energy e^+e^- collisions (with S. S. Gershtein and G. Jikia).

PROGRAMMING EXPERIENCE:

Platforms - VAX, SGI, IBM, DEC, PC, Mac.

OS - DOS, Windows, MacOS, VAX VMS, UNIX, LINUX.

Languages - PC 8086/8088 Assembly, C/C++, Fortran/Fortran90, OpenGL, Pascal/ Delphi, Basic, Java/ JavaScript, ActiveX, HTML, Perl, Python, Awk, Inventor, VRML, Mathematica, FORM.

PRESENTATION AND IMPACT OF WORK:

INVITED TALKS:

1. The Physics Institute, Tbilisi, Georgia, 1993 - Single top quark production and V-tb CKM matrix element measurement in high energy e+e- collisions.
2. Boston University, Biophysics Seminar, 1998 - Folding of 'Go' protein.
3. Harvard University, Shakhnovich Group Seminar, 1998 - Molecular dynamics simulations of protein models.
4. International Workshop on Dynamics of Non-Equilibrium Systems, Trieste, Italy, 1999 - Folding kinetics of the model protein from molecular dynamics.
5. Harvard University, Whitesides Group Seminar, 2000 - Statistical properties of DNA dimeric tandem repeats.
6. International Workshop on Protein Folding, Structure and Design, Trieste, Italy, 2001
 - (a) Understanding hierarchical protein evolution from the first principles
 - (b) Direct observation of folding transition state ensemble of C-Src SH3 domain in molecular dynamics simulations.

CONFERENCE PRESENTATIONS:

1. Statphys XIX, Xiamen, China, 1995 - Distribution of Repeats in DNA. (1995). [poster]
2. Patterns in Nature '95, and '96. Two-week summer Institutes to introduce teachers in the use of advanced technology materials, Boston University. [with colleagues] (1995, 1996). [talks]
3. International School of Physics "Enrico Fermi", Varenna, Italy, 1996 - Mechanism of Expansion of Simple Repeats in DNA. [poster]
4. Conference on Complex Systems, Bar Ilan University, Israel, 1997 - Model of Unequal Chromosomal Crossing Over in DNA Sequences. [poster]
5. Conference on Statistical Mechanics, Rutgers University, 1997 - Distribution of Dimeric Repeats in DNA. [talk]
6. Conference on Percolation and Disordered Systems: Theory and applications, Gießen, Germany, 1998 - Scaling of the distribution of shortest paths in percolation. [poster]
7. Conference on Protein folding and structure prediction, Torino, Italy, 1998 - Molecular dynamics simulations of protein-like model. [talk]
8. American Physical Society Centennial Meeting, Atlanta, USA, 1999 - Quest for the protein folding nucleus. [talk]
9. Boston University Science Day, 1999 - Quest for the amino acids that make a protein fold. [poster]
10. The 3rd Tohwa University International Conference on Statistical Physics, Fukuoka, Japan, 1999 - Quest for the protein folding nucleus. [talk]
11. International School of Physics "Enrico Fermi" Course CXLV: "Protein folding, evolution and design", Varenna, Italy, 2000 - Predicting conserved amino acids in proteins. [talk]
12. Statphys XXI, Cancun, Mexico, 2001 - A model of protein evolution. [talk]
13. Third Annual Greater Boston Area Statistical Mechanics Meeting, Brandeis University, 2001 - Direct observation of folding transition state ensemble of C-Src SH3 domain in molecular dynamics simulations. [talk]

SESSION CHAIR:

1. International workshop on protein folding, structure and design, Trieste, Italy, 2001

PRESS RELEASES ON MY RESEARCH:

- T. McNeil, Bostonia, "*Percolating Texas Tea*", p. 39, December 1998.

LIST OF PUBLICATIONS

JOURNAL ARTICLES:

I. High Energy Physics:

- [1] N. V. Dokholyan & G. V. Jikia, “Single top quark production and V_{tb} CKM matrix element measurement in high energy e^+e^- collisions.” *Phys. Lett. B* **336**: 251–256 (1994).

II. DNA:

- [2] N. V. Dokholyan, S. V. Buldyrev, S. Havlin & H. E. Stanley, “Distribution of base pair repeats in coding and noncoding DNA sequences.” *Phys. Rev. Lett.* **79**: 5182–5185 (1997).
- [3] N. V. Dokholyan, S. V. Buldyrev, S. Havlin & H. E. Stanley, “Model of unequal chromosomal crossing over in DNA sequences.” *Physica A* **249**: 594–599 (1998).
- [4] S. V. Buldyrev, N. V. Dokholyan, A. L. Goldberger, S. Havlin, C.-K. Peng, H. E. Stanley & G. M. Viswanathan, “Analysis of DNA sequences using methods of statistical physics.” *Physica A* **249**: 430–438 (1998).
- [5] R. H. R. Stanley, N. V. Dokholyan, S. V. Buldyrev, S. Havlin & H. E. Stanley, “Clumping of identical oligonucleotides in coding and noncoding DNA sequences.” *J. Biomol. Struct. & Dyn.* **17**: 79–87 (1999).
- [6] S. V. Buldyrev, N. V. Dokholyan, S. Havlin, H. E. Stanley & R. H. R. Stanley, “Expansion of tandem repeats and oligomer clustering in coding and noncoding DNA sequences.” *Physica A* **273**: 19–32 (1999).
- [7] N. V. Dokholyan, S. V. Buldyrev, S. Havlin & H. E. Stanley, “Non-randomness of dimeric tandem repeats in noncoding DNA sequences.” *J. Theor. Biol.* **202**: 273–282 (2000).

III. Cell motility:

- [8] M. Hong, A. Jeung, N. V. Dokholyan, T. I. Smith, H. A. Schwettman, P. Huie, & S. Erramilli, “Imaging single living cells with a scanning near-field infrared microscope based on a free electron laser.” *Nucl. Instr. & Methods in Physics Research B* **144**: 246–255, (1998).

IV. Random systems:

- [9] N. V. Dokholyan, Y. Lee, S. V. Buldyrev, S. Havlin, H. E. Stanley & P. King, “Scaling of the distribution of shortest paths in percolation.” *J. Stat. Phys.* **93**: 603–613 (1998).
- [10] N. V. Dokholyan, S. V. Buldyrev, S. Havlin, P. King, Y. Lee, & H. E. Stanley, “Distribution of shortest paths in percolation.” *Physica A* **266**: 53–59 (1999).
- [11] P. King, J. S. Andrade Jr., S. V. Buldyrev, N. V. Dokholyan, Y. Lee, S. Havlin, & H. E. Stanley, “Predicting oil recovery using percolation.” *Physica A* **266**: 107–114 (1999).
- [12] Y. Lee, J. S. Andrade Jr., S. V. Buldyrev, N. V. Dokholyan, S. Havlin, P. R. King, G. Paul, & H. E. Stanley, “Traveling time and traveling length for flow in porous media.” *Phys. Rev. E* **60**: 3425–3428 (1999).
- [13] P. King, S. V. Buldyrev, N. V. Dokholyan, S. Havlin, Y. Lee, & H. E. Stanley, “Application of statistical physics to the oil industry: Predicting oil recovery using percolation theory.” *Physica A* **274**: 60–66 (1999).
- [14] G. Paul, S. V. Buldyrev, N. V. Dokholyan, S. Havlin, P. R. King, Y. Lee, & H. E. Stanley, “Dependence of conductance on percolation backbone mass” *Phys. Rev. E* **61**: 3435–3440 (2000).
- [15] J. S. Andrade Jr., S. V. Buldyrev, N. V. Dokholyan, S. Havlin, P. R. King, Y. Lee, G. Paul, & H. E. Stanley, “Flow in percolation clusters” *Phys. Rev. E* **62**: 8270–8281 (2000); (preprint **cond-mat/0004397**).
- [16] P. King, S. V. Buldyrev, N. V. Dokholyan, Y. Lee, S. Havlin, G. Paul, H. E. Stanley, & N. Vandesteeg, “Predicting oil recovery using percolation theory.” *Petroleum Geoscience* **7**: S105–S107 (2001).

V. Protein folding, design, and evolution:

- [17] N. V. Dokholyan, S. V. Buldyrev, H. E. Stanley & E. I. Shakhnovich, “Molecular dynamics studies of folding of a protein-like model.” *Folding & Design*, **3**: 577–587 (1998).
- [18] N. V. Dokholyan, S. V. Buldyrev, H. E. Stanley & E. I. Shakhnovich, “The protein folding nucleus: a molecular dynamics observation.” *J. Mol. Biol.*, **296**: 1183–1188 (2000); (preprint **cond-mat/9812284**).
- [19] N. V. Dokholyan, “The protein folding problem.” *Recent Res. Devel. Stat. Phys.*, **1**: 77–84 (2000).
- [20] A. Scala, N. V. Dokholyan, S. V. Buldyrev & H. E. Stanley, “Thermodynamically important contacts in folding of model proteins.” *Phys. Rev. E* **63**: 032901 (2001); (preprint **cond-mat/0012288**).
- [21] N. V. Dokholyan & E. I. Shakhnovich, “A model of hierarchical protein evolution.” *J. Mol. Biol.* **312**: 289–307 (2001); (preprint **cond-mat/0104469**).

CONFERENCE PROCEEDINGS ARTICLES:

- [1] N. V. Dokholyan, S. V. Buldyrev, H. E. Stanley & E. I. Shakhnovich, “Kinetics of the protein folding transition.” *AIP Proceedings of the Third Tohwa University Conference on Statistical Physics, November 8-12, 1999*, 419–425 (2000).
- [2] N. V. Dokholyan & E. I. Shakhnovich, “Two models of amino acid conservation in proteins.” Proceedings of the International School of Physics “Enrico Fermi” Course CXLV: “Protein folding, evolution and design”, Varenna, Italy, 227–245 (2000).

CONFERENCE PROCEEDINGS ABSTRACTS:

- [1] N. V. Dokholyan, “Power law distribution of random repeats in DNA sequences.” STATPHYS XIX, The 19th IUPAP International Conference on Statistical Physics, Xiamen, China, July 31 – August 4, 1995. H. Bailin (Ed.) World Scientific, London (1995).
- [2] N. V. Dokholyan, S. V. Buldyrev, S. Havlin, and H. E. Stanley, “Power law distribution of dimeric tandem repeats in DNA sequences.” Proceedings of the International School of Physics “Enrico Fermi”, Course CXXXIV. Varenna on Lake Como, Villa Monastero, Italy, July 9 – 19, (1996). *“The Physics of Complex Systems.”* IOS Press, Oxford (1997).
- [3] N. V. Dokholyan, S. V. Buldyrev, H. E. Stanley, and E. I. Shakhnovich, “Discrete molecular dynamics studies of folding of proteinlike model.” STATPHYS XX, The 20th IUPAP International Conference on Statistical Physics, Paris, France, July 20 – 24, 1998. A. Gervois, M. Gingold, D. Iagolnitzer (Eds.) UNESCO, Sorbone.
- [4] N. V. Dokholyan, S. V. Buldyrev, H. E. Stanley, and E. I. Shakhnovich, “Quest for the protein folding nucleus.” Proceedings of the American Physical Society Centennial Meeting, Atlanta, GA, USA, March 20 – 26, (1999).
- [5] Y. Lee, S. V. Buldyrev, N. V. Dokholyan, G. Paul, H. E. Stanley, J. Andrade Jr., S. Havlin, P. King, “Transport in Percolation Clusters.” Proceedings of the American Physical Society Centennial Meeting, Atlanta, GA, USA, March 20 – 26, (1999).
- [6] N. V. Dokholyan, S. V. Buldyrev, H. E. Stanley, and E. I. Shakhnovich, “Folding kinetics of the model protein from molecular dynamics” Proceedings of the Workshop on Dynamics of Non-Equilibrium Systems, Trieste, Italy, August 17 – 27, (1999).
- [7] E. I. Shakhnovich, J. Shimada, E. Kussell, and N. V. Dokholyan, “Statistical mechanics of proteins: Perspective from analytical theory and simulations” Abstracts of papers of the american chemical society **221**: 100-COMP, (2001).
- [8] P. R. King, S. V. Buldyrev, N. V. Dokholyan, S. Havlin, G. Paul, and H. E. Stanley “Using percolation theory to predict oil recovery.” STATPHYS XXI, The 21th IUPAP International Conference on Statistical Physics, Cancun, Mexico, July 15 – 21, 2001. D. López, M. Barbosa, A. Robledo (Eds.).
- [9] L. R. da Silva, S. V. Buldyrev, N. V. Dokholyan, S. Havlin, P. R. King, G. Paul, and H. E. Stanley “Shortest path distribution among multiple points.” STATPHYS XXI, The 21th IUPAP International

Conference on Statistical Physics, Cancun, Mexico, July 15 – 21, 2001. D. López, M. Barbosa, A. Robledo (Eds.).

- [10] E. Lopez, S. V. Buldyrev, N. V. Dokholyan, S. Havlin, P. R. King, G. Paul, and H. E. Stanley “Flow in percolation clusters: post-breakthrough behavior.” STATPHYS XXI, The 21th IUPAP International Conference on Statistical Physics, Cancun, Mexico, July 15 – 21, 2001. D. López, M. Barbosa, A. Robledo
- [11] F. Ding, N. V. Dokholyan, S. V. Buldyrev, H. E. Stanley, and E. I. Shakhnovich, “Direct observation of folding transition state ensemble of C-Src SH3 domain in molecular dynamics simulations.” STATPHYS XXI, The 21th IUPAP International Conference on Statistical Physics, Cancun, Mexico, July 15 – 21, 2001. D. López, M. Barbosa, A. Robledo (Eds.).
- [12] J. M. Borreguero, N. V. Dokholyan, S. V. Buldyrev, H. E. Stanley, and E. I. Shakhnovich, “Transition State and folding nucleus of C-crK SH3 Domain from Discrete Molecular Dynamics Simulations.” STATPHYS XXI, The 21th IUPAP International Conference on Statistical Physics, Cancun, Mexico, July 15 – 21, 2001. D. López, M. Barbosa, A. Robledo (Eds.).
- [13] N. V. Dokholyan, and E. I. Shakhnovich, “A model of protein evolution.” STATPHYS XXI, The 21th IUPAP International Conference on Statistical Physics, Cancun, Mexico, July 15 – 21, 2001. D. López, M. Barbosa, A. Robledo (Eds.).

PREPRINTS & SUBMITTED ARTICLES:

I. High Energy Physics:

- [P1] N. V. Dokholyan & G. V. Jikia, preprint: IHEP 93111, Protvino, Russia (1993).
- [P2] N. V. Dokholyan, “Cabbibo - Kabayashi - Maskawa mixing matrix in the case of four generations.” *preprint* (1994).

II. Protein folding, design, and evolution:

- [P3] N. V. Dokholyan, L. A. Mirny & E. I. Shakhnovich, “Understanding conserved amino acids in proteins.” *preprint* (2000); (preprint **cond-mat/0007084**).
- [P4] N. V. Dokholyan, L. Li & E. I. Shakhnovich, “Structural determinants of folding transition state in proteins” *preprint* (2000).
- [P5] N. V. Dokholyan & E. I. Shakhnovich, “How many protein sequences correspond to a given structure?” *preprint* (2001).
- [P6] N. V. Dokholyan, L. Li, F. Ding, & E. I. Shakhnovich, “Topological determinants of protein folding.” *Nature submitted* (2001).
- [P7] N. V. Dokholyan, Estelle Pitard, Sergey V. Buldyrev, & H. Eugene Stanley, “Glassy behavior of a homopolymer from molecular dynamics simulations.” *Phys. Rev. E submitted* (2001); (preprint **cond-mat/0109198**).
- [P8] M. Vendruscolo, N. V. Dokholyan, & M. Karplus, “A small-world view of the amino acids that play a key role in protein folding.” *Phys. Rev. Lett. submitted* (2001).
- [P9] J. M. Borreguero, N. V. Dokholyan, S. V. Buldyrev, H. E. Stanley, & E. I. Shakhnovich, “Transition state of C-crK SH3 domain: Molecular dynamics simulations of simple models.” *preprint* (2001).
- [P10] F. Ding, N. V. Dokholyan, S. V. Buldyrev, H. E. Stanley & E. I. Shakhnovich, “Direct observation of folding transition state ensemble of C-Src SH3 domain in molecular dynamics simulations.” *Nature Struc. Biol. submitted* (2001).

III. Complex Systems:

- [P11] G. Malescio, N. V. Dokholyan, S. V. Buldyrev, & H. E. Stanley, “Hierarchical organization of cities and nations.” *preprint* (2000); (preprint **cond-mat/0005178**)

REFERENCES

- (1) Eugene I. Shakhnovich: Professor of Chemistry; Department of Chemistry and Chemical Biology, Harvard University, 12 Oxford Street, Cambridge, MA 02138. **Tel:** (617) 495 4130, **FAX:** (617) 496 5175, **Email:** eugene@belok.harvard.edu
- (2) H. Eugene Stanley: University Professor of Physics, Professor of Physiology, Director of Center for Polymer Studies; Department of Physics, Boston University, 590 Commonwealth Avenue, Boston, MA 02215. **Tel:** (617) 353 2617, **FAX:** (617) 353 3783, **Email:** hes@bu.edu
- (3) Shlomo Havlin: Professor of Physics, President of Israel Physical Society, Director of Minerva Center for Fractals; Gonda-Goldschmied Center and Department of Physics, Bar-Ilan University, Ramat Gan, 52900 Israel. **Tel:** +972 3 5318436, **FAX:** +972 3 5353298, **Email:** havlin@ophir.ph.biu.ac.il
- (4) Peter King: Professor of Petroleum Engineering; Centre for Petroleum Studies, Department of Earth Science & Engineering, Imperial College, Prince Consort Road, London SW7 2BP UK. **Tel:** +44 (0)20 759 47362, **FAX:** +44 20 759 47444, **Email:** king@ic.ac.uk
- (5) Shyamsunder Erramilli: Professor of Physics, Department of Physics; Boston University, 590 Commonwealth Avenue, Boston, MA 02215. **Tel:** (617) 353 6114, **FAX:** (617) 353 9393, **Email:** shyam@buphy.bu.edu