David V. Svintradze, Ph.D

Curriculum Vitae

CONTACT INFORMATION

Department of Mathematics&Statistics
University of Massachusetts Lowell
Southwick Hall 303, One University Ave., Office: Olney 408,
Kennedy College of Sciences, Lowell, MA 01854

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Web Sites: New Vision University, Loop, ReserchGate, LinkedIn, Google Scholar

PROFESSIONAL EXPERIENCE

Kennedy College of Sciences, University of Massachusetts Lowell, MA, USA ..... **Aug 2024–**
SIR Fulbright Professor
Adjunct Professor of Mathematics and Chemistry

Niels Bohr Institute, University of Copenhagen, Copenhagen, Danmark ..... **Apr 2024–Jul 2024**
Erasmus+ Visiting Professor
Visiting Professor of Biophysics and Physics

New Vision University, Tbilisi, Georgia **2021–**
New Vision University Representative Board Member
Research and Innovation Committee Professor and Professor of Biophysics

University of Georgia, Tbilisi, Georgia **2018–2021**
Chair of Biophysics Division
Associate Professor of Medical Physics and Biophysics, School of Health Sciences

Ilia State University, Tbilisi, Georgia ..... **Jun 2018–Dec 2018**
Invited Guest Scientist, Department of Physics, Institute of Biophysics

Max Planck Institute for the Physics of Complex Systems, Dresden, Germany ..... **Jan 2018–Mar 2018**
Guest Scientist, Division of Biological Physics

Aspen Center for Physics, Aspen, CO USA ..... **Aug 2017–Sept 2017**
Visiting Physicist

Tbilisi State University, Tbilisi, Georgia **2012–2017**
Assistant Professor, Department of Physics

Virginia Commonwealth University, Richmond, VA USA **2011–2012**
Adjunct Faculty, Institute for Structural Biology and Drug Discovery

Virginia Commonwealth University, Richmond, VA USA **2011–2012**
Research Associate, Oral and Craniofacial Molecular Biology Philips Institute

Virginia Commonwealth University, Richmond, VA USA **2008–2011**
Postdoctoral Fellow, Oral and Craniofacial Molecular Biology Philips Institute

Virginia Commonwealth University, Richmond, VA USA **2007–2008**
Research Associate, Department of Mechanical Engineering

Virginia Commonwealth University, Richmond, VA USA **2007–2008**
Visiting Postdoctoral Fellow, Department of Chemical Engineering

Ilia State University, Tbilisi, Georgia **2006–2007**
Invited Lecturer, Department of Physics and Mathematics

Nicolaus Copernicus University, Torun, Poland **2006–2007**
Principal Investigator, Department of General Chemistry

Tbilisi State University, Tbilisi, Georgia **2006–2007**
Research Scientist, Department of Physics

EDUCATION

Tbilisi State University, Tbilisi, Georgia
Ph.D in Physics (Summa Cum Laude) ..... **Sept 2006**
- ◇ Thesis Topic: "Collagen Triple Helix and DNA Double Helix Complex in Aqueous Solution"
- ◇ Advisor: Prof. George Mrevlishvili

M.S. in Physics (Summa Cum Laude) ..... **June 2005**
B.S. in Physics (with Honors) ..... **June 2003**

HONORS, AWARDS, FELLOWSHIPS

- ◇ SIR Fulbright Professor (Fulbright Scholar) **2024**
- ◇ Biophysical Society's Virtual Travel Award (Biophysical Society, USA)
  Scientists 10+ professional years beyond terminal degree **2021**
- ◇ Biophysical Society's Travel Award (Biophysical Society, USA, declined)
  Scientists 10+ professional years beyond terminal degree **2020**
- ◇ Membership Committee (Biophysical Society, USA) **2018–2024**
- ◇ Albert Nelson Marquis Lifetime Achievement Award (declined) **2017**
- ◇ Simons Foundation Recipient (Summer Program, Aspen Center for Physics, USA) **2017**
- ◇ Selected to Co-Chair Membrane Dynamics Session (Biophysical Society, USA) **2017**
- ◇ International Relations Committee Travel Award (Biophysical Society, USA) **2015**
- ◇ Biographies in Marques Who's Who (Who's Who in America, Who's Who in The World, Who's Who in Medicine and Healthcare) **2009–2016**
- ◇ International Relations Committee Travel Award (Biophysical Society, USA), 2008
- ◇ NATO scholarship (8th Course: Biophysics and the Challenges of Emerging Threats) **2007**
- ◇ International Relations Committee Travel Award (Biophysical Society, USA) **2006**
- ◇ Presidential Early Career Award for Young Scientists (Georgia) **2005**
- ◇ G. Soros Foundation II Prize for Young Scientists (Runner up the best presentation, Conference in Exact and Natural Sciences, organized by G. Soros foundation in Georgia) **2003**
- ◇ G. Soros Foundation I Prize for Young Scientists (Winner the best presentation, Conference in Exact and Natural Sciences, organized by G. Soros foundation in Georgia) **2002**
- ◇ Georgian Academy of Sciences III Prize for Young Scientists (Conference in Exact and Natural Sciences, organized by Georgian Academy of Sciences) **2002**
- ◇ Tbilisi State University I Prize for Young Scientists (Winner of the best presentation, Student Conference in Exact and Natural Sciences organized by Tbilisi State University, Georgia) **2002**
- ◇ Tbilisi Olympiads in Mathematics and Physics (Georgia) **1996–1999**

TEACHING

University of Massachussetts Lowell
- ◇ CHEM 5320 Advanced Physical Chemistry **2025**
- ◇ MATH.1310 Calculus I **2024**

New Vision University
- ◇ Research Methodology I/II **2022–2024**
- ◇ Introduction to Bophysics **2022–**
- ◇ Advanced Medical Physics and Biophysics **2021**
- ◇ General Physiology **2021**

University of Georgia (Tbilisi)
Medical Physics and Biophysics **2019–2021**

Tbilisi State University

Theoretical Biophysics **2016–2017**

General Physics for Biologists **2014–2016**

General Physics for Chemists **2014–2016**

Classical Mechanics (including Calculus) **2012–2015**

General Physics/Electromagnetism (including Calculus) **2012–2015**

Molecular Biophysics **2012–2013**

Methods in Molecular Biophysics **2012–2013**

Quantum Chemistry for Biophysicist **2012–2013**

Basics in Medical Physics and Biophysics **2012–2013**

Ilia State University

Molecular Physics and Biophysics **2007**

Thermodynamics of Biological Systems **2007**

SERVICE

◇ Board Committee Member for Ph.D dissertations **2016–2017**

◇ Committee on Conference and Faculty Appeal **2015–2016**

◇ Board Committee Member for Graduate and Undergraduate Studies **2012–2016**

◇ Scientific Content Reviewer for Peer-Reviewed Publications:

Biophysical Journal, Physical Review Fluids, Journal of Theoretical Biology, International Journal of Biological Macromolecules, Polymer Degradation and Stability, Journal of Molecular Biology, Biomacromolecules, European Polymer Journal, Nanotechnology Reviews

◇ Peer-Reviewed Journal Editorial Board Member:

Journal of Nanoscience with Advanced Technology **2016–2017**

Review Editor for membrane physiology and biophysics, subsection for Frontiers in Physics, Frontiers in Physiology and Frontiers in Cell and Developmental Biology **2021–**

CONFERENCES, SEMINARS, INVITED TALKS

◇ **Department of Theoretical Physics, Niels Bohr's Institute, University of Copenhagen**
Informal Seminar
Talk Title: Generalizing General Relativity. **2024**

◇ **Niels Bohr's Institute, University of Copenhagen**
Invited Seminar
Talk Title: Generalizing Ostwald Ripening. **2024**

◇ **Annual Meeting of the Biophysical Society, BPS2024**
Poster: Shape dynamics driving force for living matter formation. **2024**

◇ **Membrane Fusion and Budding - Estes Park**
Poster: Membrane Dynamics Control Fusion, Fission and Patterning. **2023**

◇ **International Conference on Biological Physics, ICBP 2023**
Speaker, IUPAP Travel Awardee
Talk Title: Phase Separation as Driving Force for Living Matter Formation. **2023**

◇ **Department of Physics, University of Massachusetts Lowell**
Colloquium Talk
Talk Title: Moving Manifolds and Young – Laplace, Kelvin, and Gibbs–Thomson Problems. **2022**

◇ **Niels Bohr's Institute, University of Copenhagen**
Invited Seminar
Talk Title: Generalizing the Gibbs-Thomson Equation. **2022**

◇ **American Association for Advances in Functional Materials, AAAFM UCLA**
Invited Speaker (declined)
Talk Title: Does Invisibility Cloaks Really Exist? **2021**

◇ **Annual Meeting of the Biophysical Society, BPS2021**
Virtual Travel Award
Poster: Generalization of the Gibbs-Thomson Equation and Predicting Melting Temperatures of Biomacromolecules in Confined Geometries **2021**

◇ **International Conference on Nano Research and Development**
Invited Speaker, Chair of Nano Physics, Advisory Board Member (declined)
Talk: Kelvin Equation at Nano-scale for Arbitrarily Curved Molecular Surfaces **2020**

◇ **Annual World Congress of Nano Science and Technology**
Invited Speaker
Talk: Little Droplets and Origin of Life **2019**

◇ **Global Summit of Physics**
Invited Speaker
Talk : Surface Dynamics **2019**

◇ **Annual Meeting of the Biophysical Society, BPS2019**
Late Poster: Surface Dynamics **2019**

◇ **Group Retreat Oberwiesenthal, Max Plank Institute**
Invited Speaker, Biological Physics, Max Planck Institute for the Physics of Complex Systems
Talk: Moving Manifolds and Gravitational Electrodynamics **2018**

◇ **Aspen Center for Physics**, Seminar: Active Biological Matter
Simons Recipient, Independent Physicist Supported by Simons Foundation
Talk: Moving Manifolds in Electromagnetic Field **2017**

◇ **Annual Meeting of the Biophysical Society, PBS2017** (Platform Speaker)
Co-Chair for Membrane Dynamics Session
Talk Title: Geometric Diversity of Living Organisms and Viruses **2017**

◇ **ENS Third Scientific Conference in Exact and Natural Sciences** (Plenary Talk)
Talk: Micelles Hydrodynamics **2016**

◇ **Annual Meeting of the Biophysical Society, BPS2015**
International Travel Award
Poster: Moving Macromolecular Surfaces Under Hydrophilic/Hydrophobic Stress **2015**

◇ **ENS Second Scientific Conference in Exact and Natural Sciences** (Plenary Talk)
Talk: Conformational Motion in Redox Sensitive Gene Regulatory Protein **2014**

◇ **ENS First Scientific Conference in Exact and Natural Sciences** (Plenary Talk)
Talk: Conformational Motion in OxyR **2013**

◇ **Annual Meeting of the Biophysical Society, BPS2010**
Poster: Hydrophobic-Hydrophilic Interactions **2010**

◇ **Annual Meeting of the Biophysical Society, BPS2009**
Poster: Conformational Motion of Biological Macromolecules **2009**

◇ **Annual Meeting of the Biophysical Society, BPS2008**
International Travel Award
Poster: Entropy Definition of Non-equilibrium Biological Macromolecules **2008**

◇ **Biophysics and the Challenges of the Emerging Threats**
Poster: Geometry of Water Molecules Hydrogen Bonds and Collagen-DNA Complex **2007**

◇ **Frontiers in Chemical Biology: Single Molecule**, Cambridge University
Poster: Water Bridges in Collagen-DNA Complex **2006**

◇ **Annual Meeting of the Biophysical Society, BPS2006**
International Travel Award
Poster: A mechanism of interaction between collagen triple helix and DNA double helix in aqueous solution **2006**

◇ **European Biophysics Congress**
Poster: Complex Between Collagen Triple Helix and DNA Double Helix **2005**

PERSONAL INFORMATION

◇ Birth Date: 11.14.1981

◇ Marital Status: Married, Spouse: Shorena Ukleba, Daughter: Lile Svintradze

RESEARCH INTERESTS

I am interested in new physics inspired by biological processes, such as the conformational motion of biological macromolecules and cell motility. Major inspiration from biological processes is non-equilibrium statistical physics, sometimes referred to as non-equilibrium thermodynamics, or as it becomes popular nowadays, stochastic thermodynamics and other, what I recall, shape dynamics. Both developments required new mathematical tools, and as it was consequently found, new calculus coming from Langevin dynamics, now known as Ito calculus, and for shape dynamics, new mathematical developments of differential geometry, now referred to as calculus of moving surfaces (CMS). One may not like having seemingly two different calculus. I think it is possible to unify stochastic calculus and CMS, though at the moment, my interest is using CMS to study new physics inspired by conformational motion and cell motility. In addition, I am also interested in all aspects of Theoretical and Experimental Biophysics, Soft Condensed Matter, Molecular Biophysics, Redox Sensitive Gene Regulation, Bionanotechnology, and Biomaterials.

all PUBLICATIONS

42. **David V. Svintradze**. Moving Manifolds and General Relativity. *arXive* 2406.08382 (2024).
41. **David V. Svintradze**. Manifold Solutions to Navier-Stokes Equations. *arXive* 2405.15575 (2024).
40. **David V. Svintradze**. Shape dynamics driving force for living matter formation. *Biophysical Journal.* **123**, 236a (2024). [1]
39. *[2] **David V. Svintradze**. Generalization of Young-Laplace, Kelvin, and Gibbs-Thomson Equations for Arbitrarily Curved Surfaces. *Biophysical Journal.* **122**, 892-904 (2023), **Featured Article**.
38. **David V. Svintradze**. Pattern formation on dynamic membranes. *Biophysical Journal.* **122**, 364a (2023).
37. **David V. Svintradze**. Membranes and invisibility cloaks. *Biophysical Journal* **121**, 70-71a (2022).
36. **David V. Svintradze**. Generalization of the Gibbs-Thomson Equation and Predicting Melting Temperatures of Biomacromolecules in Confined Geometries. *Biophysical Journal* **120**, 201a (2021).
35. ***David V. Svintradze**. Generalization of the Kelvin equation for arbitrarily curved surfaces. *Physics Letters A* **384**, 126412 (2020).
34. **David V. Svintradze**. Generalization of the Kelvin Equation and Macromolecular Surfaces. *Biophysical Journal* **118**, 83a (2020).
33. **David V. Svintradze**. Shape Dynamics of Bouncing Droplets. *Scientific Reports – Nature* **9**, 6015 (2019).
32. ***David V. Svintradze**. Closed, Two Dimensional Surface Dynamics. *Frontiers in Physics* **6**, 136 (2018).
31. **David V. Svintradze**. Shape Dynamics of Freely Falling Droplets. arXiv:1802.07477, (2018).
30. ***David V. Svintradze**. Moving Manifolds in Electromagnetic Fields. *Frontiers in Physics* **5**, 37 (2017).
29. **David V. Svintradze**. Geometric Diversity of Living Organisms and Viruses. *Biophysical Journal* **112**, 309a (2017).

[1] a stands for meeting abstracts.
[2] Asterisks indicate representative publications.

28. **David V. Svintradze**, (2016). Moving Manifolds in Electromagnetic Fields. arXiv:1609.07765v1 [cond-mat.soft].
27. **David V. Svintradze**, (2016). Micelles Hydrodynamics. arXiv:1608.01491 [physics.bio- ph].
26. **David V. Svintradze**. Cell Motility and Growth Factors According to Differentially Variational Surfaces. *Biophysical Journal* **110**, 623a (2016).
25. **David V. Svintradze**. Moving macromolecular surfaces under hydrophobic/hydrophilic stress. *Biophysical Journal* **108**, 512a (2015).
24. **David V. Svintradze**. Conformational Motion in Gene Regulatory Proteins. *Biophysical Journal* **106**, 652a (2014).
23. *__David V. Svintradze__, Darrell L. Peterson, Evys A. Collazo-Santiago, Janina P. Lewis, and H. Tonie Wright. Crystal Structures of the P. gingivalis OxyR Regulatory Domain Explain Differences in Expression of the OxyR Regulon in E. coli and P. gingivalis. *Acta Crystallographica Section D: Biological Crystallography* **D69**, 2091–2103 (2013).
22. **David V. Svintradze**. Predictive Power of Conformational Motion. *Biophysical Journal* **104**, 68a (2013).
21. **David V. Svintradze**. Topology of Gene Delivery Systems. *Biophysical Journal* **100**, 52a (2011).
20. * Vamsi K. Yadavalli, **David V. Svintradze**, and Ramana M. Pidaparti. Nanoscale measurements of the assembly of collagen to fibrils. *International Journal of Biological Macromolecules* **46**, 458–464 (2010).
19. **David V. Svintradze**, and Ramana M. Pidaparti. A Theoretical Model for Corrosion Degradation. *International Journal of Corrosion* **2010**, Article ID 279540, 7 pages, (2010).
18. Nunu O. Metreveli, Ketevan K. Jariashvili, Luisa O. Namicheishvili, **David V. Svintradze**, Eduard N. Chikvaidze, Alina Sionkowska, and Joanna Skopinska. UV–vis and FT-IR spectra of ultraviolet irradiated collagen in the presence of antioxidant ascorbic acid. *Ecotoxicology and Environmental Safety* **73**, 448–455 (2010).
17. **David V. Svintradze**. Hydrophobic-Hydrophilic Interactions. *Biophysical Journal* **98**, 43a (2010).
16. **David V. Svintradze**. Conformational Motion of Biological Macromolecules. *Biophysical Journal* **96**, 584a (2009).
15. Ramana M. Pidaparti, **David V. Svintradze**, Ying F. Shan, and Hiroki Yokota. Optimization of Hydrogen-Bonds for Combined DNA/Collagen Complex. *Journal of Theoretical Biology* **256**, 149–156 (2009).
14. **David V. Svintradze**, Vamsi K. Yadavalli, and Ramana Pidaparti. Structure and Nanomechanics of Collagen Complexes for Novel Biomaterials. AIChE Annual Meeting 745g (2008).
13. **David V. Svintradze**. Entropy Definition of Non-equilibrium Biological Macromolecules. *Biophysical Journal* **94**, 364a (2008).
12. * **David V. Svintradze**, George M. Mrevlishvili, Nunu Metreveli, Ketevan Jariashvili, Luisa Namicheishvili, Joanna Skopinska and Alina Sionkowska. Collagen-DNA complex. *Biomacromolecules* **9**, 21–28 (2008).
11. **David V. Svintradze**, George M. Mrevlishvili, Nunu Metreveli, Ketevan Jariashvili, Luisa Namicheishvili, Joanna Skopinska and Alina Sionkowska. Investigation of collagen-DNA films. *Journal of Physical Biology and Chemistry* **7**, 107–116 (2007).
10. **David V. Svintradze**. Prediction of Topology of Biological Macromolecules. *Biophysical Journal* **92**, 154a (2007).
9. George M. Mrevlishvili, **David V. Svintradze**, et al, (2006). Collagen-DNA macromolecular complex study by the proton magnetic relaxation method. arXiv:cond-mat/0609667 [cond-mat.soft]
8. **David V. Svintradze**, and George M. Mrevlishvili. A mechanism of interaction between collagen triple helix and DNA double helix in aqueous solution. *Biophysical Journal* **90**, 203a (2006).

7. **David V. Svintradze**, and George M. Mrevlishvili. Fiber molecular model of collagen triple helix and DNA double helix complex in aqueous solution. *Asian Journal of Biochemistry* **1**, 18–27 (2006).
6. **David V. Svintradze**, and George M. Mrevlishvili. Fiber molecular model of atelocollagen-small interfering RNA (siRNA) complex. *International Journal of Biological Macromolecules* **37**, 283–286 (2005).
5. George M. Mrevlishvili, and **David V. Svintradze**. DNA as a matrix of collagen fibrils. *International Journal of Biological Macromolecules* **36**, 324–326 (2005).
4. **David V. Svintradze**, and George M. Mrevlishvili. Complex between triple helix of collagen and double helix of DNA in aqueous solution. *European Biophysics Journal* **34**, 729a (2005).
3. George M. Mrevlishvili, and **David V. Svintradze**. Complex between triple helix of Collagen and double helix of DNA in aqueous solution. *International Journal of Biological Macromolecules* **35**, 243–245 (2005).
2. George M. Mrevlishvili, and **David V. Svintradze**. DNA as a matrix of collagen fibrils in collagen diseases. *Les Nouvelles Dermatologiques* **24**, 53a (2005).
1. George M. Mrevlishvili, and **David V. Svintradze**. Supramolecular self-assembly systems in biochemistry: Complex between triple helix of Collagen and double helix of DNA in aqueous solution. *Bulletin of the Georgian Academy of Sciences* **169**, 367–379 (2004).

FUNDING

◇ **Erasmus+ Mobility Grant Between University of Copenhagen and New Vision University**
co – Principal Investigator (25, 000 Euro)
Partnership and Mobility Agreement Between UCPH and NVU **2023–2026**

◇ **Shota Rustaveli National Science Foundation of Georgia (SRNSFG)**
Principal Investigator, Grant No. STEM-22-365 (140, 000 Gel)
Phase Separation in Biology **2022–2024**

◇ **New Vision University (NVU)**
Principal Investigator, Internal Grant (240, 000 Gel)
Cell Shape Dynamics **2022–2025**

◇ **Shota Rustaveli National Science Foundation of Georgia (SRNSFG)**
Principal Investigator, Grant No. FR-21-2844 (240, 000 Gel)
Moving Manifolds **2021–2024**

◇ **Shota Rustaveli National Science Foundation of Georgia (SRNSFG)**
Principal Investigator, Grant No. MG-TG-19-043 (10, 000 Gel)
Surface Dynamics **2019**

◇ **NATO Public Diplomacy Division's Co-Sponsorship Grants**
Co-Investigator, Grant No. CBP.EAP.CLG 982215 (10, 000 Eur)
Mechanisms of the Influence of UV Irradiation on
Collagen and Collagen-DNA Functional Complex **2006–2008**