Neer Asherie

Office Address

Yeshiva University, Belfer Hall 1412
2495 Amsterdam Avenue
New York, NY 10033, USA
(212) 960-5452
asherie@yu.edu

Home Address

345 West Street
Apt. 9B1
New York, NY 10031, USA
(212) 283-5803

EDUCATION

Massachusetts Institute of Technology **Cambridge, MA**

- Ph.D. in Physics, awarded February 1998.
- Thesis Title: "The phase diagram of protein solutions: The role of the range of interaction."
- Theoretical modeling, computer simulations and experimental investigation of the thermodynamic properties of protein solutions.
- Advisor: Prof. G.B. Benedek

University of Cambridge *(Gonville and Caius College)* **Cambridge, England**

- B.A. in Natural Sciences (Physical) with First (Highest Distinction), awarded June 1991.
- Broad curriculum in physical sciences (physics, mathematics, chemistry, crystalline materials and computing) with emphasis on mathematical physics. Senior Thesis: "The mass of the top quark."
- M.A. awarded March, 1995.

PROFESSIONAL EXPERIENCE

Yeshiva University **New York, NY**

Associate Professor: September 2010-present
Assistant Professor: September 2004-August 2010

- Joint appointment in the Department of Physics and the Department of Biology.

Massachusetts Institute of Technology **Cambridge, MA**

Research Associate: May 2001-August 2004

- Determined the phase diagram of globular proteins.
- Simulated phase behavior of proteins with highly anisotropic interactions.
- Examined the mechanism of enhanced crystal nucleation in recombinant mutant proteins.

Postdoctoral Associate: February 1998-April 2001

- Elucidated mechanism for the formation of three human genetic cataracts.
- Developed computationally tractable model for aeolotopic protein interactions.
- Examined self-assembly of helical ribbons in solutions of chiral amphiphiles.
- Synthesized and studied oligomers of phase-separating proteins.
- Co-Investigator on funded NASA research proposal.

Research Assistant: June 1994-January 1998

- Developed computer simulations to analyze protein phase separation.
- Studied mixtures of eye-lens proteins both theoretically and experimentally.

Research Assistant: *September 1991-May 1994*

- Analyzed mechanism for cyclotron emission in fusion plasmas.

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GRANTS RECEIVED

NATIONAL SCIENCE FOUNDATION — Principal Investigator
RUI: Chirality and the Phase Behavior of Globular Proteins: — $275,000
September 2012 – August 2015 — (direct plus indirect costs)

NATIONAL SCIENCE FOUNDATION — Principal Investigator
RUI: Understanding the Self-Assembly of Globular Proteins: — $300,000
Phase Behavior, Interactions, and Chirality — (direct plus indirect costs)
September 2009 – August 2012

ANONYMOUS DONOR/YESHIVA UNIVERSITY — Principal Investigator
Commercial Synthesis of R- and S-2-methyl-2,4-pentanediol — $12,000
July 2008 – June 2009 — (direct costs)

KRESSEL SCHOLARS PROGRAM — Principal Investigator
Chirality and Protein Crystallization — $14,000
June 2008 – May 2009 — (direct costs)

MILTON AND MIRIAM HANDLER FOUNDATION — Principal Investigator
Thaumatin: A Protein Sweetener — $15,000
March 2006 – February 2009 — (direct costs)

PUBLICATIONS

1. **N. Asherie**, "A dialogue about protein crystallization and phase diagrams," *Protein Pept. Lett.* **19**, 708-713 (2012).
2. C.H. Wales, J. Berger, S. Blass, R.M. Crooks, and **N. Asherie**, "Quasielastic light scattering of platinum dendrimer-encapsulated nanoparticles," *Langmuir* **27**, 4104-4109 (2011).
3. **N. Asherie**, "Blind attraction: The mechanism of an inherited congenital cataract," *Proc. Natl. Acad. Sci. USA* **108**, 437-438 (2011).
4. **N. Asherie**, J. Jakoncic, C. Ginsberg, A. Greenbaum, V. Stojanoff, B.J. Hrnjez, S. Blass and J. Berger, "Tartrate chirality determines thaumatin crystal habit," *Cryst. Growth Des.* , 4189-4198 (2009).
5. **N. Asherie**, C. Ginsberg, A. Greenbaum, S. Blass and S. Knafo, "Effects of protein purity and precipitant stereochemistry on the crystallization of thaumatin," *Cryst. Growth Des.* **8**, 4200-4207 (2008).
6. B.J. Hrnjez, A. Kabarriti, B.I. Dach, S.V. Buldyrev, **N. Asherie**, G.R. Natanov and J. Balderman, "Pyrazine in supercritical xenon: local density defined by experiment and calculation," *J. Phys. Chem. B* **112**, 15341-15441 (2008).
7. **N. Asherie**, C. Ginbserg, S. Blass, A. Greenbaum and S. Knafo, "Solubility of thaumatin," *Cryst. Growth Des.* **8**, 1815-1817 (2008).
8. L. Chincarini and **N. Asherie**, "An analytical model for the formation of economic clusters," *Reg. Sci. Urban Econ.* **38**, 252-270 (2008).
9. A. Pande, O. Annunziata, **N. Asherie**, O. Ogun, G.B. Benedek and J. Pande, "Decrease in protein solubility and cataract formation caused by the Pro23 to Thr mutation in human γD crystallin," *Biochemistry* **44**, 2491-2500 (2005).
10. **N. Asherie**, "Protein crystallization and phase diagrams," *Methods* **34**, 266-272 (2004).
11. A. Lomakin, **N. Asherie** and G.B. Benedek, "Liquid-solid transition in nuclei of protein crystals," *Proc. Natl. Acad. Sci.* **100**, 10254-10257 (2003).

PUBLICATIONS (cont.)

12. A. Basak, O. Bateman, C. Slingsby, A. Pande, **N. Asherie**, O. Ogun, G.B. Benedek and J. Pande "High resolution x-ray crystal structures of human γD crystallin and the R58H mutant associated with aculeiform cataract," *J. Mol. Biol.* **328**, 1137-1147 (2003).
13. O. Annunziata, **N. Asherie**, A. Lomakin, J. Pande, O. Ogun and G.B. Benedek, "Effect of polyethylene glycol on the liquid-liquid phase transition in aqueous protein solutions," *Proc. Natl. Acad. Sci. USA* **99**, 14165-14170 (2002).
14. **N. Asherie**, J. Pande, A. Pande, J.A. Zarutskie, J. Lomakin, A. Lomakin, O. Ogun, L.J. Stern, J. King and G.B. Benedek, "Enhanced crystallization of the Cys18 to Ser mutant of bovine γB crystallin," *J. Mol. Biol.* **314**, 663-669 (2001).
15. A. Pande, J. Pande, **N. Asherie**, A. Lomakin, O. Ogun, J. King and G.B. Benedek, "Crystal Cataracts: Human genetic cataract caused by protein crystallization," *Proc. Natl. Acad. Sci. USA* **98**, 6116-6120 (2001).
16. A. Pande, J. Pande, **N. Asherie**, A. Lomakin, O. Ogun, J.A. King, N.H. Lubsen, D. Walton and G.B. Benedek, "Molecular basis of a progressive juvenile-onset hereditary cataract," *Proc. Natl. Acad. Sci. USA* **97**, 1993-1998 (2000).
17. A. Lomakin, **N. Asherie** and G.B. Benedek, "Aeolotopic interactions of globular proteins," *Proc. Natl. Acad. Sci. USA* **96**, 9465-9468 (1999).
18. Y.V. Zastavker, **N. Asherie**, A. Lomakin, J. Pande, J.M. Donovan, J.M. Schnur and G.B. Benedek, "Self-assembly of helical ribbons," *Proc. Natl. Acad. Sci. USA* **96**, 7883-7887 (1999).
19. **N. Asherie**, J. Pande, A. Lomakin, O. Ogun, S.R.A. Hanson, J.B. Smith and G.B. Benedek, "Oligomerization and phase separation in globular protein solutions," *Biophys. Chem*. **75**, 213-227 (1998).
20. **N. Asherie**, A. Lomakin and G.B. Benedek, "Phase diagram of colloidal solutions," *Phys. Rev. Lett.* **77**, 4832-4835 (1996).
21. A. Lomakin, **N. Asherie** and G.B. Benedek, "Monte Carlo study of phase separation in aqueous protein solutions," *J. Chem. Phys*. **104**, 1646-1656 (1996).
22. C. Liu, **N. Asherie**, A. Lomakin, J. Pande, O. Ogun and G.B. Benedek, "Phase separation in aqueous solutions of lens γ-crystallins: special role of γS," *Proc. Natl. Acad. Sci. USA* **93**, 377-382 (1996).
23. C. Liu, A. Lomakin, G.M. Thurston, D. Hayden, A. Pande, J. Pande, O. Ogun, **N. Asherie** and G.B. Benedek, "Phase separation in multicomponent aqueous protein solutions," *J. Phys. Chem*. **99**, 454-461 (1995).

AWARDS AND HONORS

- Faculty/Student Research Support awarded by the National Synchrotron Light Source at Brookhaven National Laboratory, Upton, NY (January-April, 2008).
- Travel Fellowships for the XIVth International Biophysics Congress in Buenos Aires, Argentina (2002).
- Travel grant to attend the Annual Meeting of the American Crystallographic Association (1999).

PROFESSIONAL SOCIETIES

- American Physical Society, American Chemical Society.

SERVICE

- Referee for Physical Review Letters, Biophysical Journal, Journal of Physical Chemistry B, Langmuir, Crystal Growth and Design, Macromolecules, Journal of Crystal Growth, Journal of Colloid and Interface Science, Biotechnology Progress, Physical Review E, Biophysical Chemistry, Biology Letters, and Chemical Engineering Science.
- Reviewer for the National Science Foundation.

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INVITED TALKS

- "An Adventure at X6A: Precipitant chirality and protein crystallization," National Synchrotron Light Source Symposium, Brookhaven National Laboratory, Upton, NY, February 2013.
- "Precipitant chirality and protein crystallization," presented at the following places:
  i. Department of Chemistry, Texas Christian University, Fort Worth, TX, March 2011.
  ii. Department of Biology, Columbia University, New York, NY, October 2010.
- "Precipitant chirality and the crystallization of thaumatin," New York Structural Biology Discussion Group, Cold Spring Harbor, NY, August 2008.
- "Quasielastic light scattering and protein crystallization," Workshop of the International Conference on the Crystallization of Biological Macromolecules, Cancun, Mexico, May 2008
- "The phase behavior of thaumatin," presented at the following places:
  i. International Conference on the Crystallization of Biological Macromolecules, Cancun, Mexico, May 2008.
  ii. Department of Physics, Queens College (CUNY), New York, NY, April 2008.
  iii. National Synchrotron Light Source, Brookhaven National Laboratory, Upton, NY, April 2008.
  iv. Department of Physics, Rensselaer Polytechnic Institute, Troy, NY, April 2008.
  v. Department of Physics, Yeshiva University, New York, NY, April 2008.
- Lecturer and Laboratory Instructor for the National Synchrotron Light Source Protein Crystallization Workshop, Brookhaven National Laboratory, Upton, NY, June 2005, 2006, 2007 and 2008.
- "The phase behavior of globular proteins," New York Section of the American Physical Society, Spring Meeting, Rochester, NY, March 2005.
- "Understanding protein phase behavior," presented at the following places:
  i. Lehigh University, Bethlehem, PA, March 2005.
  ii. Brookhaven National Laboratory, Uptown, NY, December 2004.
  iii. Department of Physics, Yeshiva University, New York, NY, February 2004.
- "Macromolecular Solutions: Properties, Interactions and Crystal Nucleation," *Session Chair*, American Crystallographic Association, Annual Meeting, Covington, KY, July 2003.
- "Understanding protein phase behavior," presented at the following places:
  i. Department of Physics, University of South Florida, Tampa, FL, March 2003.
  ii. Department of Physics, University of California, Santa Barbara, CA, February 2003.
  iii. Division of Engineering and Applied Sciences, Harvard University, Cambridge, MA, January 2003.
- "Phase transitions in protein solutions," Modern Optics and Spectroscopy Seminar, Massachusetts Institute of Technology, Cambridge, MA, October 2002.
- "The role of anisotropic interactions in protein phase behavior," American Crystallographic Association, Annual Meeting, San Antonio, TX, May 2002.
- "The phase behavior of globular protein solutions," presented at the following places:
  i. Collège Propédeutique, University of Lausanne, Lausanne, Switzerland, March 2002.
  ii. Department of Physics, University of Oxford, Oxford, United Kingdom, February 2002.
  iii. Department of Physics, Rice University, Houston, TX, January 2002.
- "The phase diagram of globular protein solutions," presented at the following places:
  i. Laboratory for Chemical Physics, National Institutes of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, Bethesda, MD, January 1998.
  ii. Center for Bio/Molecular Science and Engineering, Naval Research Laboratory, Washington, DC, November 1997.
  iii. Interdisciplinary Workshop on Phase Transformations Occurring in Solutions of Biological Molecules, Massachusetts Institute of Technology, Cambridge, MA, October 1997.

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ORAL AND POSTER PRESENTATIONS

- "Quasielastic light scattering of dendrimer-encapsulated platinum nanoparticles," American Chemical Society National Meeting, San Diego, CA, March 2012 [talk].
- "Chirality and protein crystallization," American Chemical Society National Meeting, Washington, DC, August 2009 [talk]; December 2009 [webinar].
- "Is there a universal phase diagram for globular proteins?" Pan-American Advanced Studies Institute, Mar del Plata, Argentina, December 2006 [poster].
- "Phase behavior and protein interactions," XX Congress of the International Union of Crystallography, Florence, Italy, August 2005 [poster].
- "Liquid-solid transition in nuclei of protein crystals," New England Workshop on Complex Fluids, Harvard University, Cambridge, MA, December 2002 [talk].
- "The role of anisotropic interactions in protein phase behavior," (i) XIVth International Biophysics Congress, Buenos Aires, Argentina, April 2002 [talk]; and
  (ii) Biophysical Society, Annual Meeting, San Francisco, CA, February 2002 [poster].
- "The phase behavior of the C18S mutant of bovine γB crystallin," Biophysical Society, Annual Meeting, Boston, MA, February 2001 [poster].
- "The phase diagram of the γ-crystallins," New England Quarterly Workshop on Complex Fluids, Cambridge, MA (Massachusetts Institute of Technology), September 2000 [talk].
- "The phase diagram of globular protein solutions," American Crystallographic Association, Annual Meeting, Buffalo, NY, May 1999 [talk]; American Physical Society, Centennial Meeting, Atlanta, GA, March 1999 [talk]; Biomaterials and Complex Fluids Conference, Brandeis University, Waltham, MA, October 1997 [poster].
- "The phase diagram of aqueous protein solutions," Materials Research Society, Fall Meeting, Boston, MA, December 1996 [talk]; New England Section of the America Physical Society, Cambridge, MA, April 1996 [talk].
- "Theoretical analysis of the emissions at the cyclotron frequency harmonics of fusion produced alpha particles," International Sherwood Fusion Theory Conference, Newport, RI, March 1993 [poster].

TEACHING EXPERIENCE

Yeshiva University **New York, NY**
Fall 2004-present

- Lecturer for Waves and Optics (1110H)—honors course.
- Lecturer and Recitation Instructor for General Physics I and II (1041R; 1042R; 1042H).
- Lecturer and Recitation Instructor for Introductory Physics I and II (1031R;1032R)—redesigned courses.
- Lecturer for Topics: Biophysics (4932)—new course.
- Lecturer for Waves and Optics (1110)—redesigned course.
- Supervisor for Research in Physics (4911).
- Recitation Instructor for General Physics I and II (1041R; 1042R).
- Instructor for Physics Colloquium (4933).
- Guest Lecturer: Seminar in Physics (1837); Science Onstage (1932H), International Relations (1503); Survey of Contemporary Physics (4001H).

Massachusetts Institute of Technology **Cambridge, MA**
Fall 1991-Fall 1995

- Member of School of Science Teaching Committee.
- Teaching Assistant for graduate plasma physics courses and undergraduate statistical physics.
- Recitation Instructor for undergraduate mechanics.