

## Rana Ashkar, Ph.D.

Department of Physics ♦ Virginia Tech ♦ 850 W. Campus Dr ♦ 309 Robeson Hall ♦ 540-231-5243  
♦ [ashkar@vt.edu](mailto:ashkar@vt.edu) ♦ <https://ashkar.science>

---

### ❖ Professional Appointments

- ♦ **Associate Professor**, Department of Physics, Virginia Tech (VT) 2025–present
- ♦ **Affiliate Faculty**, Biomedical Engineering & Mechanics, VT 2025–present
- ♦ **Affiliate Faculty**, Materials Science & Engineering, VT 2026–present
- ♦ **Assistant Professor**, Department of Physics, VT 2018–2025
- ♦ **Clifford G. Shull Fellow**, Oak Ridge National Lab 2015–2017
- ♦ **Postdoctoral Scholar**, National Institute of Standards and Technology & University of Maryland at College Park 2012–2015

### ❖ Scientific Education

- ♦ **Ph.D.** in Experimental Condensed Matter Physics 2012  
Indiana University, Bloomington, IN (advisor: Prof. R. Pynn)  
*Dissertation Title: “Dynamical theory applications to neutron scattering from periodic nanostructures”* – received the 2013 Esther L. Kinsley Ph.D. dissertation award & was nominated for the Council of Graduate Schools distinguished dissertation award.
- ♦ **M.S.** in Theoretical Particle Physics 2007  
American University of Beirut, Lebanon (advisor: Prof. A. Chamseddine)  
*Thesis Title: “Spontaneously Broken Supersymmetric Gauge Theories”*
- ♦ **B.Sc.** in Physics “Summa Cum Laude” 2003  
Lebanese University, Beirut, Lebanon

### ❖ Select Awards, Honors & Leadership Roles

- ♦ Patricia Caldwell Faculty Fellowship, College of Science, VT 2025–2028
- ♦ Sloan Research Fellowship, Alfred P. Sloan Foundation 2025
- ♦ Alumni Award for Excellence in Graduate Academic Advising, VT 2024
- ♦ Elected chair, APS Committee on the Status of Women in Physics 2024
- ♦ Elected member-at-large, APS-DBIO Executive Committee 2021–2024
- ♦ Elected member-at-large, SNS/HFIR User Group Executive Committee 2021–2023
- ♦ Named Soft Matter Emerging Investigator, Royal Society of Chemistry 2021
- ♦ Invited member, Penn State Neutron Science Advisory Council 2020
- ♦ Ralph E. Powe Junior Faculty Award, Oak Ridge Associated Universities 2019
- ♦ Elected chair, American Physical Society Climate Site Visits Program 2019–2020
- ♦ AAAS-BPS Congressional Fellowship, Biophysical Society (declined) 2017
- ♦ Founder & Chair, Women in Neutron Sciences Group, ORNL 2016–2017
- ♦ Clifford G. Shull Fellowship, Oak Ridge National Lab (ORNL) 2015–2017
- ♦ Esther L. Kinsley Ph.D. Dissertation Award, Indiana University 2013
- ♦ 11<sup>th</sup> Surface X-ray and Neutron Scattering Fellowship Award 2010

❖ **Publications** (\* corresponding author, † equal authors, Superscripts: <sup>V</sup> Visiting scholar, <sup>P</sup> Postdoctoral associate, <sup>G</sup> Graduate student, and <sup>U</sup> Undergraduate mentee in the Ashkar Lab)

- ◆ “Electromechanically Induced Membrane Restructuring Enables Learning and Memory”, P.T. Podar\*, D. Bolmatov, <sup>G</sup>T. Kumarage, **R. Ashkar**, A. Adkisson, O. Ziemer, V. Sullivan, A.S. Mohamed, J.S. Najem, C.P. Collier\*, J. Katsaras\*, *Proc. Natl. Acad. Sci.* (2025). [doi.org/10.1073/pnas.2510664122](https://doi.org/10.1073/pnas.2510664122)
- ◆ “Development of Transferable Coarse-Grained Lipid Models with Optimized Structural and Elastic Membrane Properties”, S.Y. Joshi, <sup>G</sup>T. Kumarage, **R. Ashkar\***, S.A. Deshmukh\*, *J. Chem. Theory Comput.* (2025). [doi.org/10.1021/acs.jctc.5c00579](https://doi.org/10.1021/acs.jctc.5c00579)
- ◆ “Cholesterol Modulates Membrane Elasticity via Unified Biophysical Laws”, <sup>G</sup>T. Kumarage, <sup>P</sup>S. Gupta, <sup>U</sup>N.B. Morris, F.T. Doole, H. L. Scott, L.-R. Stingaciu, S.V. Pingali, J. Katsaras, G. Khelashvili, M. Doktorova\*, M.F. Brown\*, **R. Ashkar\***, *Nat. Commun.* (2025). [doi.org/10.1038/s41467-025-62106-0](https://doi.org/10.1038/s41467-025-62106-0)
- ◆ “Modification of Liposomal Properties by an Engineered Gemini Surfactant”, <sup>V</sup>A. Eftaiha\*, <sup>P</sup>S. Buti, <sup>U</sup>N.B. Morris, A. Qaroush, K. Assaf, D. Foudeh, S. Hammad, **R. Ashkar\***, *Langmuir* (2025). [doi.org/10.1021/acs.langmuir.4c03043](https://doi.org/10.1021/acs.langmuir.4c03043)
- ◆ “Neutron Spin Echo Shows pHLIP is Capable of Retarding Membrane Thickness Fluctuations”, H.L. Scott, V. Burns- Casamayor, A.C. Dixon, R.F. Standaert, C.B. Stanley, L.-R. Stingaciu, J.-M.Y. Carrillo, B.G. Sumpter, J. Katsaras, W. Qiang, F.A. Heberle, B. Mertz, **R. Ashkar\***, F.N. Barrera\*, *Biochim. Biophys. Acta (BBA) - Biomembranes* (2024). [doi.org/10.1016/j.bbamem.2024.184349](https://doi.org/10.1016/j.bbamem.2024.184349)
- ◆ “The Effects of Molecular and Nanoscopic Additives on Phospholipid Membranes”, <sup>G</sup>T. Kumarage†, <sup>U</sup>N.B. Morris†, and **R. Ashkar\***, *Front. Phys., Soft Matter Physics* (2023). **Invited Review.** [doi.org/10.3389/fphy.2023.1251146](https://doi.org/10.3389/fphy.2023.1251146)
- ◆ “Synthesis and Characterization of Stimuli-Responsive Polymer Brushes in Nanofluidic Channels”, <sup>G</sup>H. Rahmaninejad, A.J. Parnell, W.-L. Chen, N. Duzen, T. Sexton, G. Dunderdale, J.F. Ankner, W. Bras, C.K. Ober\*, A.J. Ryan\*, and **R. Ashkar\***, *ACS Appl. Mater. Interfaces* (2023). [doi.org/10.1021/acsami.3c12744](https://doi.org/10.1021/acsami.3c12744)
- ◆ “Solution Structure and Scaling Laws of Cylindrical and Tapered Bottlebrush Polymers”, M. Alaboalirat, S.J. Scannelli, <sup>G</sup>H. Rahmaninejad, J.-M. Carrillo. C. Do, J.B. Matson\*, and **R. Ashkar\***, *Macromolecules* (2023). [doi.org/10.1021/acs.macromol.3c01412](https://doi.org/10.1021/acs.macromol.3c01412)
- ◆ “Biophysics of Membrane Stiffening by Cholesterol and Phosphatidylinositol 4,5-bisphosphate (PIP2)”, F.T. Doole, <sup>G</sup>T. Kumarage, **R. Ashkar\***, M.F. Brown\*, **Invited Chapter** in the book titled *Cholesterol and PI(4,5)P2 in Vital Biological Functions*, edited by A. Rosenhouse-Dantsker (Springer 2023). [doi.org/10.1007/978-3-031-21547-6\\_2](https://doi.org/10.1007/978-3-031-21547-6_2)
- ◆ “Neutron Scattering Studies of Nanoscale Polymer-Based Coatings”, <sup>G</sup>H. Rahmaninejad, and **R. Ashkar\***, **Invited Chapter** in the book titled *Polymer-Based Nanoscale Materials for Surface Coatings*, edited by S. Thomas and J. Susan George (Elsevier 2023). [doi.org/10.1016/B978-0-32-390778-1.00024-4](https://doi.org/10.1016/B978-0-32-390778-1.00024-4)
- ◆ “Cinematic reflectometry using QIKR, the quite intense kinetics reflectometer”, J.F. Ankner\*, **R. Ashkar**, J.F. Browning, ..., E.B. Watkins, and D. Wilson, *Rev. Sci. Instrum.* (2023). [doi.org/10.1063/5.0122279](https://doi.org/10.1063/5.0122279)
- ◆ “Cholesterol Stiffening of Lipid Membranes”, F.T. Doole, <sup>G</sup>T. Kumarage, **R. Ashkar\***, M.F. Brown\*, *J. Membr. Biol.* (2022). **Invited Paper.** [doi.org/10.1007/s00232-022-00263-9](https://doi.org/10.1007/s00232-022-00263-9)
- ◆ “Molecular Simulations and NMR Reveal How Lipid Fluctuations Affect Membrane Mechanics”, M. Doktorova\*, G. Khelashvili, **R. Ashkar**, and M.F. Brown\*, *Biophys. J.* (2023). [doi.org/10.1016/j.bpj.2022.12.007](https://doi.org/10.1016/j.bpj.2022.12.007)

- ◆ "EXPANSE: A time-of-flight EXPanded Angle Neutron Spin Echo spectrometer at the Second Target Station of the Spallation Neutron Source", C. Do\*, **R. Ashkar**, C. Boone, ..., D. Wilson, Y Z, *Rev. Sci. Inst.* (2022). [doi.org/10.1063/5.0089349](https://doi.org/10.1063/5.0089349)
- ◆ "Comparison of Bulk- vs Layer-by-Layer-Cured Stimuli-Responsive PNIPAM–Alginate Hydrogel Dynamic Viscoelastic Property Response via Embedded Sensors", Y. Liu, K. Bethel, M. Singh, J. Zhang, **R. Ashkar**, E.M. Davis, B.N. Johnson\*, *ACS Appl. Polym. Mater.* (2022). [doi.org/10.1021/acsapm.2c00634](https://doi.org/10.1021/acsapm.2c00634)
- ◆ "Molecular mechanisms of spontaneous curvature and softening in complex lipid bilayer mixtures", H.J. Lessen, K.C. Sapp, A.H. Beaven, **R. Ashkar**, and A.J. Sodt\*. *Biophys. J.* (2022). [doi.org/10.1016/j.bpj.2022.07.036](https://doi.org/10.1016/j.bpj.2022.07.036)
- ◆ "Cholesterol stiffening of lipid membranes and drug interactions: Insights from neutron spin echo and deuterium NMR spectroscopy", <sup>P</sup>S. Gupta<sup>†</sup>, F.T. Doole<sup>†</sup>, <sup>G</sup>T. Kumarage, M. Doktorova, G. Khelashvili, **R. Ashkar\***, and M.F. Brown\*, **Invited Chapter** in the book titled *Cholesterol*, edited by Alex Dopico and Anna Bukiya (Elsevier 2022). [doi.org/10.1016/B978-0-323-85857-1.00037-7](https://doi.org/10.1016/B978-0-323-85857-1.00037-7)
- ◆ "The dynamic face of lipid membranes", <sup>P</sup>S. Gupta and **R. Ashkar\***, **Invited Review** in the **2021 Soft Matter Emerging Investigators Themed Collection**, *Soft Matter* (2021). **Back Cover**. [doi.org/10.1039/D1SM00646K](https://doi.org/10.1039/D1SM00646K)
- ◆ "Neutron spin echo spectroscopy as a unique probe for lipid membrane dynamics and membrane-protein interactions", <sup>G</sup>T. Kumarage<sup>†</sup>, <sup>U</sup>J. Nguyen<sup>†</sup>, and **R. Ashkar\***, **Invited Paper** in the Special Issue titled: "Neutron scattering in the biological sciences: Techniques and applications" *J. Vis. Exp.* (2021). [doi.org/10.3791/62396](https://doi.org/10.3791/62396)
- ◆ "Biomembrane structure and material properties studied with neutron scattering", J. Kinnun\*, H.L. Scott\*, **R. Ashkar\***, and J. Katsaras\*, *Front. Chem.* (2021). **Invited Review**. [doi.org/10.3389/fchem.2021.642851](https://doi.org/10.3389/fchem.2021.642851)
- ◆ "Scaling relationships for the elastic moduli and viscosity of mixed lipid membranes", E.G. Kelley\*, P. Butler, **R. Ashkar**, R. Bradbury, and M. Nagao, *Proc. Natl. Acad. Sci.* (2020). [doi.org/10.1073/pnas.2008789117](https://doi.org/10.1073/pnas.2008789117)
- ◆ "How cholesterol stiffens unsaturated lipid membranes", <sup>P</sup>S. Chakraborty, M. Doktorova, T.R. Molugu, F.A. Heberle, H.L. Scott, B. Dzikovski, M. Nagao, L.-R. Stingaciu, R.F. Standaert, F. Barrera, J. Katsaras, G. Khelashvili, M.F. Brown\*, and **R. Ashkar\***, *Proc. Natl. Acad. Sci.* (2020). [doi.org/10.1073/pnas.2004807117](https://doi.org/10.1073/pnas.2004807117)
- ◆ "Selective Dynamics in Polymeric Materials: Insights from Quasi-Elastic Neutron Scattering Spectroscopy", **R. Ashkar\***, *J. Appl. Phys.* (2020). **Invited Tutorial & Featured Article**. [doi.org/10.1063/1.5144243](https://doi.org/10.1063/1.5144243)
- ◆ "Profile retrieval of a buried periodic structure using spin echo grazing incidence neutron scattering", **R. Ashkar\***, R.M. Dalgliesh, R. Pynn, A.D.F. Dunbar, R.A.L. Jones, and A.J. Parnell\*, *Appl. Phys. Lett.* (2020). [doi.org/10.1063/1.5140616](https://doi.org/10.1063/1.5140616)
- ◆ "The Influence of Curvature on Domain Distribution in Binary Mixture Membranes", W. Li, J. M. Carrillo\*, J. Katsaras, B. Sumpter, **R. Ashkar\***, and R. Kumar\*, *Soft Matter* (2019). **Back Cover**. [doi.org/10.1039/C9SM01262A](https://doi.org/10.1039/C9SM01262A)
- ◆ "Neutron scattering in the biological sciences: Progress and prospects", **R. Ashkar**, H.Z. Bilheux, H. Bordallo, R. Briber, D.J.E. Callaway, X. Cheng, . . . and J.C. Smith\*, *Acta Cryst. D* (2018). **Lead article**. [doi.org/10.1107/S2059798318017503](https://doi.org/10.1107/S2059798318017503)
- ◆ "Quantification of carbon nanotube liquid crystal morphology via neutron scattering", F. Mirri<sup>†</sup>, **R. Ashkar\***, V. Jamali, L. Liberman, R.A. Pinnick, P. van der Schoot, Y. Talmon, P.D. Butler, and M. Pasquali\*, *Macromolecules* (2018).

[doi.org/10.1021/acs.macromol.8b01017](https://doi.org/10.1021/acs.macromol.8b01017)

- ◆ “Conformational change and suppression of the  $\Theta$ -temperature for solutions of polymer-grafted nanoparticles”, K.I. S. Mongcopa,<sup>†</sup> R. Poling-Skutvik,<sup>†</sup> **R. Ashkar**, P. Butler, and R. Krishnamoorti\*, *Soft Matter* (2018). [doi.org/10.1039/C8SM00929E](https://doi.org/10.1039/C8SM00929E)
- ◆ “Flexible approach to vibrational sum-frequency generation using shaped near-infrared light”, A. Chowdhury, F. Liu, B. Watson, **R. Ashkar**, J. Katsaras, C. Collier, D. Lutterman, Y.Z. Ma, T.R. Calhoun\*, B. Dougherty\*, *Optics Lett.* (2018). [doi.org/10.1364/OL.43.002038](https://doi.org/10.1364/OL.43.002038)
- ◆ “Grating-based holographic diffraction methods for x-rays and neutrons: phase object approximation and dynamical theory”, H. Feng, **R. Ashkar**, N. Steinke, R. Dalgliesh, N.V. Lavrik, I.I. Kravchenko, R. Pynn. *J. Appl. Cryst.* (2018). [doi.org/10.1107/S1600576717016867](https://doi.org/10.1107/S1600576717016867)
- ◆ “Probing elastic and viscous properties of phospholipid bilayers using neutron spin echo spectroscopy”, M. Nagao\*, E. Kelley, **R. Ashkar**, R. Bradbury, and P. Butler, *J. Phys. Chem. Lett.* (2017). [doi.org/10.1021/acs.jpcllett.7b01830](https://doi.org/10.1021/acs.jpcllett.7b01830)
- ◆ “Rapid large-scale assembly and pattern transfer of one-dimensional gold nanorod superstructures”, **R. Ashkar**\*, M.J. Hore\*, X. Ye, B. Natarajan, N.J. Greybush, T. Lam, C. Kagan, and C.B. Murray, *ACS Appl. Mater. Interfaces* (2017) [doi.org/10.1021/acsami.7b06273](https://doi.org/10.1021/acsami.7b06273)
- ◆ “A computational approach to model neutron scattering data from lipid bilayers”, J.-M. Carrillo\*, J. Katsaras, B.G. Sumpter, and **R. Ashkar**\*, *J. Chem. Theory Comput.* (2017). [doi.org/10.1021/acs.jctc.6b00968](https://doi.org/10.1021/acs.jctc.6b00968)
- ◆ “Unlocking the secrets of cell membranes”, **R. Ashkar**\*, *Editorial Piece – ACM SIGCAS Computers and Society Newsletter* (2016). [doi.org/10.1145/2984071.2984072](https://doi.org/10.1145/2984071.2984072)
- ◆ “Multiscale metrologies for process optimization of carbon nanotube polymer composites”, B. Natarajan, N. Orloff, **R. Ashkar**, S. Doshi, K. Twedt, A. Krishnamurthy, C. Davis, A.M. Forster, E. Thostenson, J. Obrzut, R. Sharma, J.A. Liddle\*, *Carbon* (2016). [doi.org/10.1016/j.carbon.2016.07.028](https://doi.org/10.1016/j.carbon.2016.07.028)
- ◆ “Spin echo modulated small-angle neutron scattering using superconducting magnetic Wollaston prisms”, F. Li, S. R. Parnell, H. Bai, W. Yang, W.A. Hamilton, B. B. Maranville, **R. Ashkar**, D.V. Baxter, J.T. Cremer and R. Pynn\*, *J. Appl. Cryst.* (2016). [doi.org/10.1107/S1600576715021573](https://doi.org/10.1107/S1600576715021573)
- ◆ “Graphene nanocomposites with high molecular weight poly( $\epsilon$ -caprolactone) grafts: Controlled synthesis and accelerated crystallization”, T. Mondal,<sup>†</sup> **R. Ashkar**,<sup>†</sup> P. Butler, A. Bhowmick\* and R. Krishnamoorti\*, *ACS Macro Lett.* (2016). [doi.org/10.1021/acsmacrolett.5b00930](https://doi.org/10.1021/acsmacrolett.5b00930)
- ◆ “Lightweight, flexible, high-performance carbon nanotube cables made by scalable flow coating”, Francesca Mirri, Nathan D. Orloff, **R. Ashkar**, A. Forster, C. Long, A. Bengio, A. Choi, Y. Luo, A. Hight Walker, P. Butler, K. Migler, and Matteo Pasquali\*, *ACS Appl. Mater. Interfaces* (2016). [doi.org/10.1021/acsami.5b11600](https://doi.org/10.1021/acsami.5b11600)
- ◆ “Wetting-dewetting and dispersion-aggregation transitions are distinct for polymer grafted nanoparticles in chemically dissimilar polymer matrix”, T. B. Martin<sup>†</sup>, K. I. Mongcopa<sup>†</sup>, **R. Ashkar**, P. Butler, R. Krishnamoorti\*, and A. Jayaraman\*, *J. Am. Chem. Soc.* (2015). [doi.org/10.1021/jacs.5b05291](https://doi.org/10.1021/jacs.5b05291)
- ◆ “Tuning membrane thickness fluctuations in model lipid bilayers”, **R. Ashkar**, M. Nagao\*, P. Butler, A. Woodka, M.K. Sen and T. Koga, *Biophys. J.* (2015). <https://doi.org/10.1016/j.bpj.2015.05.033>

- ◆ “Thermoresponsive PNIPAM coatings on nanostructured gratings for cell alignment and release”, M. Zhernenkov\*<sup>†</sup>, **R. Ashkar**\*<sup>†</sup>, H. Feng, O. Akintewe, N.D. Gallant, R. Toomey, J.F. Ankner, and R. Pynn, *ACS Appl. Mater. Interfaces* (2015).  
[doi.org/10.1021/acsami.5b01453](https://doi.org/10.1021/acsami.5b01453)
- ◆ “Kinetic polymer arrest in percolated SWNT networks”, **R. Ashkar**\*, M. Abdalbaki, M. Tyagi, A. Faraone, P. Butler and R. Krishnamoorti\*, *ACS Macro Lett.* (2014).  
[doi.org/10.1021/mz500636s](https://doi.org/10.1021/mz500636s)
- ◆ “A new approach for probing matter in periodic nanoconfinements using neutron scattering”, **R. Ashkar**\*, R. Pynn, R. Dalgliesh, N. Lavrick, and I. Kravchenko. *J. Appl. Cryst.* (2014). [doi.org/10.1107/S1600576714013387](https://doi.org/10.1107/S1600576714013387)
- ◆ “Optimization of a solid-state polarizing bender for cold neutrons”, V.R. Shah, A.L. Washington, P. Stonaha, **R. Ashkar**, H. Kaiser, T. Krist and R. Pynn\*. *Nucl. Instr. Meth. A* (2014). [doi.org/10.1016/j.nima.2014.09.005](https://doi.org/10.1016/j.nima.2014.09.005)
- ◆ “Dynamical Theory: Application to spin echo resolved grazing incidence scattering from periodic structures”, **R. Ashkar**\*, W.L. Schaich, V.O. de Haan, A.A. van Well, R. Dalgliesh, J. Plomp, R. Pynn\*. *J. Appl. Phys.* (2011). [doi.org/10.1063/1.3661162](https://doi.org/10.1063/1.3661162)
- ◆ “Comparison of dynamical theory and phase-object approximation on neutron scattering from periodic structures”, **R. Ashkar**\*, V. de Haan, A.A. vanWell, R. Dalgliesh, J. Plomp, W.L. Schaich, and R. Pynn. *J. Appl. Cryst.* (2011). [doi.org/10.1107/S0021889811032730](https://doi.org/10.1107/S0021889811032730)
- ◆ “Some recent results using Spin Echo Resolved Grazing Incidence Scattering (SERGIS)”, Roger Pynn\*, **R. Ashkar**, P. Stonaha, and A.L. Washington. *Physica B* (2011).  
[doi.org/10.1016/j.physb.2010.10.085](https://doi.org/10.1016/j.physb.2010.10.085)
- ◆ “Dynamical theory calculations of spin echo resolved grazing-incidence scattering from a diffraction grating”, **R. Ashkar**\*, P. Stonaha, A.L. Washington, V.R. Shah, M.R. Fitzsimmons, B. Maranville, C. F. Majkrzak, W.T. Lee, W.L. Schaich, and R. Pynn\*. *J. Appl. Cryst.* (2010). [doi.org/10.1107/S0021889810010642](https://doi.org/10.1107/S0021889810010642)

❖ **Select Invited Talks** (Internal talks, job talks & summer school lectures not included)

- ◆ “*Unified Scaling in Membrane Elasticity: From Molecular Complexity to Predictive Laws*”, **Invited Colloquium**, Physics Dept., Wake Forest University, Salem, NC (Nov. 2025)
- ◆ “*When Complexity Simplifies: Predictive Laws of Membrane Elasticity*”, **Invited Colloquium**, Department of Physics, Indiana University, Bloomington, IN (Oct. 2025)
- ◆ “*From Molecular Complexity to Unified Laws: Rethinking Membrane Elasticity*”, **Invited Talk**, 92<sup>nd</sup> Annual Meeting of the Southeastern Section of the American Physical Society (SESAPS), Harrisonburg, VA (Oct. 2025)
- ◆ “*Lessons from Nature: How Membrane Dynamics Shape Health and Technology*”, **Invited Talk**, Non-Equilibrium And Emergent Transients in advanced and soft matter (NEAT) Symposium, Oak Ridge National Lab (Aug. 2025)
- ◆ “*Unified Elastic Behavior of Biomembranes: Biophysical Significance and Potential Applications*”, **Invited Seminar**, Department of Chemistry, University of Tennessee, Knoxville, TN (Nov. 2024)
- ◆ “*Smart Nanostructured Interfaces: Biologically Inspired to Biologically Applied*”, **Plenary Talk**, International Symposium on Stimuli-Responsive Materials, Windsor, CA (Oct. 2024)
- ◆ “*Membrane Elasticity and Phase Separation with Free and Bound Sterols*”, **Invited Talk**, Biological Membranes and Membrane Proteins Meeting, Santa Fe, NM (June 2024)
- ◆ “*Predictive Laws of Membrane Elasticity: From Fundamental Principles to Practical Applications*”, **Invited Colloquium**, Materials Science & Engineering Department,

University of Illinois, Urbana-Champaign, IL (Jan. 2024)

- ◆ “Membrane Deformations: Inherent Fluctuations and Imposed Curvature”, Invited Talk, Telluride Workshop on Complexity in the Chemistry and Physics of Lipid Membranes, Telluride, CO (June 2023)
- ◆ “Mesoscopic Membrane Mechanics: From Fundamental Principles to Health and Disease”, Invited Talk, Virginia Soft Matter Workshop, Richmond, VA (April 2023)
- ◆ “Mesoscopic Membrane Dynamics: From Fundamental Principles to Health and Disease”, Invited Seminar, Department of Chemistry & Biochemistry, University of Arizona, virtual (April 2023)
- ◆ “Dynamic Signatures of Vital Functional Processes in Lipid Membranes”, Invited Colloquium, Physics Department, Lehigh University, Bethlehem, PA (April 2023)
- ◆ “Lipid Membrane Mechanics: From Fundamental Physics to Health and Disease”, Invited talk, 89<sup>th</sup> Annual Meeting of the Southeastern Section of the American Physical Society (SESAPS), University of Mississippi, MS (Nov. 2022)
- ◆ “Smart Polymer Interfaces: From Biologically Inspired to Biologically Applied”, Invited Talk, Materials Research Society (MRS) Meeting, Honolulu, HI (May 2022)
- ◆ “Membranes In Action: How Mesoscopic Membrane Mechanics Regulate Cellular Functions”, Invited Colloquium, Department of Chemistry and Biochemistry, University of Windsor, virtual (March 2022)
- ◆ “Cell Membranes from the Lens of Neutron Scattering and Computer Simulations”, Plenary Talk, 2021 Joint Nanoscience and Neutron Scattering User Meeting, Oak Ridge National Lab, virtual (Aug. 2021)
- ◆ “The Dynamic Interplay Between Cell Membranes and Membrane Proteins”, Invited Talk, 71<sup>st</sup> American Crystallographic Association (ACA) Annual Meeting, virtual (Aug. 2021)
- ◆ “Stiffening Effect of Cholesterol in Saturated and Unsaturated Phosphatidylcholine Membranes”, Invited Talk, 257<sup>th</sup> American Chemical Society (ACS) Annual Meeting, virtual (April 2021)
- ◆ “Collective Dynamics in Lipid Membranes: From Fundamental Physics to Health and Disease”, Invited Colloquium, Department of Physics, College of William & Mary, virtual (March 2021)
- ◆ “Biomimetic Lipid Membranes from a Neutron Scattering and Simulations Perspective”, Invited Seminar, Department of Chemical and Biomedical Engineering, University of South Florida, virtual (2020)
- ◆ “Elasticity and Phase-Separation in Amphiphilic Self-Assemblies: From Biology to Nanotechnology”, Invited Talk, American Conference on Neutron Scattering (ACNS), virtual (July 2020)
- ◆ “Biomimetic Lipid Membranes: A Neutron Scattering & Simulations Perspective”, Invited Talk, Materials Research Society (MRS) Fall Meeting & Exhibit, Boston, MA (Dec. 2019).
- ◆ “Polymer Dynamics in Percolated Polymer Networks”, Keynote Lecture, 93<sup>rd</sup> ACS Colloid & Surface Science Symposium, Atlanta, GA (June 2019).
- ◆ “Interfacial Structure and Dynamics in Nanoparticle-Polymer Composites”, Invited Talk, American Physical Society (APS) March Meeting, Boston, MA (March 2019)
- ◆ “Playing Hide-and-Seek with Neutrons”, Keynote Lecture, 10<sup>th</sup> Annual Conference for Undergraduate Women in Physical Sciences, Lincoln, NE (Oct. 2018)
- ◆ “Topography and Fluctuations in Biomimetic Lipid Bilayers”, Invited Talk, 9<sup>th</sup> workshop on Neutron Scattering Applications in Structural Biology, Oak Ridge National Lab (June 2018)
- ◆ “Interfacial Properties in Polymer Nanocomposites”, Invited Talk, American Conference on Neutron Scattering (ACNS), Long Beach, CA (July 2016)
- ◆ “A Neutron Scattering Approach for Probing Matter in Nanoconfinements”, Invited Talk, American Conference on Neutron Scattering (ACNS), Washington D.C. (June 2012)

## ❖ Outreach and External Service Activities

- ◆ Program co-chair, American Conference on Neutron Scattering (2026).
- ◆ Vice chair, NCNR User Group Executive Committee (2026-2027).
- ◆ Elected member-at-large, NIST Center for Neutron Research User Group (2025-2029).
- ◆ Member, APS Maria Goeppert Mayer Award selection committee (2025).
- ◆ Member, SESAPS BEAMS Award Selection committee (2025).
- ◆ Past chair, APS Committee on the Status of Women in Physics (2025).
- ◆ Chair, APS Committee on the Status of Women in Physics (2024).
- ◆ Chair, APS M. Hildred Blewett Fellowship selection committee (2024).
- ◆ Co-organizer of the “Biomembrane Synthesis, Structure, Mechanics, and Dynamics” Symposium, ACS Spring Meeting (2024-present).
- ◆ Invited member, Scientific review and advisory committee, ORNL-wide crosscut initiative for Non-Equilibrium And Emergent Transients in advanced and soft matter (NEAT) (2024-present).
- ◆ Organizer and chair of the “Biomembranes” session, APS March Meeting (2022-2025).
- ◆ Invited lecturer, National School on Neutron and X-Ray Scattering run by Oak Ridge National Lab and Argonne National Lab (2020-present).
- ◆ Chair, APS-DBIO Travel Award selection committee (2021-2023)
- ◆ Invited reviewer, National Academies of Sciences, Engineering, and Medicine (NASEM) report, "An Assessment of the National Institute of Standards and Technology Center for Neutron Research: Fiscal Year 2023".
- ◆ Co-lead, Training and Institutional Structure session, NSF sponsored workshop on Instrumentation and Infrastructure for Soft Materials, Polymers and Biomaterials (2022).
- ◆ Member, APS-DBIO Fellowship selection committee (2021-2022).
- ◆ Elected member-at-large, Executive Committee of the American Physical Society, Division of Biological Physics (APS-DBIO) (2021-2024).
- ◆ Elected member-at-large, Executive Committee of the Spallation Neutron Source and High Flux Isotope Reactor (SNS/HFIR) User Group (2021-2024).
- ◆ Chair, APS-DBIO Dissertation Award selection committee (2021).
- ◆ Representative of the American Physical Society on Congressional Visits (2021).
- ◆ Invited member, Advisory boards of the Quite Intense Kinetics Reflectometer (QIKR) and the EXpanded-Angle Neutron Spin Echo (EXPANSE) instruments for the Second Target Station (STS) at ORNL (2021-2023).
- ◆ Invited member, Penn State Neutron Science Advisory Council (2020-present).
- ◆ Chair, APS Climate Site Visits program, the flagship program of the APS Committee on the Status of Women in Physics (2019-2020).
- ◆ Invited member, APS Committee on the Status of Women in Physics (2018-2020).
- ◆ Program co-chair, Soft Matter, American Conference on Neutron Scattering (2018).
- ◆ Physics editor, ACM Computers and Society Newsletter (2015-2017).
- ◆ Founder and chairperson, “Women in Neutron Sciences (WiNS)” group at Oak Ridge National Lab (2015-2017).
- ◆ Member, NIST postdoc association leadership team (2014-2015).
- ◆ Member, Advisory Board of the “Women in Science Program” run by the Office of Women’s Affairs at Indiana University (2009-2012).
- ◆ Reviewer for NSF, NIH, DOE, and ACS PRF (2018-present).
- ◆ Reviewer for SNS/HFIR, NCNR, SSRL, APS scattering facilities (2013-present).
- ◆ Reviewer for numerous scientific journals including Nature Journals, Biophysical Journal, APS Journals, ACS Journals, RSC Journals, Elsevier Journals.

## ❖ Department and University Service Activities (Virginia Tech)

- ◆ Member, Strategic Planning Committee, Department of Physics (2025-2026).
- ◆ Member, Honorifics Committee, Department of Physics (AY 2025-2026).
- ◆ Lead, Physics cohort, Equity in Graduate Education Consortium, Virginia Tech Sloan Center for Change (2024-2025).
- ◆ Reviewer, Virginia Tech Presidential Postdoctoral Fellowship Program (2024-present).
- ◆ Elected Member, Executive Committee, Department of Physics (2020-2021, 2021-2022, 2023-2024, 2024-2025).
- ◆ Elected member, Steering Committee, Center of Soft Matter and Biological Physics (2022-2024, 2024-2026).
- ◆ Regular participant, College of Science outreach events for high school students and teachers (2020-present).
- ◆ Member, Department of Physics FAR evaluation committee (2019, 2021, 2022, 2024).
- ◆ Reviewer, 2025 Advising Awards Selection Committee (2025).
- ◆ Member, Experimental Soft Matter and/or Biological Physics Faculty Search Committee (AY 2022- 2023).
- ◆ Organizer, VT-ORNL Joint Symposium on Soft Matter and Biological Physics – held in collaboration with Oak Ridge National Laboratory (2023).
- ◆ Organizer, Annual Symposium for the Center of Soft Matter and Biological Physics (2021-present).
- ◆ Reviewer, grant applications for the Center for Emerging, Zoonotic, and Anthropod-borne Pathogens (CeZAP) (2022-2023).
- ◆ Beckman Mentor, College of Science (2021-2022).
- ◆ Invited member, Materials Destination Area (DA) Stakeholders Committee (2019-2020).
- ◆ Invited member, ICTAS Center for Engineered Health Stakeholders Committee (2019-2020).
- ◆ Member, Theoretical/Computational Soft Matter and/or Biological Physics Faculty Search Committee (2018- 2019).
- ◆ Lead, Taskforce on Biological Interfaces for the VT-BioMaterials Workshop (2019).
- ◆ Member, Strategic Planning Committee, Department of Physics (2018-2019).
- ◆ Host of numerous speakers at departmental colloquia and seminars, as well as seminar series run by the Macromolecular Innovation Institute and the Fralin Life Sciences Institute.

## ❖ Teaching Experience

- ◆ Instructor, PHYS 2305, Foundations of Physics for Engineers – calculus-based mechanics course for non-physics majors, primarily engineering majors (2018-present).
- ◆ Instructor, PHYS 4714/5714G, (Introduction to) Biophysics – specifically developed to meet the needs of graduate and undergraduate students with diverse educational backgrounds, different disciplines, and research/career interests across the Colleges of Science and Engineering (2019-present).
- ◆ Guest Instructor, Nano 2114, Nanoscience Research Seminar – covers current research in nanoscience and nanotechnology including functional nanomaterials, molecular engineering, bionanotechnology and nanomedicine (2022-present).
- ◆ Invited Lecturer, National School on Neutron and X-Ray Scattering hosted by Oak Ridge National Lab and Argonne National Lab to train next-generation users on scattering principles and applications in materials science and engineering (2020-present).

## ❖ **Scholars/Students Advised**

- ◆ **Visiting Scholars:** Prof. Alaa Efaiha, Hashemite University (Sept. 2023 – Aug. 2024)
- ◆ **Postdocs:** Suryabrahmam Buti, research associate (2023-present)  
Sudipta Gupta, research associate (2021-2022) – now at Merck Analytical  
Saptarshi Chakaraborty, postdoc (2019-2020) – now at Wacker Polysilicon
- ◆ **Graduate Mentees:** Teshani Kumarage (Ph.D. 2024, now a postdoc at U. Illinois Urbana-Champaign), Hadi Rahmaninejad (Ph.D. 2022, now a postdoc at U. Southern California), Chi Chen (M.S. 2022), Amirali Chizari (M.S. 2025), Dinidu Hathnagoda (Ph.D. candidate), Chathurika Arachchige (Ph.D. candidate), Dina Foudeh (Ph.D. candidate), Alexander Nelli (Ph.D. candidate).
- ◆ **Undergraduate Mentees:** Julie Nguyen (Physics, 1<sup>st</sup> generation college student), Vincent Vasudevan (Physics), Michael Kane (Mechanical Engineering), Alison Gaylord (Physics), Liam Weston (Physics), Wallace Borden (Physics), Maria Ziu (Physics), Eleni Ziu (Nanoscience), Mayuk Sengupta (Nanomedicine), Nicholas Morris (Physics, 1<sup>st</sup> generation student), Andrew Johnson (Physics), Cassell McMillian (Beckman Scholar), Alexandra Habibi (Nanomedicine), Justin Polcha (Materials Science & Engineering), Jacob DeGregoris (Physics), Jeffrey Pearson (Physics), Brannon Semp (Physics), Joshua Buontempo (Physics/Materials Science & Engineering), Jasmine Albert (Physics), Emma Lee Kinsey (Biology), Al Mercedes Casado (Physics), Cecelia Cashin (Nanoscience), Eva Choberka (Engineering), Matthew Crane (Physics), Dominic Arseni (Physics), Bokyoung Kim (Nanoscience), Toby Lam (Physics), Dmitri Golden (Physics).
- ◆ **Other Mentees:** In addition to directly mentoring scholars and students in my lab, I have served on the doctoral committees of more than 15 Ph.D. students across various departments within the Virginia Tech College of Science and College of Engineering.

## ❖ **Funding Sources**

- ◆ Alfred P. Sloan Foundation
- ◆ U.S. National Science Foundation
- ◆ U.S. Department of Energy
- ◆ Health Resources in Action