Curriculum Vitae

Arnaldo L. Serrano

Assistant Professor

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Department of Chemistry and Biochemistry
University of Notre Dame
361 Stepan Chemistry Hall
Notre Dame, IN 46556

Education

2013 Ph.D. in Chemistry
University of Pennsylvania; Philadelphia, PA
Advisor: Professor Feng Gai
Dissertation Title: Time-Resolved Infrared and Fluorescent Spectroscopic Studies of Protein Dynamics and Structure

2007 B.A. in Chemistry (with Honors)
Rutgers University; Newark, NJ
Research Advisor: Huixin He

Professional Experience

2017-Present Assistant Professor
Department of Chemistry and Biochemistry
University of Notre Dame

2013-2016 Postdoctoral Fellow
Research Advisor: Professor Martin T. Zanni
Department of Chemistry
University of Wisconsin, Madison

Affiliations

2017-Present Faculty Participant
Integrated Biomedical Sciences (IBMS) Graduate Program
University of Notre Dame

2017-Present Faculty Participant
Biophysics Graduate Program
University of Notre Dame

Honors and Awards

2023 NSF CAREER Award
2015 ACS Physical Division Postdoctoral Research Award
2015 Hans Neurath Outstanding Promise Award, from the Protein Society
2007 Phi Beta Kappa Honors Society
2007 Honors College Graduate
2004 Nets/Devil Scholarship
2003 James Dickson Carr Scholarship

Professional Memberships

2008-Present The American Chemical Society
2015-Present The Protein Society

Publications

From Notre Dame

(1) Smith J., Hanson M., Corcelli S.A., **Serrano A.L.** Perspective: The Potential of Data Science Approaches in Multidimensional Spectroscopy and Imaging. (Invited Article), *Journal of Physical Chemistry A.* (in preparation)

(2) Cracchiolo O.M., Edun D., Goldberg J.M., **Serrano A.L.** Cross-α/β Polymorphism of PSMα3 Fibrils. *Proceeding of the National Academy of Sciences* **2022**

(3) Edun D., Cracchiolo O.M., **Serrano A.L.** A Theoretical Analysis of Coherent Cross-Peaks in Polarization Sensitive 2DIR for Detection of Cross-α Fibrils. *Journal of Chemical Physics* **2021**

(4) Drexler C.I., Cracchiolo O.M., Myers R.L., Okur H.I., **Serrano A.L.**, Corcelli S.A., Cremer P.S. Local Electric Fields in Aqueous Electrolytes. *Journal of Physical Chemistry B* **2021**

(5) Edun D., Flanagan M., **Serrano A.L.** Does liquid–liquid phase separation drive peptide folding? *Chemical Science* **2021**

(6) Cracchiolo O.M., Geremia D.K., Corcelli S.A., **Serrano A.L.** Hydrogen Bond Exchange and Ca^{2+} Binding of Aqueous N-Methylacetamide Revealed by 2DIR Spectroscopy. *Journal of Physical Chemistry B* **2020**

(7) Edun D.N., Nelmark C.E., **Serrano A.L.** Resolution Enhancement in Wide-Field IR Imaging and Time-Domain Spectroscopy Using Dielectric Microspheres. *Journal of Physical Chemistry A* **2020**

Prior to Notre Dame

(8) **Serrano A.L.**, Lomont J.P., Tu L.H, Raleigh D.P., Zanni M.T. A Free Energy Barrier Caused by the Refolding of an Oligomeric Intermediate Controls the Lag Time of Amyloid Formation by hIAPP. *Journal of the American Chemical Society* **2017**

(9) Kratochvil H.T.; Carr J.K.; Matulef K.; Annen A.W.; Li H., Maj M.; Ostmeyer J.; **Serrano A.L.**; Raghuraman H.; Moran S.D.; Skinner J.L.; Perozo E.; Roux B.; Valiyaveetil F.I.; Zanni M.T. Instantaneous ion configurations in the K+ ion channel selectivity filter revealed by 2D IR spectroscopy. *Science* **2016**

(10) Ostrander J.S.; **Serrano A.L.**; Ghosh A; Zanni M.T. Spatially Resolved Two-Dimensional Infrared Spectroscopy via Wide-Field Microscopy. *ACS Photonics* **2016**

(11) Ghosh A.; **Serrano A.L.**; Oudenhoven T.A.; Ostrander J.S.; Eklund E.C.; Blair A.F.; Zanni M.T. Experimental implementations of 2D IR spectroscopy through a horizontal pulse shaper design and a focal plane array detector. *Optics Letters* **2016**

(12) **Serrano A.L.**; Ghosh A.; Ostrander J.S.; Zanni M.T. Wide-Field FT-IR Microscopy using Mid-IR pulse-shaping. *Optics Express* **2015**

(13) Ghosh A.; Ho J.J.; **Serrano A.L.**; Skoff D.R.; Zhang T.O.; Zanni M.T. Two-dimensional sum-frequency generation (2D SFG) spectroscopy: summary of principles and its application to amyloid fiber monolayers. *Faraday Discuss* **2015**

(14) Tu L.H.; **Serrano A.L.**; Zanni M.T.; Raleigh D.P. Mutational Analysis of Preamyloid Intermediates: The Role of His-Tyr Interactions in Islet Amyloid Formation. *Biophysical Journal* **2014**

(15) Laaser J.E.; Skoff D.R.; Ho J.J.; Joo Y.; **Serrano A.L.**; Steinkruger J.; Gopalan P.; Gellman S.H.; Zanni M.T. Two-dimensional sum-frequency generation (2D SFG) reveals structure and dynamics of a surface-bound peptide. *Journal of the American Chemical Society* **2014**

(16) **Serrano, A.L.**; Bilsel O.; Gai, F. Native State Conformational Heterogeneity of HP35 Revealed by Time-Resolved FRET. *Journal of Physical Chemistry B* **2012**

(17) **Serrano, A.L.**; Waegele, M.M.; Gai, F. Spectroscopic Studies of Protein Folding: Linear and Nonlinear Methods. *Protein Science* **2012**

(18) Culik, R.M.; **Serrano, A.L.**; Bunagan, M.R.; Gai, F. Achieving Secondary Structural Resolution in Kinetic Measurements of Protein Folding: A Case Study of the Folding Mechanism of Trp-Cage. *Angewandte Chemie-International Edition* **2011**

(19) **Serrano, A.L.**; Tucker, M.J.; Gai, F. Direct Assessment of the Alpha-Helix Nucleation Time. *Journal of Physical Chemistry B* **2011**

(20) Urbanek, D.C.; Vorobyev, D.Y.; **Serrano, A.L.**; Gai, F.; Hochstrasser, R. M. The Two-Dimensional Vibrational Echo of a Nitrile Probe of the Villin HP35 Protein. *Journal of Physical Chemistry Letters* **2010**

(21) **Serrano, A.L.**; Troxler, T.; Tucker, M.J.; Gai, F. Photophysics of a Fluorescent Non-Natural Amino Acid: P-Cyanophenylalanine. *Chemical Physics Letters* **2010**

(22) Ma, Y.; Chiu, P.L.; **Serrano, A.L.**; Ali, S.R.; Chen, A.M.; He, H. The Electronic Role of DNA-Functionalized Carbon Nanotubes: Efficacy for in Situ Polymerization of Conducting Polymer Nanocomposites. *Journal of the American Chemical Society* **2008**

Research Support

Current

1. National Science Foundation
   "CAREER: Nonlinear Infrared Studies of Biomolecular Coacervation"
   Role: Sole Principal Investigator
   $650,000 total (03/23-02/28)

2. National Science Foundation
   "Super Resolution Two-Dimensional Infrared Imaging"
   Role: Sole Principal Investigator
   $360,000 total (08/21-07/24)

Presentations

Upcoming

36. Physical Chemistry Seminar, *UW-Madison, Department of Chemistry,* 2023 (invited)

35. Physical Chemistry Seminar, *UMD, Department of Chemistry,* 2023 (invited)

34. Physical Chemistry Seminar, *Purdue University, Department of Chemistry*, 2023 (invited)

33. Physical Chemistry Seminar, *UC-San Diego, Department of Chemistry*, 2023 (invited)

Completed:

32. Protein Folding Dynamics Gordon Research Conference, *Ventura CA* (poster)

31. FACSS SciX, "Structural Transitions of FUS Protein within Liquid-Liquid Phase Separated Droplets Probed by Light Scattering and 2DIR spectroscopy," 2022 (invited)

30. FACSS SciX, "Advancements in Mid-IR Imaging Techniques for the Study of Biological Liquid-Liquid Separation," 2022 (invited)

29. Telluride Workshop on Advances of Multidimensional Vibrational Spectroscopy in Water, Biology and Materials, *Telluride, CO* 2022 (invited)

28. 10th International Conference on Coherent Multidimensional Spectroscopy, 2022 (invited)

27. Physical Chemistry Seminar, *UC-Irvine, Department of Chemistry*, 2022 (invited)

26. Physical Chemistry Seminar, *University of Pennsylvania, Department of Chemistry*, 2022 (invited)

25. Chemistry Seminar, *University of Nevada-Reno, Department of Chemistry*, 2022 (invited)

24. Chemistry Colloquium, *Rutgers University, Department of Chemistry*, 2022 (invited)

23. Chemistry Seminar, *University of Alabama, Department of Chemistry,* 2022 (invited)

22. Physical Chemistry Seminar, *University of Michigan, Department of Chemistry,* 2021 (invited)

21. Physical Chemistry Seminar, *Wayne State University, Department of Chemistry*, 2021 (invited)

20. *ACS Fall National Meeting*, Atlanta, Ga, 2021 (invited)

19. Telluride Workshop on Vibrational Dynamics, *Telluride, CO* 2021 (invited)

18. Condensed Matter Seminar, *University of Delaware, Department of Physics*, 2021 (invited)

17. Towards super-resolution 2DIR Imaging: Wide-field IR imaging and time-domain spectroscopy through dielectric microspheres *ACS Fall National Meeting* 2020 (contributed)

16. Does liquid-liquid phase separation drive peptide folding? *ACS Fall National Meeting* 2020 (contributed)

15. "Frontiers of 2DIR Spectroscopy: Proteins, Materials, and Microscopy*" Indiana Weslyan University* 2019 (invited)

14. Combined FTIR, 2DIR and Computational Study of the Effects of Hofmeister Ions on a Model Peptide *ACS Spring National Meeting* 2019 (contributed)

Prior to appointment at Notre Dame:

13. George Washington University, Department of Chemistry, 2017

12. California Institute of Technology, Division of Chemistry and Chemical Engineering, 2017

11. Penn State, Department of Chemistry, 2016

10. Boston University, Departments of Chemistry and Physics, 2016

9. University of Rochester, Department of Chemistry, 2016

8. University at Buffalo, Department of Physics, 2016

7. University of Oregon, Department of Chemistry, 2016

6. Rice University, Department of Chemistry, 2016

5. "Wide-field FTIR (and some 2D IR) microscopy using mid-IR pulse shaping". *Fall American Chemical Society National Conference.* 2015 Boston, MA. (Contributed Talk)

4. "2D IR spectroscopy reveals a β-sheet intermediate that dictates the fiber formation of hIAPP." *29th Annual Symposium of the Protein Society.* 2015 Barcelona, Spain. (Poster)

3. "Wide-field FTIR microscopy using mid-IR pulse shaping. *TRVS 2015*. 2015 Madison, WI. (Contributed Talk)

2. "Secondary Structure and Dynamics of an Amyloid Intermediate studied by 2D IR Spectroscopy and progress towards 2D IR Imaging". *7th International Conference on CMDS.* 2014 Eugene, OR. (Poster)

1. "Native State Conformational Heterogeneity of HP35 Revealed by Time-Resolved FRET." *Fall American Chemical Society National Conference.* 2012 Philadelphia, PA. (Poster)

Mentoring

Name	***Years of Mentorship***	***Current Position***
Postdoctoral Researchers		
1. Dr. Lu Lin	2019- 2020	Post Doc, Oak Ridge National Lab
Doctoral Dissertation Students		
1. Robert Catuto	2023-Present	
2. Claire Nelmark	2019-Present	
3. Anna Zepeda	2021-Present	
4. Danielle Geremia	2018-Present	

5.	Dean Edun	2018-2022	
6.	Olivia Cracchiolo	2019-2021	Vertex Pharmaceuticals

Undergraduate Researchers

1.	Chase Soukup	2018-2020	Student, Univ. of Minn. Med. School
2.	Meredith Flanagan	2018-2021	Student, Univ. of Pitt. Med. School
3.	Jacob Smith	2020-2022	

Mentee Presentations

5. Anna Zepeda, "Probing Protein Structural Changes During Liquid Hydrogel Progression via 2DIR Spectroscopy" *Fall ACS National Meeting 2022* (Poster)

4. Claire Nelmark "Advancements in mid-IR imaging techniques for the study of biological liquid-liquid phase separation" *Fall ACS National Meeting 2022* (Poster)

3. Danielle Geremia "Using Infrared Spectroscopy Methods to Probe Peptide Structure and Solvation within Phase Separated Droplets" *Fall ACS National Meeting 2022* (Poster)

2. Olivia Cracchiolo "Effect of Salt on the Amide I Vibrations of Model Peptides" *Spring ACS National Meeting* **2019** (Poster)

1. Danielle Geremia "Small Molecule Inhibition of Tau Aggregation" *Midwest Protein Folding Conference* **2019** (Poster)

University Service Activities

2021-Present	Physical Chemistry representative to the Seminar Committee
2021-Present	Physical Chemistry representative to the Graduate Studies Committee
2020-Present	Mentor, Mary E. Galvin Science and Engineering Scholars program
2017-2021	Graduate Admissions Committee, Physical Division Representative

Thesis Committees

2017-2020	Shelby Brantley
2017-2021	Hyeln Do
2017-2020	Rebecca Sheidt
2018-2019	Brendan Mahoney
2018-Present	Brandan Brown
2018-Present	Seol Baek
2018-2019	Heath Rose
2019-Present	Lauren Eckerman
2019-Present	Reagan Meredith
2020-2021	Allison Miller

2020-2021	Jin Jia
2021-Present	Cameron Wright
2021-Present	Kirill Kniazev
2021-Present	Jarek Metro
2021-Present	Rebekah Thimes
2022-Present	Maria Andrea Rodriguez
2022-Present	Shayanta Mukherjee

External Service Activities

2022	NSF-CMI review panelist
2021	Co-Symposium Organizer "Ultrafast Vibrational Spectroscopy – New Methods and Applications" Hybrid In-Person/Virtual , ACS National Meeting Fall 2021
2021	Early Career Reviewer, NIH EBIT study section
2020	Session Chair, ACS National Meeting Fall 2020
2017-Present	Ad hoc proposal reviewer: NSF, ACS PRF, DOE
2017-Present	Journal Referee: *JPC, JCP, Optics Letters, PRL, Spectrochimica Acta, Chem, JACS, ACS Photonics, J Mol Liq, Comm. Physics, ACS Books, Biophys. J.*
2018	Judge, Association for Women in Science Conference
2019	Judge, Northern Indiana Regional Science and Engineering Fair
2019	Session Chair, ACS National Meeting Spring 2019

Collaborators:

Paul Cremer	Pennsylvania State University, State College, PA
Jacob Goldberg	Colgate University, Hamilton, NY
Lin Guo	Thomas Jefferson University, Philadelpha, PA
Steven Corcelli	University of Notre Dame, Notre Dame, IN

Synergistic Activities

Course Design – Redesigned courses to introduce concepts from "Mastery"-style teaching (such as identifying and distilling component skills), incorporated new technology (tablet based lectures to synthesize content in a more seamless manner), prerecorded material to allow for partially "flipped" classroom, and finally, introduced students to scientific programing through the use of a Python IDE. These course elements were integrated into both undergraduate and graduate courses including: Quantum Mechanics (Graduate), Physical Chemistry I (Juniors), and Mathematical Methods for the Chemical Sciences (Sophomores).

Educational and Scientific Software – Developed an online code package with students from sophomore Math Methods to allow lay people to simulate a variety of conditions of pandemic infection dynamics. Project was developed in the context of the initial lockdown during the Covid-19 pandemic and published open access to GitHub.

Midwest Graduate Workshop on Ultrafast Science – In development with Sarah King of the University of Chicago. A workshop designed to combine and compound the training efforts of the many the ultrafast spectroscopy and imaging labs in the Midwest Region of the United States and to provide a local and low-cost opportunity for Graduate Students to network. Organization is ongoing, with first meeting projected for summer 2023.