DR. PETAR N. PETROV

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EDUCATION

2014-2020 **Stanford University**
PhD in Physical Chemistry
Thesis: *Improving the Precision and Accuracy of Three-Dimensional Single-Molecule Localization Microscopy*
Advisor: Prof. W. E. Moerner

2010-2013 **University of California, Berkeley**
BS in Chemistry with high honors

APPOINTMENTS

2020-Present **Prof. Holger Müller Lab, University of California, Berkeley**
Postdoctoral Scholar, Dept. of Physics
Research area: method development for phase-contrast cryo-electron microscopy

2014-2020 **Prof. W. E. Moerner Lab, Stanford University**
Graduate Student Researcher, Dept. of Chemistry
Research area: method development for single-molecule fluorescence microscopy

2011-2013 **Prof. Peidong Yang Lab, University of California, Berkeley**
Undergraduate Student Researcher, Dept. of Chemistry
Research area: synthesis and characterization of nanowire photonics

Summer 2011 **Berkeley Center for Green Chemistry**
Research Intern
Advisors: Dr. Martin Mulvihill and Dr. Michelle Douskey
Research areas: solar cell design and chemical education

2007-2010 **Prof. John Bowen Lab, University of Central Oklahoma**
High School Student Researcher (volunteer), Dept. of Chemistry
Research area: synthesis and characterization of biodiesel

RESEARCH INTERESTS

Method development in optical & electron microscopy & spectroscopy; structure & spatio-temporal dynamics of biomolecules & their environments; theory & experiment in optical metrology; signal & image processing algorithms

GRANTS & FELLOWSHIPS

2023-2024 Ruth L. Kirschstein Postdoctoral Fellowship (F32 GM149186); NIH/National Institute of General Medical Sciences

2017-2020 Stanford Interdisciplinary Graduate Fellowship; Stanford University

2011-2014 Melvin J. Heger-Horst Undergraduate Fellowship; College of Chemistry, UC Berkeley

2013 Undergraduate Research Stipend; College of Chemistry, UC Berkeley

HONORS & AWARDS

2019 Bio-X Travel Award; Stanford University

2018 Poster Award, Bio-X Interdisciplinary Initiatives Seed Grants Program Symposium; Stanford University

2018 Second Best Poster; Stanford University Photonics Retreat

2018 Bio-X Travel Award; Stanford University

2017 Second Best Poster; Stanford University Photonics Retreat
2017 Bio-X Travel Award; Stanford University
2016 Best Poster; Stanford University Photonics Retreat
2014 Glenn T. Seaborg Award for Outstanding Undergraduate Research in Chemistry; UC Berkeley
Awarded to one graduating chemistry major for exceptional performance in research
Fall 2013 Dean's List; College of Chemistry, UC Berkeley
Spring 2013 Dean's List; College of Chemistry, UC Berkeley
Fall 2011 Dean's List; College of Chemistry, UC Berkeley

TEACHING, MENTORSHIP, & OUTREACH

Teaching:

Fall 2016 Head Teaching Assistant; Chemical Principles Accelerated (Chem 31X); Stanford University
Fall 2015 Teaching Assistant; Chemical Principles Accelerated (Chem 31X); Stanford University
Winter 2015 Teaching Assistant; Physical Chemistry Laboratory (Chem 176); Stanford University
Fall 2014 Teaching Assistant; Chemical Principles Accelerated (Chem 31X); Stanford University
2013-2014 Independent Tutor (Mathematics, Chemistry)
Fall 2011 Co-Facilitator; Chemistry Undergraduate Internships & Research (Chem 98/198); UC Berkeley

Mentorship & Outreach:

2022 The Compass Project at Berkeley
Provided bi-weekly one-on-one mentorship to an undergraduate physics student at UC Berkeley
2021 Be A Scientist (Bay Area Scientists In Schools)
Led middle school students in developing, conducting, and presenting science experiments in their classroom
2018-2019 Stanford Splash
Created and taught short courses on microscopy for high school students
2017 Stanford Science Penpals
Corresponded by mail with high school students from low-income backgrounds about science, college, and graduate school
2017 Inspiring Future Scientists Through Shadowing
Supervised and mentored a high school student in a research project on white-light interferometry
2016 Stanford Summer Undergraduate Research Fellowship Program
Trained and mentored a visiting undergraduate student in an independent research project on adaptive optics

SERVICE

2024-Present Springer Nature; Reviewer
2018-Present Optica Publishing Group; Reviewer
2011-2014 Berkeley Undergraduate Chemical Society; Co-Founder & Webmaster
2012 Berkeley Chemical Review; Founding Editor

SELECTED PRESENTATIONS

Invited Talks:

12. Molecular Foundry Symposium on Free Electron Quantum Physics; Berkeley, CA, USA; August 2024
11. From Solid State to Biophysics; Cavtat, Croatia; June 2024
10. TU Wien; Vienna, Austria; May 2024
9. I2PC Seminar Series on Image Processing; virtual; October 2023
8. Gordon Research Seminar on Three Dimensional Electron Microscopy; Newry, ME, USA; June 2023
7. Rosalind Franklin Institute; Didcot, UK; April 2023

6. Laboratory of Molecular Biology; Cambridge, UK; April 2023
5. One World Cryo-EM Seminar Series; virtual; March 2023
4. Institute for Pure and Applied Mathematics; Los Angeles, CA, USA; November 2022
3. University of Vienna; Vienna, Austria; September 2022
2. Max Planck Institute for the Science of Light; Erlangen, Germany; September 2022
1. Max Planck Institute of Molecular Cell Biology and Genetics; Dresden, Germany; September 2022

Other Talks:

9. Institute of Science and Technology Austria; Klosterneuburg, Austria; May 2024
8. Bay Area Cryo-EM Meeting; Redwood City, CA, USA; October 2023
7. International Microscopy Congress; Busan, South Korea; September 2023
6. Quantitative BioImaging; Oxford, UK; January 2020
5. Quantitative BioImaging; Rennes, France; January 2019
4. Quantitative BioImaging; Göttingen, Germany; January 2018
3. Stanford University Single-Molecule Seminar Series; Stanford, CA, USA; February 2017
2. SPIE BiOS (Single Molecule Spectroscopy and Superresolution Imaging Conference); San Francisco, CA, USA; January 2017 [doi]
1. Annual Pentasectional Meeting of the American Chemical Society; Norman, OK, USA; April 2010

Poster Presentations:

14. Frontiers in Electron Microscopy for Physical and Life Sciences; Princeton, NJ, USA; October 2024
13. Gordon Research Conference on Three Dimensional Electron Microscopy; Newry, ME, USA; June 2023
12. eBEAM School on Nano-Optics with Free Electrons; Porquerolles, France; September 2022
11. Stanford Bio-X Interdisciplinary Initiatives Seed Grants Symposium; Stanford, CA, USA; February 2020
10. Stanford Bio-X Fellowship Symposium; Stanford, CA, USA; October 2019
9. Stanford University Photonics Retreat; Marshall, CA, USA; April 2019
8. Stanford Bio-X Interdisciplinary Initiatives Seed Grants Symposium; Stanford, CA, USA; February 2019
   · *Received Poster Award*
7. Stanford Bio-X Symposium; Stanford, CA, USA; August 2018
6. Stanford Photonics Retreat; Pacific Grove, CA, USA; April 2018
   · *Awarded Second Best Poster*
5. Stanford Bio-X Fellowship Symposium; Stanford, CA, USA; October 2017
4. NIH Common Fund 4D Nucleome 2017 Annual Meeting; Bethesda, MD, USA; September 2017
3. Stanford University Photonics Retreat; Pacific Grove, CA, USA; April 2017
   · *Awarded Second Best Poster*
2. Stanford University Photonics Retreat; Marshall, CA, USA; April 2016
   · *Awarded Best Poster*
1. UC Berkeley Saegebarth Undergraduate Research Fair; Berkeley, CA, USA; April 2013

PUBLICATIONS

Pre-Prints:

1. **PN Petrov**, JT Zhang, JJ Axelrod, H Müller, "Crossed laser phase plates for transmission electron microscopy," arXiv:2410.11328 [doi]

Peer-Reviewed Papers:

16. J Remis, **PN Petrov**, JT Zhang, JJ Axelrod, H Cheng, S Sandhaus, H Müller, RM Glaeser, "Cryo-EM phase-plate images reveal unexpected levels of apparent specimen damage," *J. Struct. Biol.* **216**(4), 108150 (2024) [doi]
15. JJ Axelrod, JT Zhang, **PN Petrov**, RM Glaeser, H Müller, "Modern approaches to improving phase contrast electron microscopy," *Curr. Opin. Struc. Biol.* **86**, 102805 (2024) [doi]

14. JJ Axelrod, **PN Petrov**, JT Zhang, J Remis, B Buijsse, RM Glaeser, H Müller, "Overcoming resolution loss due to thermal magnetic field fluctuations from phase plates in transmission electron microscopy," *Ultramicroscopy* **249**, 113730 (2023) [doi]

13. A-K Gustavsson, RP Ghosh, **PN Petrov**, JT Liphardt, WE Moerner, "Fast and parallel nanoscale three-dimensional tracking of heterogeneous mammalian chromatin dynamics," *Mol. Biol. Cell* **33**(6), 1-11 (2022) [doi]
· *Selected as a Highlight from MBoC*

12. **PN Petrov**, H Müller, RM Glaeser, "Perspective: Emerging strategies for determining atomic-resolution structures of macromolecular complexes within cells," *J. Struct. Biol.* **214**(1), 107827 (2022) [doi]

11. C Turnbaugh, JJ Axelrod, SL Campbell, JY Dioquino, **PN Petrov**, J Remis, O Schwartz, Z Yu, Y Cheng, RM Glaeser, H Müller, "High-power near-concentric Fabry-Perot cavity for phase contrast electron microscopy," *Rev. Sci. Instrum.* **92**, 053005 (2021) [doi]
· *Selected as Editor's pick*

10. **PN Petrov**, WE Moerner, "Addressing systematic errors in axial distance measurements in single-emitter localization microscopy," *Opt. Express* **28**(13), 18616-18632 (2020) [doi]

9. HW Bennett, A-K Gustavsson, CA Bayas, **PN Petrov**, N Mooney, WE Moerner, PK Jackson, "Novel fibrillar structure in the inversin compartment of primary cilia revealed by 3D single-molecule super-resolution microscopy," *Mol. Biol. Cell* **31**(7), 619-639 (2020) [doi]
· *Selected as a Highlight from MBoC*

8. L Möckl, AR Roy, **PN Petrov**, WE Moerner, "BGnet: Accurate and rapid background estimation in single-molecule localization microscopy with deep neural nets," *Proc. Natl. Acad. Sci. U.S.A.* **117**(1), 60-67 (2020) [doi]

7. L Möckl, **PN Petrov**, WE Moerner, "Accurate phase retrieval of complex 3D point spread functions with deep residual neural networks," *Appl. Phys. Lett.* **115**, 251106 (2019) [doi]
· *Selected as Editor's pick*

6. A-K Gustavsson, **PN Petrov**, WE Moerner, "Light sheet approaches for improved precision in 3D localization-based super-resolution imaging in mammalian cells," *Opt. Express* **26**(10), 13122-13147 (2018) [doi]

5. A-K Gustavsson, **PN Petrov**, MY Lee, Y Shechtman, WE Moerner, "3D single-molecule super-resolution microsocopy with a tilted light sheet," *Nat. Commun.* **9**, 123 (2018) [doi]
· *Featured in Nature Methods Research Highlights* [doi]
· *Featured in BioPhotonics (front cover)* [url]

4. Y Shechtman, A-K Gustavsson, **PN Petrov**, E Dultz, MY Lee, K Weis, WE Moerner, "Observation of live chromatin dynamics in cells via 3D localization microscopy using Tetrapod point spread functions," *Biomed. Opt. Express* **8**(12), 5735-5748 (2017) [doi]

3. **PN Petrov**, Y Shechtman, WE Moerner, "Measurement-based estimation of global pupil functions in 3D localization microscopy," *Opt. Express* **25**(7), 7945-7959 (2017) [doi]

2. MP Backlund, A Arbabi, **PN Petrov**, E Arbabi, A Faraon, WE Moerner, "Removing orientation-induced localization biases in single-molecule microscopy using a broadband metasurface mask," *Nat. Photonics* **10**(7), 459-462 (2016) [doi]

1. A Fu, H Gao, **PN Petrov**, P Yang, "Widely Tuneable Distributed Bragg Reflectors Integrated into Nanowire Waveguides," *Nano Lett.* **15**(10), 6909-6913 (2015) [doi]

Software:

1. **PN Petrov** & WE Moerner, *Easy Pupil Finder* (2017); SourceForge, GitHub