DR. PETAR N. PETROV

email: ppetrov@berkeley.edu | website: https://itspetar.github.io

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
GPA: 3.92/4

RESEARCH EXPERIENCE

2020-Present **Prof. Holger Müller Lab, University of California, Berkeley**
NIH F32 Postdoctoral Fellow (2022-Present)
Postdoctoral Scholar (2020-2021)

2014-2020 **Prof. W. E. Moerner Lab, Stanford University**
Stanford Interdisciplinary Graduate Fellow (2017-2020)
Graduate Student Researcher (2014-2017)

2011-2013 **Prof. Peidong Yang Lab, University of California, Berkeley**
Undergraduate Student Researcher

Summer 2011 **Berkeley Center for Green Chemistry**
Research Intern
Advisors: Dr. Martin Mulvihill and Dr. Michelle Douskey

2007-2010 **Prof. John Bowen Lab, University of Central Oklahoma**
High School Researcher (volunteer)

RESEARCH INTERESTS

Novel methods in optical & electron microscopy & spectroscopy; structure & spatio-temporal dynamics of molecules; theory & experiment in optical metrology; optical resonators; signal & image processing algorithms

GRANTS & FELLOWSHIPS

2022-2023 Ruth L. Kirschstein Postdoctoral Fellowship (F32 GM149186); NIH/National Institute of General Medical Sciences
2017-2020 Stanford Interdisciplinary Graduate Fellowship (Anonymous Donor); Stanford University
2011-2014 Melvin J. Heger-Horst Fellowship; 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

2013 Undergraduate Research Stipend; College of Chemistry, UC Berkeley

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, MENTORING, & 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

Fall 2011 Co-Facilitator; Chemistry Undergraduate Internships & Research (Chem 98/198); UC Berkeley

2013-2014 Private Tutor (SAT Preparation)

Mentorship & Outreach:

2022 Mentor; The Compass Project at Berkeley

2021 Instructor; Be A Scientist (Bay Area Scientists In Schools)

2018-2019 Instructor & Course Creator, *"A single molecule, the smallest thing you can see"*; Stanford Splash

2017 Mentor; Stanford Science Penpals

2017 Mentor; Inspiring Future Scientists Through Shadowing; Stanford Chemistry

2016 Mentor; Stanford Summer Undergraduate Research Fellowship Program

SERVICE

2018-Present Reviewer; Optica Publishing Group

2011-2014 Co-Founder & Webmaster; Berkeley Undergraduate Chemical Society

2012 Founding Editor; Berkeley Chemical Review

SELECTED PRESENTATIONS

Invited Talks:

10. From Solid State to Biophysics X; Cavtat, Croatia; June 2024 (planned)
9. I2PC Seminar Series on Image Processing; remote; 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. Laboratry of Molecular Biology; Cambridge, UK; April 2023
5. One World Cryo-EM Seminar Series; remote; 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:

8. Bay Area Cryo-EM Meeting; Redwood City, CA; October 2023
7. International Microscopy Congress 20; 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. 55th Annual Pentasectional Meeting of the American Chemical Society; Norman, OK, USA; April 2010

Poster Presentations:

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

Peer-Reviewed Papers:

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 Research Highlights, Methods in Brief, *Nat. Methods* **15**(3), 163 (2018) [doi]
   · Featured in Stanford News, 22 February, 2018 [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]

Conference Proceedings:

3. JJ Axelrod, **PN Petrov**, JT Zhang, S Sandhaus, J Remis, RM Glaeser, H Müller, "Overcoming Resolution Loss in Laser Phase Plate Cryo-Electron Microscopy," *Microsc. Microanal.* **29**(S1), 1017 (2023) [doi]

2. JJ Axelrod, JY Dioquino, **PN Petrov**, J Remis, S Sandhaus, JH Silber, J Whinnery, RM Glaeser, H Müller, "Laser Phase Plate: Advancing Beyond Proof-of-Concept," *Microsc. Microanal.* **28**(S1), 1186-1187 (2022) [doi]

1. A-K Gustavsson, **PN Petrov**, MY Lee, Y Shechtman, WE Moerner, "Tilted light sheet microscopy with 3D point spread functions for single-molecule super-resolution imaging in mammalian cells," *Proc. SPIE Int. Soc. Opt. Eng.* **10500**, 105000M (2018) [doi]

Software:

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