Stanford



W. E. Moerner

Harry S. Mosher Professor, Emeritus

Chemistry

Curriculum Vitae available Online

CONTACT INFORMATION

- **Alternate Contact**

  Sarah Fields - Administrative Associate

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Bio

BIO

W. E. (William Esco) Moerner, the Harry S. Mosher Professor of Chemistry and Professor by courtesy of Applied Physics, has conducted research in physical chemistry, biophysics, and the optical properties of single molecules, and is actively involved in the development of 2D and 3D super-resolution imaging for cell biology. Imaging studies include viral RNA and proteins in infected cells, protein superstructures in bacteria and mammalian cells, and studies of chromatin organization. Using powerful microscopes optimized for tracking of single objects in cells, the motions of proteins, DNA, and RNA are being measured in three dimensions in real time to understand organization, processing and binding interactions. A previous research area concerns precise analysis of photodynamics of single trapped biomolecules in solution, with applications to photosynthesis, protein-protein interactions, and transport measurements.

Born in Pleasanton, California, Moerner was raised in San Antonio, Texas. He attended Washington University as a Langsdorf Engineering Fellow, graduating in 1975 with degrees in Physics and Electrical Engineering (both B.S. with top honors), and Mathematics (A.B. summa cum laude). His doctoral research in physics at Cornell University (M.S. 1978, Ph.D. 1982) employed tunable infrared lasers to explore infrared vibrational modes of impurities in crystals. In 1982, he joined the IBM Research Division developing spectral holeburning for frequency domain optical storage and photorefractivity for dynamic hologram formation. After 13 years at IBM, Dr. Moerner became Distinguished Professor of Physical Chemistry at UC San Diego, where he broadened his research to include biological systems and biophysics. Recruited to the Stanford Chemistry Department faculty in 1997, he served as Chair of the department from 2011 to 2014.

Professor Moerner’s scientific contributions were recognized with the 2014 Nobel Prize in Chemistry "for the development of super-resolved fluorescence microscopy." One method to surpass the optical diffraction limit (PALM/STORM) uses single-molecule imaging combined with an active control mechanism to keep the concentration of emitting molecules at a very low level, followed by sequential localization to reconstruct the underlying structure. The fundamentals of this idea came from early work in the Moerner lab: optical detection and imaging of single molecules (1989) combined with blinking and switching at low temperature, as well as the discovery of optical control and blinking of single copies of green fluorescent protein at room temperature (1997). Among many other honors and awards, Professor Moerner was elected fellow of the American Physical Society, Optical

Society of America, American Association for the Advancement of Science, American Academy of Arts and Sciences, SPIE; and member of the National Academy of Sciences.

Today, the Moerner Laboratory uses laser spectroscopy and microscopy of single molecules to probe biological processes, one molecule at a time. Primary thrusts include development and application of fluorescence microscopy far beyond the optical diffraction limit by PALM/STORM, 3D single-molecule tracking in complex cellular environments, invention and validation of methods for precise and accurate 3D optical microscopy in cells, and imaging of viral RNA and proteins during cellular infection by SARS-CoV-2 viruses. Through a variety of collaborations, these approaches are applied to explore protein and oligonucleotide localization patterns in mammalian cells and bacteria, define the organization of cell invasion proteins in parasites such as Toxoplasma gondii, and develop correlative super-resolution optical imaging with cryo-EM enhanced by suitable switchable fluorescent proteins for 77K.

Please visit the Moerner Lab home page for more information.

ACADEMIC APPOINTMENTS

- Professor Emeritus, Chemistry
- Member, Bio-X
- Faculty Fellow, Sarafan ChEM-H
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Faculty Fellow, ChEM-H at Stanford, (2014- present)
- Chairman, Department of Chemistry, Stanford University, (2011-2014)
- Member, Advisory Board, Center for Biological Imaging at Stanford, (2010-2015)
- Member, Board of Scientific Counselors, NIBIB, (2010-2014)
- Chair, University Health and Safety Committee, (2008-2010)

HONORS AND AWARDS

- Nobel Prize in Chemistry, Nobel Foundation (2014)
- Wu Zheng Kai Chemistry Prize, Fudan University (2018)
- Distinguished Eagle Scout Award, Boy Scouts of America (2017)
- INSPIRE Award for Excellence, San Antonio Independent School District (2016)
- Julio Palmaz Award for Innovation in Healthcare and Biosciences, BioMed SA (2015)
- Peter Debye Award in Physical Chemistry, American Chemical Society (2013)
- Irving Langmuir Prize in Chemical Physics, American Physical Society (2009)
- Wolf Prize in Chemistry, Wolf Foundation of Israel (2008)
- Member, National Academy of Sciences (2007)
- Earle K. Plyler Prize in Molecular Spectroscopy, American Physical Society (2001)
- Fellow, Optical Society of America (1992)
- Fellow, American Physical Society (1992)
- National Winner, Roger I. Wilkinson Outstanding Young Electrical Engineer Award, Eta Kappa Nu (1985)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, Advisory Board, Institute of Atomic and Molecular Sciences, Academica Sinica, Taiwan (2003 - 2025)
- Director, Bay Area Science and Innovation Consortium (BASIC) (2024 - present)
- Trustee, Society for Science and the Public (2018 - present)
- Member, Scientific Advisory Board, Welch Foundation (2017 - 2021)
- Member, International Advisory Board, Angewandte Chemie (2017 - 2019)
- Member, Corporation Visiting Committee, Department of Chemistry, Massachusetts Institute of Technology (2013 - 2017)
- Editorial Advisory Board Member, Journal of Physical Chemistry (2013 - 2015)
- Member, Board of Scientific Counselors, National Institute of Biomedical Imaging and Bioengineering (2010 - 2014)
- Member, DOE Workshop on Single-Molecule Research in the New Millenium (2005 - 2005)
- Advisory Editor, Single Molecules (2000 - 2002)
- Member, NIH-NIGMS Workshop on Single Molecule Detection and Manipulation (2000 - 2000)
- Member, FAMOS Update Panel, National Research Council (1999 - 2002)
- Member, NIH Bioengineering Symposium Panel on Imaging at the Molecular and Cellular Levels (1998 - 1998)

PROFESSIONAL EDUCATION

- Ph.D., Cornell University , Physics (1982)
- M.S., Cornell University , Physics (1978)
- B. S., Washington University , Physics (1975)
- B. S., Washington University , Electrical Engineering (1975)
- A. B., Washington University , Mathematics (1975)

COMMUNITY AND INTERNATIONAL WORK

- Amateur Radio Emergency Service

LINKS

- Moerner Lab: http://web.stanford.edu/group/moerner
- More information about Prof. Moerner: http://web.stanford.edu/group/moerner/WEM.html

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Most biophysical or chemical experiments in condensed matter measure the average behavior of a huge number, N, of molecules, where N may range from millions to billions to Avogadro's Number. At the same time, most theoretical models are intended to describe the behavior of a single molecule interacting with its surroundings, and averaging over the number of molecules N is normally required to compute an observable. Using precision laser spectroscopic techniques, we have been detecting and probing the detailed properties of individual impurity molecules hidden deep inside a cell, in a protein, or even in a liquid, i.e., the ultimate limit of N=1. This was first done in the Moerner Lab in 1989, and has since expanded dramatically to include many groups around the world. A key reason for doing this is to explore heterogeneity that is normally obscured by ensemble averaging.

Studying one individual molecule in a solid means we are working with an extremely small number of moles of material. You might be aware that the international standards organization, IUPAC, has defined several new prefixes: zepto- for 1E-21, and yocto- for 1E-24. Thus 1 molecule is equivalent to 1.66 yoctomoles. But we think this is unwieldy. Thus we define a new prefix guaca- so that (with apologies to Prof. Avogadro)

1 guacamole = 1 / (Avocado's Number) of moles.

More seriously, it is worth recalling that each molecule we are probing is only 1 or 2 nanometers in size. This means that when we use a laser to select one probe molecule, we can sense details of the immediate local environment of a truly nanoscopic probe.

To achieve this extreme reduction of the concentration and reach the single-molecule level, we use either (a) extremely low concentrations and diffraction-limited confocal, TIRF, or far-field microscopy, or (b) near field optical excitation to pump sample volumes much smaller than the diffraction limit, or (c) superresolution imaging by single-molecule active control. By studying a large number of individual molecules one at a time, we are able not only to observe how the usual ensemble average behavior is formed, but also to see unexpected, surprising behavior normally hidden by the usual ensemble averaging.

The phenomena under study include protein localization patternd in bacteria, chaperonin proteins, and new fluorophores for active-control superresolution imaging. By dispersing the emitted light, even the vibrational mode spectrum of a single molecule may be measured! By measuring correlations in the emitted photon stream, fast dynamics including environmental fluctuations, or the purely quantum-mechanical behavior termed photon antibunching may be probed. In biomolecules, we observe fascinating differences in behavior due to conformational states, local environments, or enzymatic cycle, all of which are obscured in large N experiments.

Importantly, a single molecule can be viewed as a probe of its immediate local nanoenvironment on the scale on the order of the molecular size (~1 nm). Because single molecules are nanoscale emitters, when active control is used to turn molecules on and off, it is possible to build up a super-resolution image of the sample, far beyond the optical diffraction limit, typically on the 40 nm scale. Several advanced optical techniques for obtaining thee-dimensional information from single-molecule photoswitching are underdevelopment, and we apply these methods to imaging a variety of cellular structures in bacteria and in mammalian cells and to tracking of RNA in living yeast.

Teaching

COURSES

2026-27

- Advanced Physical Chemistry: Single Molecules and Light: CHEM 279 (Spr)

2025-26

- Advanced Physical Chemistry: Single Molecules and Light: CHEM 279 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Danny Ha, Amy McKeown-Green, Joshua Reynolds

Postdoctoral Research Mentor

Michelle Kueppers

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biophysics (PhD Program)

Publications

PUBLICATIONS

- **Super-resolution atlas of SARS-CoV-2 infection reveals protease-dependent organelle maturation, dsRNA landscapes, and intracellular structural proteins.** *Nature communications*
  Andronov, L., Han, M., Balaji, A., Zhu, Y., Qi, L. S., Moerner, W. E.
  2026
- **Efficient double helix detection with steerable filters.** *Biomedical optics express*
  Barentine, A. E., Balaji, A., Moerner, W. E.
  2026; 17 (7): 3609-3616
- **Organization of Myosin H in the Apical Complex of Toxoplasma Gondii Revealed by 3D Single-Molecule Super-Resolution Microscopy.** *bioRxiv : the preprint server for biology*
  Balaji, A., Zarko, L. S., Barentine, A. E., Boothroyd, J. C., Moerner, W. E.
  2026
- **CRISPR-Cas-based live cell imaging of genome dynamics.** *Nature reviews. Genetics*
  Zhu, Y., Moerner, W. E., Qi, L. S.
  2026
- **Interferometric Image Scanning Microscopy for label-free imaging at 120 nm lateral resolution inside live cells.** *Light, science & applications*
  Küppers, M., Moerner, W. E.
  2026; 15 (1)
- **Revealing the nanoscale organization of myosin H in the apical complex of Toxoplasma gondii through 3D single-molecule localization microscopy of gel-expanded samples**
  Balaji, A., Zarko, L., Barentine, A. E. S., Boothroyd, J., Moerner, W. E.
  CELL PRESS.2026: 218a
- **Combined Scattering and Fluorescence Sensing of Single Nanoparticles Confined in an Anti-Brownian Electrokinetic Trap**
  Carpenter, W. B., Lavania, A. A., Squires, A. H., Moerner, W. E.
  edited by Dholakia, K., Rubinsztein-Dunlop, H.
  SPIE-INT SOC OPTICAL ENGINEERING.2026
- **Efficient Double Helix Detection with Steerable Filters.** *bioRxiv : the preprint server for biology*
  Barentine, A. E., Balaji, A., Moerner, W. E.
  2025
- **A Super-Resolution Spatial Atlas of SARS-CoV-2 Infection in Human Cells.** *bioRxiv : the preprint server for biology*
  Andronov, L., Han, M., Balaji, A., Zhu, Y., Qi, L. S., Moerner, W. E.
  2025
- **High-resolution dynamic imaging of chromatin DNA communication using Oligo-LiveFISH.** *Cell*
  Zhu, Y., Balaji, A., Han, M., Andronov, L., Roy, A. R., Wei, Z., Chen, C., Miles, L., Cai, S., Gu, Z., Tse, A., Yu, B. C., Uenaka, et al
  2025
- **Roquin exhibits opposing effects on RNA stem-loop stability through its two ROQ domain binding sites**
  Carpenter, W. B., Lavania, A., Turnsek, J., Oltrogge, L. M., Savage, D., Moerner, W. E.
  CELL PRESS.2025
- **Interferometric Image Scanning Microscopy for label-free imaging at 120 nm resolution inside live cells** *bioRxiv*
  Küppers, M., Moerner, W. E.
  2025
- **Label-Free Anti-Brownian Trapping of Single Nanoparticles in Solution.** *The journal of physical chemistry. C, Nanomaterials and interfaces*
  Carpenter, W. B., Lavania, A. A., Squires, A. H., Moerner, W. E.
  2024; 128 (47): 20275-20286

- **Label-Free Anti-Brownian Trapping of Single Nanoparticles in Solution** *JOURNAL OF PHYSICAL CHEMISTRY C*
  Carpenter, W. B., Lavania, A. A., Squires, A. H., Moerner, W. E.
  2024
- **Exploring Transient States of PAmKate to Enable Improved Cryogenic Single-Molecule Imaging.** *Journal of the American Chemical Society*
  Perez, D., Dowlatshahi, D. P., Azaldegui, C. A., Ansell, T. B., Dahlberg, P. D., Moerner, W. E.
  2024
- **Interstitial macrophages are a focus of viral takeover and inflammation in COVID-19 initiation in human lung.** *The Journal of experimental medicine*
  Wu, T. T., Travaglini, K. J., Rustagi, A., Xu, D., Zhang, Y., Andronov, L., Jang, S., Gillich, A., Dehghannasiri, R., Martinez-Colon, G. J., Beck, A., Liu, D. D., Wilk, et al
  2024; 221 (6)
- **Nanoscale cellular organization of viral RNA and proteins in SARS-CoV-2 replication organelles.** *Nature communications*
  Andronov, L., Han, M., Zhu, Y., Balaji, A., Roy, A. R., Barentine, A. E., Patel, P., Garhyan, J., Qi, L. S., Moerner, W. E.
  2024; 15 (1): 4644
- **Exploring transient states of PAmKate to enable improved cryogenic single-molecule imaging.** *bioRxiv : the preprint server for biology*
  Perez, D., Dowlatshahi, D. P., Azaldegui, C. A., Dahlberg, P. D., Moerner, W. E.
  2024
- **Stimulated emission does not radiate in a pure dipole pattern** *OPTICA*
  Barentine, A. E. S., Moerner, W. E.
  2024; 11 (4): 464-470
- **Stimulated emission does not radiate in a pure dipole pattern.** *Optica*
  Barentine, A. E., Moerner, W. E.
  2024; 11 (4): 464-470
- **Solution-phase sample-averaged single-particle spectroscopy of quantum emitters with femtosecond resolution.** *Nature materials*
  Shi, J., Shen, Y., Pan, F., Sun, W., Mangu, A., Shi, C., McKeown-Green, A., Moradifar, P., Bawendi, M. G., Moerner, W. E., Dionne, J. A., Liu, F., Lindenberg, et al
  2024
- **Revealing the 3D nanoscale organization of MyosinH in the apical complex of toxoplasma gondii through single-molecule localization microscopy with the double-helix point spread function**
  Balaji, A., Zarko, L., Dahlberg, P. D., Boothroyd, J. C., Moerner, W. E.
  CELL PRESS.2024: 30A-31A
- **Localization of viral RNA and proteins in the SARS-CoV-2 replication organelles revealed by super-resolution microscopy**
  Andronov, L., Han, M., Zhu, Y., Roy, A. R., Barentine, A. E. S., Qi, L. S., Moerner, W. E.
  CELL PRESS.2024: 464A
- **Single-molecule orientation and position measurement assisted by deep learning and point spread function engineering**
  Jouchet, P., Roy, A. R., Moerner, W. E.
  CELL PRESS.2024: 154A
- **Proving stimulated emission radiates directionally.** *ArXiv*
  Barentine, A. E., Moerner, W. E.
  2023
- **Combining deep learning approaches and point spread function engineering for simultaneous 3D position and 3D orientation measurements of fluorescent single molecules** *OPTICS COMMUNICATIONS*
  Jouchet, P., Roy, A. R., Moerner, W. E.
  2023; 542
- **Combining deep learning approaches and point spread function engineering for simultaneous 3D position and 3D orientation measurements of fluorescent single molecules.** *Optics communications*
  Jouchet, P., Roy, A. R., Moerner, W. E.

2023; 542

- **Advanced Cryogenic Light Microscopy Stage to Enable 3D Super-resolved Cryogenic Correlative Light and Electron Microscopy.** *Microscopy and microanalysis : the official journal of Microscopy Society of America, Microbeam Analysis Society, Microscopical Society of Canada*
  Perez, D., Dahlberg, P. D., Moerner, W. E.
  2023; 29 (Supplement_1): 1941

- **Structural and photophysical characterization of the small ultra-red fluorescent protein.** *Nature communications*
  Maiti, A., Buffalo, C. Z., Saurabh, S., Montecinos-Franjola, F., Hachey, J. S., Conlon, W. J., Tran, G. N., Hassan, B., Walters, K. J., Drobizhev, M., Moerner, W. E., Ghosh, P., Matsuo, et al
  2023; 14 (1): 4155

- **Characterization of mApple as a Red Fluorescent Protein for Cryogenic Single-Molecule Imaging with Turn-Off and Turn-On Active Control Mechanisms.** *The journal of physical chemistry. B*
  Sartor, A. M., Dahlberg, P. D., Perez, D., Moerner, W. E.
  2023

- **Multicolor super-resolution imaging to study human coronavirus RNA during cellular infection**
  Roy, A. R., Wang, J., Han, M., Wang, H., Moeckl, L., Zeng, L., Moerner, W. E., Qi, L. S.
  CELL PRESS.2023: 16A

- **Ratiometric sensing of redox environments inside individual carboxysomes trapped in solution.** *Biophysical journal*
  Carpenter, W. B., Lavania, A. A., Turnsek, J. B., Perez, D., Oltrogge, L. M., Dahlberg, P. D., Savage, D. F., Moerner, W. E.
  2023; 122 (3S1): 304a

- **Multicolor super-resolution imaging to study human coronavirus RNA during cellular infection.** *Biophysical journal*
  Roy, A. R., Wang, J., Han, M., Wang, H., Mockl, L., Zeng, L., Moerner, W. E., Qi, L. S.
  2023; 122 (3S1): 16a

- **Ratiometric sensing of redox environments inside individual carboxysomes trapped in solution**
  Carpenter, W. B., Lavania, A. A., Turnsek, J. B., Perez, D., Oltrogge, L. M., Dahlberg, P. D., Savage, D. F., Moerner, W. E.
  CELL PRESS.2023: 304A

- **Exploring Masses and Internal Mass Distributions of Single Carboxysomes in Free Solution Using Fluorescence and Interferometric Scattering in an Anti-Brownian Trap.** *The journal of physical chemistry. B*
  Lavania, A. A., Carpenter, W. B., Oltrogge, L. M., Perez, D., Turnsek, J. B., Savage, D. F., Moerner, W. E.
  2022

- **Metallic Support Films Reduce Optical Heating in Cryogenic Correlative Light and Electron Tomography.** *Journal of structural biology*
  Dahlberg, P. D., Perez, D., Hecksel, C. W., Chiu, W., Moerner, W. E.
  2022: 107901

- **Identification and Demonstration of roGFP2 as an Environmental Sensor for Cryogenic Correlative Light and Electron Microscopy.** *Journal of structural biology*
  Perez, D., Dahlberg, P. D., Wang, J., Sartor, A. M., Borden, J. S., Shapiro, L., Moerner, W. E.
  2022: 107881

- **Ratiometric Sensing of Redox Environments Inside Individual Carboxysomes Trapped in Solution.** *The journal of physical chemistry letters*
  Carpenter, W. B., Lavania, A. A., Borden, J. S., Oltrogge, L. M., Perez, D., Dahlberg, P. D., Savage, D. F., Moerner, W. E.
  2022: 4455-4462

- **Fast and parallel nanoscale 3D tracking of heterogeneous mammalian chromatin dynamics.** *Molecular biology of the cell*
  Gustavsson, A., Ghosh, R. P., Petrov, P. N., Liphardt, J. T., Moerner, W. E.
  2022: mbcE21100514

- **A bottom-up perspective on photodynamics and photoprotection in light-harvesting complexes using anti-Brownian trapping.** *The Journal of chemical physics*
  Squires, A. H., Wang, Q., Dahlberg, P. D., Moerner, W. E.
  2022; 156 (7): 070901

- **Autobiography of W. E. (William Esco) Moerner.** *The journal of physical chemistry. B*
  Moerner, W. E.
  2022; 126 (6): 1159
- **Characterizing the distribution of myosin H in the apical complex of conoid protruded and conoid retracted Toxoplasma gondii**
  Balaji, A., Dahlberg, P. D., Segev-Zarko, L., Sun, S., Chiu, W., Boothroyd, J., Moerner, W. E.
  CELL PRESS.2022: 409A
- **roGFP2 as an environmental sensor for cryogenic correlative light and electron microscopy**
  Perez, D., Dahlberg, P. D., Sartor, A. M., Wang, J., Borden, J., Moerner, W. E.
  CELL PRESS.2022: 128
- **Simultaneous position and orientation measurements of single molecules using deep learning and PSF engineering approaches**
  Jouchet, P., Roy, A. R., Moerner, W. E.
  CELL PRESS.2022: 412A-413A
- **Redox sensing inside individual carboxysomes in the ISABEL trap**
  Carpenter, W. B., Borden, J., Oltrogge, L. M., Lavania, A., Perez, D., Dahlberg, P. D., Savage, D., Moerner, W. E.
  CELL PRESS.2022: 104
- **Characterizing physical properties of single carboxysomes in the Interferometric Scattering Anti-Brownian ELectrokinetic trap**
  Lavania, A. A., Carpenter, W. B., Oltrogge, L. M., Borden, J., Perez, D. D., Squires, A. H., Dahlberg, P. D., Savage, D. F., Moerner, W. E.
  CELL PRESS.2022: 431A
- **Exploring cell-surface nanopillar interactions with 3D superresolution microscopy**
  Roy, A. R., Zhang, W., Jahed, Z., Tsai, C., Cui, B., Moerner, W. E.
  CELL PRESS.2022: 278A
- **Custom metallic electron microscopy grids reduce sample heating in super-resolved cryogenic correlative light and electron microscopy experiments**
  Dahlberg, P. D., Perez, D., Moerner, W. E.
  CELL PRESS.2022: 128
- **Multi-color super-resolution imaging to study human coronavirus RNA during cellular infection.** *bioRxiv : the preprint server for biology*
  Wang, J., Han, M., Roy, A. R., Wang, H., Mockl, L., Zeng, L., Moerner, W. E., Qi, L. S.
  2022
- **ATP-responsive biomolecular condensates tune bacterial kinase signaling.** *Science advances*
  Saurabh, S., Chong, T. N., Bayas, C., Dahlberg, P. D., Cartwright, H. N., Moerner, W. E., Shapiro, L.
  2022; 8 (7): eabm6570
- **Multi-color super-resolution imaging to study human coronavirus RNA during cellular infection.** *Cell reports methods*
  Wang, J., Han, M., Roy, A. R., Wang, H., Möckl, L., Zeng, L., Moerner, W. E., Qi, L. S.
  2022: 100170
- **Genome-Wide CRISPR screens reveal specific ligands for glycan-binding immune checkpoint receptors**
  Wisnovsky, S., Mockl, L., Malaker, S. A., Pedram, K., Hess, G. T., Riley, N. M., Gray, M. A., Smith, B. A. H., Bassik, M. C., Moerner, W. E., Bertozzi, C. R.
  OXFORD UNIV PRESS INC.2021: 1682-1683
- **A localized adaptor protein performs distinct functions at the Caulobacter cell poles.** *Proceedings of the National Academy of Sciences of the United States of America*
  Wang, J., Moerner, W. E., Shapiro, L.
  2021; 118 (13)
- **A localized adaptor protein performs distinct functions at the Caulobacter cell poles** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Wang, J., Moerner, W. E., Shapiro, L.
  2021; 118 (13)

- **Genome-wide CRISPR screens reveal a specific ligand for the glycan-binding immune checkpoint receptor Siglec-7.** *Proceedings of the National Academy of Sciences of the United States of America*
  Wisnovsky, S., Mockl, L., Malaker, S. A., Pedram, K., Hess, G. T., Riley, N. M., Gray, M. A., Smith, B. A., Bassik, M. C., Moerner, W. E., Bertozzi, C. R.
  2021; 118 (5)
- **Cryogenic Super-Resolution Fluorescence and Electron Microscopy Correlated at the Nanoscale.** *Annual review of physical chemistry*
  Dahlberg, P. D., Moerner, W. E.
  2021
- **Exploring Cell Surface-Nanopillar Interactions with 3D Super-Resolution Microscopy.** *ACS nano*
  Roy, A. R., Zhang, W., Jahed, Z., Tsai, C. T., Cui, B., Moerner, W. E.
  2021
- **Viewpoint: Single Molecules at 31: What's Next?** *Nano letters*
  Moerner, W. E.
  2020
- **Super-resolution Microscopy with Single Molecules in Biology and Beyond-Essentials, Current Trends, and Future Challenges.** *Journal of the American Chemical Society*
  Mockl, L., Moerner, W. E.
  2020
- **Addressing systematic errors in axial distance measurements in single-emitter localization microscopy** *OPTICS EXPRESS*
  Petrov, P. N., Moerner, W. E.
  2020; 28 (13): 18616–32
- **Cryogenic single-molecule fluorescence annotations for electron tomography reveal in situ organization of key proteins in Caulobacter.** *Proceedings of the National Academy of Sciences of the United States of America*
  Dahlberg, P. D., Saurabh, S., Sartor, A. M., Wang, J., Mitchell, P. G., Chiu, W., Shapiro, L., Moerner, W. E.
  2020
- **Deep learning in single-molecule microscopy: fundamentals, caveats, and recent developments [Invited].** *Biomedical optics express*
  Mockl, L., Roy, A. R., Moerner, W. E.
  2020; 11 (3): 1633–61
- **Cryogenic Superresolution Fluorescence Correlated with Cryogenic Electron Tomography: Combining Specific Labeling and High Resolution**
  Dahlberg, P. D., Saurabh, S., Wang, J., Sartor, A. M., Chiu, W., Shapiro, L., Moerner, W. E.
  CELL PRESS.2020: 20A–21A
- **Continuous, Topologically Guided Protein Crystallization Drives Self-Assembly of a Bacterial Surface Layer**
  Comerci, C. J., Herrmann, J., Yoon, J., Jabbarpour, F., Zhou, X., Nomellini, J. F., Smit, J., Shapiro, L., Wakatsuki, S., Moerner, W. E.
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- **Robust Modulation of a Bacterial Kinase by Protein Phase Separation**
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  Lasker, K., von Diezmann, L., Zhou, X., Ahrens, D. G., Mann, T. H., Moerner, W. E., Shapiro, L.
  2020
- **Novel fibrillar structure in the inversin compartment of primary cilia revealed by 3D single-molecule super-resolution microscopy.** *Molecular biology of the cell*
  Bennett, H. W., Gustavsson, A., Bayas, C. A., Petrov, P. N., Mooney, N., Moerner, W. E., Jackson, P. K.
  2020: mbcE19090499
- **T-Plastin reinforces membrane protrusions to bridge matrix gaps during cell migration.** *Nature communications*
  Garbett, D. n., Bisaria, A. n., Yang, C. n., McCarthy, D. G., Hayer, A. n., Moerner, W. E., Svitkina, T. M., Meyer, T. n.

2020; 11 (1): 4818

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  Lavania, A. A., Squires, A. H., Dahlberg, P. D., Moerner, W. E.
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PRESENTATIONS

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- What Can You Do With Single Molecules? (student talk 2017) - Physics/Astronomy Colloquium, University of New Mexico
- Kavli Symposium APS March Meeting 2015: Light & Single-Molecule Spectroscopy, Imaging, & Photocontrol - Foundations for Super-Resolution Microscopy - American Physical Society March Meeting (3/1/2015)
- AAAS Science technology webinar 2013: Fluorescent Probes and Digital Imaging - AAAS Science (June 12, 2013)
- Moerner Presentations - full list - Various locations
- SPIE interview 2012: Super-Resolution and the Double-Helix Point Spread Function - SPIE (June 4, 2012)