

Publications: William Esco (W. E.) Moerner

1. Richard G. Domey and William E. Moerner, "Cooperative Studies of the Kuroshio and Adjacent Regions, Part I: A Factor Analysis," *Indian J. Marine Sciences* **2**, 69 (1973).
2. H. I. Ringermacher, W. E. Moerner, and J. G. Miller, "Improved Transducer Correction for Standing Wave Ultrasonic Velocity Measurements," *J. Appl. Phys.* **45**, 549 (1974).
3. H. I. Ringermacher, W. E. Moerner, and J. G. Miller, "Two Transducer Formula for More Precise Determination of Ultrasonic Phase Velocity from Standing Wave Measurements," Proc. IEEE Ultrasonics Symposium, IEEE Cat. No. PD74CH0896-1SU, 555 (1974).
4. W. E. Moerner and J. G. Miller, "Ultrasonic Dispersion ($\Delta v/v$) Determined from Mechanical Resonance Frequency Shifts," Proc. IEEE Ultrasonics Symposium, IEEE Cat. No. PD74CH0896-1SU, 478 (1974).
5. V. E. Stubblefield, W. E. Moerner, P. A. Fedders, J. G. Miller, and D. I. Bolef, "Ultrasonic Determination of Magnetoelastic and Anisotropy Constants of Single Crystal Ni," Proc. IEEE Ultrasonics Symposium, IEEE Cat. No. PD74CH0896-1SU, 474 (1974).
6. L. H. Greene, R. T. Warner, W. E. Moerner, and A. J. Sievers, "Passive Mode Locking of a TEA CO₂ Laser with Matrix Isolated SF₆," Eleventh International Quantum Electronics Conference Digest of Technical Papers, IEEE Cat. No. PD80CH1561-O, 640 (1980).
7. A. R. Chraplyvy, W. E. Moerner, and A. J. Sievers, "High-Resolution Spectroscopy of Matrix-Isolated ReO₄⁻ Molecules," *Opt. Lett.* **6**, 254 (1981).
8. A. R. Chraplyvy, W. E. Moerner, and A. J. Sievers, "Infrared Hole Burning Spectroscopy of Matrix-Isolated ReO₄⁻ Molecules," *Opt. Lett.* **6**, 431 (1981).
9. W. E. Moerner, A. J. Sievers, and A. R. Chraplyvy, "Anharmonic Relaxation Times of Molecular Vibrational Modes in Alkali Halide Crystals," *Phys. Rev. Lett.* **47**, 1082 (1981).
10. W. E. Moerner, A. J. Sievers, R. H. Silsbee, A. R. Chraplyvy, and D. K. Lambert, "Persistent Holes in the Spectra of Localized Vibrational Modes in Crystalline Solids," *Phys. Rev. Lett.* **49**, 398 (1982).
11. W. E. Moerner, F. M. Schellenberg, and G. C. Bjorklund, "Photochemical Hole Burning at GaAs Laser Wavelengths," *Appl. Phys.* **B28**, 263 (1982).
12. M. D. Levenson, W. E. Moerner, and D. E. Horne, "FM Spectroscopy Detection of Stimulated Raman Gain," *Opt. Lett.* **8**, 108 (1983).
13. P. Pokrowsky, W. E. Moerner, F. Chu, and G. C. Bjorklund, "Reading and Writing of Photochemical Holes Using GaAlAs Diode Lasers," *Opt. Lett.* **8**, 280 (1983).
14. W. E. Moerner, A. R. Chraplyvy, A. J. Sievers, and R. H. Silsbee, "Persistent Nonphotochemical Spectral Hole Dynamics for an Infrared Vibrational Mode in Alkali Halide Crystals," *Phys. Rev.* **B28**, 7244 (1983).
15. P. Pokrowsky, W. E. Moerner, F. Chu, and G. C. Bjorklund, "Reading and Writing of Photochemical Holes Using GaAlAs Diode Lasers," *Proc. Soc. Photo-Opt. Instrum. Engineers* **382**, 202 (1983).
16. B. H. Schechtman, G. C. Bjorklund, and W. E. Moerner, "A Horse of a Different Color:

- Frequency Domain Optical Storage," IBM Research Report # RJ4128, 1983.
- 17. W. E. Moerner, "Organic Materials for Frequency Domain Optical Storage," Proc. Lasers '83, R. C. Powell, editor, (STS Press, McLean, Virginia, 1983), p. 489.
 - 18. W. E. Moerner, A. R. Chraplyvy, and A. J. Sievers, "Anharmonic Vibrational Relaxation Dynamics for a Molecular Impurity Mode in Alkali Halide Crystals," *Phys. Rev. B* **29**, 6694 (1984).
 - 19. A. L. Huston and W. E. Moerner, "Detection of Persistent Spectral Holes Using Ultrasonic Modulation," *J. Opt. Soc. Am. B: Opt. Phys.* **1**, 349 (1984).
 - 20. M. Romagnoli, W. E. Moerner, F. M. Schellenberg, M. D. Levenson, and G. C. Bjorklund, "Beyond the Bottleneck: Submicrosecond Hole-Burning in Phthalocyanine," *J. Opt. Soc. Am. B: Opt. Phys.* **1**, 341 (1984).
 - 21. W. E. Moerner, M. Gehrtz, and A. L. Huston, "Measurement of Quantum Efficiencies for Persistent Spectral Hole-Burning," *J. Phys. Chem.* **88**, 6459 (1984).
 - 22. W. E. Moerner, "The Spectroscopic Search for Single-Photon Materials," *Photonics Spectra* **19**, 59 (February 1985).
 - 23. H. W. H. Lee, A. L. Huston, M. Gehrtz, and W. E. Moerner, "Photochemical Hole-Burning in a Protonated Phthalocyanine with GaAlAs Diode Lasers," *Chem. Phys. Lett.* **114**, 491 (1985).
 - 24. W. E. Moerner and M. D. Levenson, "Can Single-Photon Processes Provide Useful Materials for Frequency Domain Optical Storage?" *J. Opt. Soc. Amer. B: Opt. Phys.* **2**, 915 (1985).
 - 25. W. E. Moerner, F. M. Schellenberg, G. C. Bjorklund, P. Kaipa, and F. Lüty, "High Efficiency Photochemical Hole-Burning for an Infrared Color Center," *Phys. Rev. B* **32**, 1270 (1985).
 - 26. M. Gehrtz, W. E. Moerner, and G. C. Bjorklund, "Shot-Noise Limited Detection in FM Spectroscopy by Optical Nulling of Residual Amplitude Modulation," IBM RJ#4678, 1985.
 - 27. H. W. H. Lee, M. Gehrtz, E. Marinero, and W. E. Moerner, "Two-Color, Photon-Gated Spectral Hole-Burning in an Organic Material," *Chem. Phys. Lett.* **118**, 611 (1985).
 - 28. W. E. Moerner, "Laser-Light-Induced Physical Processes in Optical Materials: Persistent Spectral Hole-Burning," *Proc. Soc. Photo-Opt. Instrum. Engr.* **541**, 60 (1985).
 - 29. W. E. Moerner, R. M. Macfarlane, and R. M. Shelby, "Photon-Gated Spectral Hole-Burning," Physics/Optics News in 1985 *Optics News* **11** (12), 9 (1985).
 - 30. W. E. Moerner, "Molecular Electronics for Frequency Domain Optical Storage: Persistent Spectral Hole-Burning - A Review," *J. Molec. Elec.* **1**, 55 (1985).
 - 31. W. E. Moerner, P. Pokrowsky, F. M. Schellenberg, and G. C. Bjorklund, "Persistent Spectral Hole-Burning for R' Color Centers in LiF Crystals: Statics, Dynamics, and External Field Effects," *Phys. Rev. B* **33**, 5702 (1986).
 - 32. W. E. Moerner and A. L. Huston, "Phase-Sensitive Ultrasonic Modulation of Persistent Spectral Holes," *Appl. Phys. Lett.* **48**, 1181 (1986).

33. W. Lenth and W. E. Moerner, "Gated Spectral Hole-Burning for Frequency Domain Optical Recording," *Optics Commun.* **58**, 249 (1986).
34. W. E. Moerner, "Dynamical Hole-Burning Requirements for Frequency Domain Optical Storage," in Unconventional Photoactive Solids, Harvey Scher, editor, (Plenum, New York, 1988), pp. 41-51.
35. W. Lenth, R. M. Macfarlane, W. E. Moerner, F. M. Schellenberg, R. M. Shelby, and G. C. Bjorklund, "High-Density Frequency-Domain Optical Recording," *Proc. Soc. Photo-opt. Instrum. Engr.* **695**, 216 (1986).
36. A. J. Sievers and W. E. Moerner, "Persistent Infrared Spectral Hole-Burning for Impurity Vibrational Modes in Solids," Chapter 6 of Persistent Spectral Hole-Burning: Science and Applications, W. E. Moerner, editor, Topics in Current Physics Vol. 44 (Springer, Berlin, Heidelberg, 1988).
37. W. E. Moerner and A. L. Huston, "Phase-sensitive Detection of Persistent Spectral Holes Using Synchronous Ultrasonic Modulation Spectroscopy," *J. Opt. Soc. Am. B: Opt. Phys.* **3**, P210 (1986).
38. W. E. Moerner, T. P. Carter, and C. Bräuchle, "Fast Burning of Persistent Spectral Holes in Small Laser Spots Using Photon-Gated Materials," *Appl. Phys. Lett.* **50**, 430 (1987).
39. T. P. Carter, C. Bräuchle, V. Y. Lee, M. Manavi, and W. E. Moerner, "Photon-Gated Spectral Hole-Burning Via Donor-Acceptor Electron Transfer," *Opt. Lett.* **12**, 370 (1987).
40. T. P. Carter, C. Bräuchle, V. Y. Lee, M. Manavi, and W. E. Moerner, "Mechanism of Photon-Gated Persistent Spectral Hole-Burning in Metalloporphyrin/Halomethane Systems: Donor-Acceptor Electron Transfer," *J. Phys. Chem.* **91**, 3998 (1987).
41. W. E. Moerner, Sharon Moerner, and David Palmer, "FINDER – The Family INformation Database for Emergency Responders," Proceedings of the 6th Computer Networking Conference, American Radio Relay League, Redondo Beach, California, August 29, 1987, pp. 134-141. ISBN 0-87259-202-2.
42. W. E. Moerner, W. Lenth, and G. C. Bjorklund, "Frequency Domain Optical Storage and Other Applications of Persistent Spectral Hole-Burning," Chapter 7 of Persistent Spectral Hole-Burning: Science and Applications, W. E. Moerner, editor, Topics in Current Physics Vol. 44 (Springer, Berlin, Heidelberg, 1988).
43. W. E. Moerner, "Introduction to Persistent Spectral Hole-Burning: Science and Applications," Chapter 1 of Persistent Spectral Hole-Burning: Science and Applications, W. E. Moerner, editor, Topics in Current Physics Vol. 44 (Springer, Berlin, Heidelberg, 1988).
44. W. E. Moerner and T. P. Carter, "Statistical Fine Structure in Inhomogeneously Broadened Absorption Lines," *Phys. Rev. Lett.*, **59**, 2705 (1987).
45. W. E. Moerner and T. P. Carter, "Statistical Fine Structure in Inhomogeneously Broadened Absorption Lines in Solids," Advances in Laser Science III, AIP Conference Proceedings **172** (AIP, New York, 1988), p. 419.
46. T. P. Carter, M. Manavi, and W. E. Moerner, "Statistical Fine Structure in the Inhomogeneously Broadened Electronic Origin of Pentacene in p-Terphenyl," *J. Chem. Phys.* **89**, 1768 (1988).

47. T. P. Carter, D. E. Horne, and W. E. Moerner, "Pseudo-Stark Effect and FM/Stark Double-Modulation Spectroscopy for the Detection of Statistical Fine Structure in Alexandrite," *Chem. Phys. Lett.* **151**, 102 (1988).
48. W. E. Moerner and David Palmer, "ARES/Data: A Packet-Radio Database for Emergency Communications," Proceedings of the 7th Computer Networking Conference, American Radio Relay League, Columbia, Maryland, October 1, 1988, pp. 141-144. ISBN 0-87259-213-8
49. L. Kador, T. P. Carter, and W. E. Moerner, "FM-Stark Double-Modulation Spectroscopy for the Detection of Weak Spectral Features in Solids," Proc. IEEE Lasers and Electro-Optics Society Annual Meeting, IEEE Cat. No. 88CH 2683-1, pp. 246-248 (1988).
50. W. E. Moerner and L. Kador, "Optical Detection and Spectroscopy of Single Molecules in a Solid," *Phys. Rev. Lett.* **62**, 2535 (1989).
51. L. Kador, D. E. Horne, and W. E. Moerner, "Optical Detection and Probing of Single Dopant Molecules of Pentacene in a p-Terphenyl Host Crystal by Means of Absorption Spectroscopy," **Feature Article**, *J. Phys. Chem.* **94**, 1237 (1990).
52. W. E. Moerner and L. Kador, "Finding a Single Molecule in a Haystack: Optical Detection and Spectroscopy of Single Absorbers in Solids," *Analyt. Chem.* **61**, A1217-A1223 (1989).
53. W. E. Moerner, "Photon-Gated Persistent Spectral Hole-Burning," Proceedings of the International Symposium on Optical Memory 1989, *Japan J. Appl. Phys.* **28** (Suppl. 28-3), 221 (1989).
54. W. E. Moerner, Sharon Moerner, and David Palmer, "ARES/Data Update: A Packet Radio Database for Emergency Communications with Conference Bridge," Proceedings of the 8th Computer Networking Conference, American Radio Relay League, Colorado Springs, Colorado, October 7, 1989, pp. 134-143. ISBN 0-87259-251-0.
55. W. E. Moerner, L. Kador, and W. P. Ambrose, "Ultrasensitive Laser Spectroscopy in Solids: Optical Detection of a Single Dopant Molecule," Proc. IEEE Lasers and Electro-Optics Society Annual Meeting, IEEE Cat. No. 89CH2641-9, p. 260 (1989).
56. W. E. Moerner, L. Kador, and W. P. Ambrose, "Ultrasensitive Laser Spectroscopy in Solids: Single-Molecule Detection," Proceedings of the Fourth International Conference on Unconventional Photoactive Solids, The Almaden Symposium, *Molec. Cryst. Liq. Cryst.* **183**, 47 (1990).
57. W. E. Moerner, "Persistent Spectral Hole-Burning: Photon-Gating and Fundamental Statistical Limits," in Polymers for Microelectronics, Science, and Technology, Y. Tabata, I. Mita, and S. Nonogaki, editors (Kodansha Scientific and VCH Publishers, 1990), pp. 465-479.
58. W. P. Ambrose and W. E. Moerner, "Temperature Dependence of Photon-Gated Persistent Spectral Hole-Burning for the meso-tetra-p-tolyl-Zn-tetrabenzoporphyrin/Chloroform System in poly(Methylmethacrylate)", *Chem. Phys.* **144**, 71 (1990).
59. S. Ducharme, W. P. Risk, W. E. Moerner, V. Y. Lee, R. J. Twieg, and G. C. Bjorklund, "Intracavity Frequency Doubling of a Nd: YAG Laser with an Organic Nonlinear Optical Crystal," *Appl. Phys. Lett.* **57**, 537 (1990).
60. W. E. Moerner, "Ultrasensitive Laser Spectroscopy in Solids: Statistical Fine Structure and

Single-Molecule Detection," *New J. Chem.* **15**, 199-208 (1991).

61. W. P. Ambrose and W. E. Moerner, "Phase-Sensitive Optical Detection of Ballistic Phonon Heat Pulses Using Frequency-Modulation Spectroscopy and Persistent Spectral Holes," *Phys. Rev.* **B43**, 1743 (1990).
62. G. C. Bjorklund, S. Ducharme, D. Jungbauer, W. E. Moerner, J. D. Swalen, R. Twieg, C. G. Willson, and D. Yoon, "Organic Nonlinear Optical Materials for Frequency Doubling, Modulation, and Switching," in Proceedings of "Symposium on Optics and Electronics for Organic Materials," Annual Meeting of Society of Fiber Science and Technology, Tokyo, Japan, July 11-12, 1990.
63. G. C. Bjorklund, S. Ducharme, W. Fleming, D. Jungbauer, W. E. Moerner, J. D. Swalen, R. Twieg, C. G. Willson, and D. Yoon, "Applications of Organic Second Order Nonlinear Optical Materials," Ch. 13 of Materials for Nonlinear Optics: Chemical Perspectives, S. R. Marder, J. E. Sohn, and G. D. Stucky, eds. ACS Symposium Series 455, 216 (1991).
64. J. D. Swalen, G. C. Bjorklund, S. Ducharme, W. Fleming, S. Herminghaus, D. Jungbauer, W. E. Moerner, B. A. Smith, R. Twieg, D. Yoon, and G. Willson, "Organic Nonlinear Optical Materials and Their Device Applications for Frequency Doubling, Modulation, and Switching," *Proc. Soc. Photo-Opt. Instrum. Engr. NLO III* **1337**, 2 (1990).
65. W. E. Moerner, "Organic Optoelectronic Materials," in Proceedings of the 23rd IBM Computer Science Symposium, Gotemba, Japan, Challenges to Novel Computing, H. Asio and S. Amari, eds. (Mita, Tokyo, 1990), pp. 153-170.
66. W. E. Moerner, Sharon Moerner, and David Palmer, "ARES/Data – A Packet Database for Emergency and Public Service Communications," *QST Magazine* **74** (12), 75 (December 1990).
67. W. P. Ambrose and W. E. Moerner, "Fluorescence Spectroscopy and Spectral Diffusion of Single Impurity Molecules in a Crystal," *Nature* **349**, 225-227 (1991).
68. W. E. Moerner and W. P. Ambrose, "Comment on 'Single Pentacene Molecules Detected by Fluorescence Excitation in a p-Terphenyl Crystal,'" *Phys. Rev. Lett.* **66**, 1376 (1991).
69. S. Ducharme, J. C. Scott, R. J. Twieg, and W. E. Moerner, "Observation of the Photorefractive Effect in a Polymer," *Phys. Rev. Lett.* **66**, 1846 (1991).
70. W. E. Moerner and W. P. Ambrose, "Finding a Single Molecule in a Haystack: Laser Spectroscopy of Solids from \sqrt{N} to $N = 1$," *Proc. Soc. Photo-Opt. Instrum. Engr.* **1435**, 244 (1991).
71. W. P. Ambrose, T. Basché, and W. E. Moerner, "Detection and Spectroscopy of Single Pentacene Molecules in a p-Terphenyl Crystal by Means of Fluorescence Excitation," *J. Chem. Phys.* **95**, 7150 (1991).
72. J. C. Scott, S. Ducharme, R. J. Twieg, and W. E. Moerner, "The Photorefractive Effect in Non-Linear Polymers Doped with Charge Transport Agents," *Polym. Preprints* **32**, 107 (1991).
73. J. D. Swalen, W. Fleming, M. Jurich, W. E. Moerner, B. A. Smith, S. Herminghaus, and G. C. Bjorklund, "Optical Waveguiding in Poled NLO Polymers," *Mat. Res. Soc. Symp. Proc.* **228**, 101 (1992).

74. S. Ducharme, J. C. Scott, R. J. Twieg, and W. E. Moerner, "Reply to 'Comment on Observation of the Photorefractive Effect in a Polymer,'" *Phys. Rev. Lett.* **67**, 2589 (1991).
75. W. E. Moerner, C. Walsh, J. C. Scott, S. Ducharme, D. M. Burland, G. C. Bjorklund, and R. J. Twieg, "Photorefractivity in Doped Nonlinear Organic Polymers," *Proc. Soc. Photo-Opt. Instrum. Engr. NLO IV* **1560**, 278 (1991).
76. W. P. Ambrose, Th. Basché, and W. E. Moerner, "Single Molecule Spectral Diffusion in a Solid Detected Via Fluorescence Spectroscopy," *J. Lumin.* **53**, 62 (1992).
77. Th. Basché and W. E. Moerner, "Optical Modification of a Single Impurity Molecule in a Solid," *Nature* **335**, 355 (1992).
78. Th. Basché, W. P. Ambrose, and W. E. Moerner, "Optical Spectra and Kinetics of Single Impurity Molecules in a Polymer: Spectral Diffusion and Persistent Spectral Hole-Burning," *J. Opt. Soc. Amer. B* **9**, 829 (1992).
79. C. A. Walsh and W. E. Moerner, "Two-Beam Coupling Measurements of Grating Phase in a Photorefractive Polymer," *J. Opt. Soc. Amer. B* **9**, 1642 (1992) (Special Issue on Photorefractive Materials, Effects, and Devices).
80. J. D. Swalen, G. C. Bjorklund, W. Fleming, S. Herminghaus, D. Jungbauer, M. Jurich, W. E. Moerner, B. Reck, B. A. Smith, R. Twieg, C. G. Willson, and R. Zentel, "Poled Epoxy Polymers for Optoelectronics," in Organic Molecules for Nonlinear Optics and Photonics, J. Messier et al. (eds.) (Kluwer Academic, Amsterdam, 1991) pp. 433-445.
81. J. C. Scott, L. Pautmeier, and W. E. Moerner, "Photoconductivity Studies of Photorefractive Polymers," *J. Opt. Soc. Am. B* **9**, 2059 (1992).
82. W. E. Moerner, C. A. Walsh, S. M. Silence, R. J. Twieg, T. J. Matray, J. C. Scott, V. Y. Lee, R. D. Miller, F. Hache, D. M. Burland, and G. C. Bjorklund, "Nonlinear Optical Properties of Organic Photorefractive Polymers," *Proc. Mat. Res. Soc.* **277**, 121 (1992).
83. J. C. Scott, L. Th. Pautmeier, W. E. Moerner, C. A. Walsh, S. M. Silence, T. J. Matray, and R. J. Twieg, "Photoconductivity of Photorefractive Polymers," *Proc. Mat. Res. Soc.* **277**, 135 (1992).
84. S. M. Silence, C. A. Walsh, J. C. Scott, T. J. Matray, R. J. Twieg, G. C. Bjorklund, F. Hache, and W. E. Moerner, "Sub-Second Grating Growth in a Photorefractive Polymer," *Opt. Lett.* **17**, 1107 (1992).
85. J. C. Scott, L. Th. Pautmeier, and W. E. Moerner, "Photoconduction and Photorefraction in Molecularly Doped Polymers," *Synth. Met.* **54**, 9 (1992).
86. Th. Basché, W. E. Moerner, M. Orrit, and H. Talon, "Photon Antibunching in the Fluorescence of a Single Dye Molecule Trapped in a Solid," *Phys. Rev. Lett.* **69**, 1516 (1992).
87. S. M. Silence, C. A. Walsh, J. C. Scott, and W. E. Moerner, "C₆₀ Sensitization of a Photorefractive Polymer," *Appl. Phys. Lett.* **61**, 2967 (1992).
88. W. E. Moerner, "Quantum Optics of a Single Molecule in a Solid," *Optics News in 1992, Opt. and Photon. News* **3**, 21 (1992).
89. J. D. Swalen, G. C. Bjorklund, W. W. Fleming, M. Jurich, W. E. Moerner, A. Skumanich, B. A. Smith, and J. I. Thackara, "Polymeric Electro-Optic Phase Modulator," *Nonl. Opt.* **6**,

205 (1993).

90. W. E. Moerner and Th. Basché (**invited review**), "Optical Spectroscopy of Single Impurity Molecules in Solids," *Angew. Chem.* **105**, 537 (1993); *Angew. Chem. Int. Ed. Engl.* **32**, 457 (1993).
91. P. Tchénio, A. B. Myers, and W. E. Moerner, "Dispersed Fluorescence Spectra of Single Molecules of Pentacene in p-Terphenyl," *J. Phys. Chem. Lett.* **97**, 2491 (1993).
92. M. C. J. M. Donckers, S. M. Silence, C. A. Walsh, F. Hache, D. M. Burland, W. E. Moerner, and R. J. Twieg, "Net Two-Beam-Coupling Gain in a Polymeric Photorefractive Material," *Opt. Lett.* **18**, 1044 (1993).
93. J. Köhler, J. A. J. M. Disselhorst, M. C. J. M. Donckers, E. J. J. Groenen, J. Schmidt, and W. E. Moerner, "Magnetic Resonance of a Single Molecular Spin," *Nature* **363**, 242 (1993).
94. J. D. Swalen, G. C. Bjorklund, W. Fleming, R. Hung, M. Jurich, V. Y. Lee, R. D. Miller, W. E. Moerner, D. Y. Morichiere, A. Skumanich, and B. A. Smith, "NLO Polymeric Waveguide Electro-Optic Phase Modulator," *Proc. Soc. Photo-Opt. Instrum. Engr. NLO V* **1775**, 369 (1992).
95. S. M. Silence, F. Hache, M. Donckers, C. A. Walsh, D. M. Burland, G. C. Bjorklund, R. J. Twieg, and W. E. Moerner, "Nonlinear Optical Properties of Photorefractive Polymers", *Proc. Soc. Photo-Opt. Instrum. Engr.* **1852**, 253 (1993).
96. P. Tchénio, A. B. Myers, and W. E. Moerner, "Optical Studies of Single Terrylene Molecules in Polyethylene," *J. Lumin.* **56**, 1 (1993).
97. S. M. Silence, J. C. Scott, F. Hache, E. J. Ginsburg, P. K. Jenkner, R. D. Miller, R. J. Twieg, and W. E. Moerner, "Poly(silane)-Based High Mobility Photorefractive Polymers," *J. Opt. Soc. Am. B* **10**, 2306 (1993).
98. S. M. Silence, M. C. J. M. Donckers, C. A. Walsh, D. M. Burland, R. J. Twieg, and W. E. Moerner, "Optical Properties of Poly(N-Vinylcarbazole)-Based Guest-Host Photorefractive Polymer Systems," *Appl. Opt.* **33**, 2218 (1993).
99. W. E. Moerner, S. M. Silence, F. Hache, and G. C. Bjorklund, "Orientationally Enhanced Photorefractive Effect in Polymers," *J. Opt. Soc. Am. B* **11**, 320-330 (1993).
100. W. E. Moerner and Scott M. Silence, "Polymeric Photorefractive Materials," *Chem. Revs.* **94**, 127 (1994).
101. B. A. Smith, M. Jurich, W. E. Moerner, W. Volksen, M. E. Best, J. D. Swalen, and G. C. Bjorklund, "Lightwave Transmission of Multiple Television Signals Using a Polyimide Electro-Optic Phase Modulator," *Proc. Soc. Photo-Opt. Instrum. Engr. NLO VI* **2025**, 499 (1993).
102. P. Tchénio, A. B. Myers, and W. E. Moerner, "Vibrational Analysis of Dispersed Fluorescence from Single Molecules of Terrylene in Polyethylene," *Chem. Phys. Lett.* **213**, 325 (1993).
103. W. E. Moerner, "Optical Detection of the Magnetic Resonance of a Single Molecular Spin," *Physics News in 1993*, (American Institute of Physics, New York, 1994), p. 28.
104. W. E. Moerner, "Optical Detection of the Magnetic Resonance of a Single Molecular

Spin," Optics News in 1993, *Opt. and Photon. News* **4**, 35(1993).

105. A. B. Myers, P. Tchénio, and W. E. Moerner, "Vibronic Spectroscopy of Single Molecules: Exploring Electronic-Vibrational Frequency Correlations Within an Inhomogeneous Distribution," *J. Lumin.* **58**, 161 (1994).
106. W. E. Moerner, "Fundamentals of Single-Molecule Spectroscopy in Solids," *J. Lumin.* **60&61**, 997 (1993).
107. S. M. Silence, M. C. J. M. Donckers, C. A. Walsh, D. M. Burland, W. E. Moerner, and R. J. Twieg, "Electric-Field Dependent Nonphotorefractive Gratings in a Nonlinear Photoconducting Polymer," *Appl. Phys. Lett.* **64**, 712 (1994).
108. G. C. Bjorklund, D. M. Burland, M. C. J. M. Donckers, E. Ginsburg, F. Hache, P. Jenkner, R. D. Miller, W. E. Moerner, J. C. Scott, S. M. Silence, R. J. Twieg, and C. A. Walsh, "Photorefractive Polymers Achieve Net Gain, High Diffraction Efficiency, and High Speed," Optics News in 1993, *Opt. and Photon. News* **4**, 42 (1993).
109. T. Plakhotnik, W. E. Moerner, T. Irngartinger, and W. E. Moerner, "Single-Molecule Spectroscopy in Shpol'skii Matrices," *Chimia* **48**, 31 (1994).
110. W. E. Moerner, "Examining Nanoenvironments in Solids on the Scale of a Single, Isolated Impurity Molecule," (**Invited General Article**) *Science* **265**, 46 (1994).
111. W. E. Moerner, T. Plakhotnik, T. Irngartinger, M. Croci, V. Palm, and U. P. Wild, "Optical Probing of Single Molecules of Terrylene in a Shpol'skii Matrix: A Two-State Single-Molecule Switch," (**R. Kopelman Festschrift**) *J. Phys. Chem.* **98**, 7382 (1994).
112. W. E. Moerner, "Book Review of Introduction to Photorefractive Nonlinear Optics by P. Yeh," *Phys. Today* (January 1994) p. 45.
113. W. E. Moerner, S. M. Silence, G. C. Bjorklund, D. M. Burland, R. D. Miller, J. J. Stankus, and R. J. Twieg, "Photorefractive Polymers," *Polym. Preprints* **35**, 93 (1994).
114. A. B. Myers, P. Tchénio, M. Z. Zgierski, and W. E. Moerner, "Vibronic Spectroscopy of Individual Molecules in Solids," (**Feature Article**) *J. Phys. Chem.* **98**, 10377 (1994).
115. S. M. Silence, R. J. Twieg, G. C. Bjorklund, and W. E. Moerner, "Quasinondestructive Readout in a Photorefractive Polymer," *Phys. Rev. Lett.* **73**, 2047 (1994).
116. S. M. Silence, G. C. Bjorklund, and W. E. Moerner, "Optical Trap Activation in a Photorefractive Polymer," *Opt. Lett.* **19**, 1822 (1994).
117. S. M. Silence, J. C. Scott, J. J. Stankus, W. E. Moerner, C. R. Moylan, G. C. Bjorklund, and R. J. Twieg, "Photorefractive Polymers Based on Dual-Function Dopants," *J. Phys. Chem.* **99**, 4096 (1995).
118. J. J. Stankus, S. M. Silence, W. E. Moerner, and G. C. Bjorklund, "Electric Field Switchable Stratified Volume Holograms in Photorefractive Polymers," *Opt. Lett.* **19**, 1480 (1994).
119. T. Plakhotnik, W. E. Moerner, V. Palm, and U. P. Wild, "Single Molecule Spectroscopy: Maximum Emission Rate and Saturation Intensity," *Opt. Commun.* **114**, 83 (1995).
120. W. E. Moerner, T. Plakhotnik, T. Irngartinger, U. P. Wild, D. W. Pohl, and B. Hecht, "Near-Field Optical Spectroscopy of Individual Molecules in Solids," *Phys. Rev. Lett.* **73**,

2764 (1994).

121. D. M. Burland, G. C. Bjorklund, W. E. Moerner, S. M. Silence, and J. J. Stankus, "Photorefractive Polymers-A Status Report," *Pure & Appl. Chem.* **67**, 33 (1995).
122. D. Y. Kim, W. E. Torruellas, J. Kang, C. Bosshard, G. I. Stegeman, P. Vidakovic, J. Zyss, W. E. Moerner, R. Twieg, and G. Bjorklund, "Second-Order Cascading as the Origin of Large Third-Order Effects in Organic Single-Crystal-Core Fibers," *Opt. Lett.* **19**, 868 (1994).
123. J. J. Stankus, S. M. Silence, R. J. Twieg, D. M. Burland, R. D. Miller, J. C. Scott, W. E. Moerner, and G. C. Bjorklund, "Recent Progress in Photorefractive Polymers: Materials and Structures," *Proc. Soc. Photo-Opt. Instrum. Engr.* **2285**, 204 (1994).
124. W. E. Moerner, "Polymers Scale New Heights," *Nature* **371**, 475 (1994).
125. S. M. Silence, D. M. Burland, and W. E. Moerner, "Photorefractive Polymers," Chapter 5 of Photorefractive Effects and Materials, David D. Nolte, Ed. (Kluwer Academic, Boston, 1995), pp. 265-309.
126. W. E. Moerner and N. Peyghambarian, "Advances in Photorefractive Polymers: Plastics for Holography and Optical Processing," *Opt. Photon. News* **6**, 24 (March 1995).
127. A. B. Myers, P. Tchénio, and W. E. Moerner, "Dynamics and Vibrational Spectra of Individual Molecules in Polymer Glasses," *Proc. Soc. Photo-Opt. Instrum. Engr.* **2385**, 103 (1995).
128. W. E. Moerner, "Optical Spectroscopy of Individual Molecules Trapped in Solids," in *Atomic Physics 14, AIP Conf. Proc.* **323**, D. J. Wineland, C. E. Wieman, and S. J. Smith, eds. (AIP Press, New York, 1995), pp. 467-486.
129. C. Poga, D. M. Burland, T. Hanemann, Y. Jia, C. R. Moylan, J. J. Stankus, R. J. Twieg, and W. E. Moerner, "Photorefractivity in New Organic Polymeric Materials," *Proc. Soc. Photo-Opt. Instrum. Engr.* **2526**, 82 (1995).
130. W. E. Moerner, D. M. Burland, C. R. Moylan, and R. J. Twieg, "Mechanisms of Photorefractivity in Polymer Composites," *Polym. Preprints* **37**, 129 (1996).
131. W. E. Moerner, "Probing Nanoenvironments in Solids and Quantum Optics Using Individual Impurity Molecules," Proceedings of Todai Symposium 1995 on Frontiers in Laser Physics and Spectroscopy, *Prog. Crystal Growth and Charact.* **33**, 11 (1996).
132. P. M. Lundquist, C. Poga, R. G. DeVoe, Y. Jia, W. E. Moerner, M.-P. Bernal, H. Coufal, R. K. Grygier, J. A. Hoffnagle, C. M. Jefferson, R. M. Macfarlane, R. M. Shelby, and G. T. Sincerbox, "Holographic Digital Data Storage in a Photorefractive Polymer," *Opt. Lett.* **21**, 890 (1996).
133. J. L. Skinner and W. E. Moerner, "Structure and Dynamics in Solids as Probed by Optical Spectroscopy," **Invited Article for the Physical Chemistry Centennial Issue** of *J. Phys. Chem.* **100**, 13251-13262 (1996).
134. W. E. Moerner, "Physical Principles and Methods of Single-Molecule Spectroscopy in Solids," Chapter 1 of Single-Molecule Optical Detection, Imaging, and Spectroscopy, Th. Basche, W. E. Moerner, M. Orrit, and U. P. Wild, eds. (VCH, Munich, 1997).
135. W. E. Moerner, "High-Resolution Optical Spectroscopy of Single Molecules in Solids,"

**Invited Article for Special Issue on Single-Molecule Detection and Manipulation,
Accounts Chem. Res. **29**, 563 (1996).**

136. W. E. Moerner and P. M. Barbara, "Editorial: Single Molecules and Atoms," *Accounts Chem. Res.* **29**, 561 (1996).
137. A. Grunnet-Jepsen, C. L. Thompson, R. J. Twieg, and W. E. Moerner, "Photorefractive Properties of Low-Glass-Transition-Temperature Polymer Composites," *Proc. Amer. Chem. Soc. Division of Polymeric Materials* **75**, 175 (1996).
138. R. M. Dickson, D. J. Norris, Y-L. Tzeng, and W. E. Moerner, "Three-Dimensional Imaging of Single Molecules Solvated in Pores of Poly(acrylamide) Gels," *Science* **274**, 966 (1996).
139. W. E. Moerner, A. Grunnet-Jepsen, C. L. Thompson, and R. J. Twieg, "Mechanisms of Photorefractivity in Polymer Composites," *Proc. SPIE* **2850**, 2 (1996).
140. R. M. Dickson, D. J. Norris, Y.-L. Tzeng, R. Sakowicz, L. S. B. Goldstein, and W. E. Moerner, "Single Molecules Solvated in Pores of Poly(acrylamide) Gels," *Mol. Cryst. Liq. Cryst.* **291**, 31 (1996).
141. A. Grunnet-Jepsen, C. L. Thompson, R. J. Twieg, and W. E. Moerner, "Amplified Scattering in a High Gain Photorefractive Polymer," *J. Opt. Soc. Am. B* **15**, 901 (1998).
142. W. E. Moerner, R. M. Dickson, and D. J. Norris, "Single-Molecule Nanophotonics in Solids," *Matls. Sci. and Engr.* **B48**, 169 (1997).
143. W. E. Moerner, A. Grunnet-Jepsen, and C. L. Thompson, "Photorefractive Polymers", **Invited Review**, *Annual Review of Materials Science* **27**, 585-623 (1997).
144. A. Grunnet-Jepsen, C. L. Thompson, R. J. Twieg, and W. E. Moerner, "High Performance Photorefractive Polymer with Improved Stability," *Appl. Phys. Lett.* **70**, 1515 (1997).
145. W. E. Moerner, R. M. Dickson, and D. J. Norris, "Single-Molecule Spectroscopy and Quantum Optics in Solids," **Invited Review**, *Advances in Atomic, Molecular and Optical Physics*, Vol. **38**, 193-236 (1997).
146. Th. Basche, W. E. Moerner, M. Orrit, and U. P. Wild, eds., Single-Molecule Optical Detection, Imaging, and Spectroscopy (VCH, Munich, 1997).
147. A. Grunnet-Jepsen, C. L. Thompson, and W. E. Moerner, "Measurement of Spatial Phase-Shift in High-Gain Photorefractive Materials," *Opt. Lett.* **22**, 874 (1997).
148. A. Grunnet-Jepsen, C. L. Thompson, and W. E. Moerner, "Spontaneous oscillation and self-pumped phase conjugation in a photorefractive polymer amplifier," *Science* **277**, 549 (1997).
149. A. Grunnet-Jepsen, C. L. Thompson, and W. E. Moerner, "Systematics of two-wave mixing in a photorefractive polymer," *J. Opt. Soc. Am. B* **15**, 905-913 (1998).
150. A. Grunnet-Jepsen, C. L. Thompson, and W. E. Moerner, "Gain enhancement by moving gratings in a photorefractive polymer," *Opt. Commun.* **145**, 145-149 (1998).
151. A. Grunnet-Jepsen, C. L. Thompson, and W. E. Moerner, "Optical Limiting in a Photorefractive Polymer", *Proc. Materials Research Society, Symposium S*, **479**, 199 (1997).

152. R. M. Dickson, A. B. Cubitt, R. Y. Tsien, and W. E. Moerner, "On/Off Blinking and Switching Behavior of Single Green Fluorescent Protein Molecules," *Nature* **388**, 355 (1997).
153. D. J. Norris, M. Kuwata-Gonokami, and W. E. Moerner, "Excitation of a Single Molecule on the Surface of a Spherical Microcavity," *Appl. Phys. Lett.* **71**, 297 (1997).
154. W. E. Moerner, **Invited Perspective**, "Those Blinking Single Molecules," *Science* **277**, 1059 (1997).
155. A. Grunnet-Jepsen, C. L. Thompson, R. J. Twieg, K. Belfield, M. S. Bratcher, and W. E. Moerner, "Large Gain Photorefractive Polymers," *Proc. Soc. Photo-Opt. Instrum. Engr.* **3144**, 216-226 (1997).
156. W. E. Moerner, A. Grunnet-Jepsen, C. L. Thompson, M. S. Bratcher, and R. J. Twieg, "Recent Advances in Photorefractive Polymer Materials," *Proc. Soc. Photo-Opt. Instrum. Engr.* **3147**, 84-94 (1997).
157. A. Grunnet-Jepsen, D. Wright, B. Smith, M. S. Bratcher, M. S. DeClue, J. S. Siegel, and W. E. Moerner, "Spectroscopic Determination of Trap Density in C₆₀-Sensitized Photorefractive Polymers," *Chem. Phys. Lett.* **291**, 553-561 (1998).
158. S. Kummer, R. M. Dickson, and W. E. Moerner, "Probing Single Molecules in Polyacrylamide Gels," *Proc. Soc. Photo-Opt. Instrum. Engr.* **3273**, 165-173 (1998).
159. W. E. Moerner, M. A. Diaz-Garcia, D. Wright, B. R. Smith, J. Casperson, M. S. Bratcher, M. S. DeClue, J. S. Siegel, and R. J. Twieg, "Fast and Efficient Photorefractivity in Polymer Composites," *Polym. Preprints* **39**, 980 (1998).
160. M. S. Bratcher, M. S. DeClue, A. Grunnet-Jepsen, D. Wright, B. Smith, W. E. Moerner, and J. S. Siegel, "Synthesis of Fully-Functional Photorefractive Polymers with Net Gain: Design Strategy Amenable to Combinatorial Optimization," *J. Amer. Chem. Soc.* **120**, 9680-9681 (1998).
161. R. M. Dickson, D. J. Norris, and W. E. Moerner, "Simultaneous Imaging of Individual Molecules Aligned Both Parallel and Perpendicular to the Optic Axis," *Phys. Rev. Lett.* **81**, 5322-5325 (1998).
162. D. Wright, M. A. Diaz-Garcia, J. D. Casperson, M. DeClue, and W. E. Moerner, "High Speed Photorefractive Polymer Composites," *Appl. Phys. Lett.* **73**, 1490-1492 (1998).
163. D. Wright, A. Grunnet-Jepsen, M. A. Diaz-Garcia, J. D. Casperson, B. Smith, M. S. Bratcher, M. S. DeClue, J. S. Siegel, W. E. Moerner, and R. J. Twieg, "Trapping Studies on Photorefractive Polymers," *Proc. Soc. Photo-Opt. Instrum. Engr.* **3471**, 60-71 (1998).
164. M. B. Klein, G. D. Bacher, A. Grunnet-Jepsen, D. Wright, and W. E. Moerner, "Homodyne Detection of Ultrasonic Surface Displacements Using Two-Wave Mixing in Photorefractive Polymers," *Opt. Commun.* **162**, 79-84 (1999).
165. W. E. Moerner, E. J. G. Peterman, S. Brasselet, S. Kummer, and R. M. Dickson, "Optical Methods for Exploring Dynamics of Single Copies of Green Fluorescent Protein," *Cytometry* **36**, 232-238 (1999).
166. W. E. Moerner and M. Orrit, "Illuminating Single Molecules in Condensed Matter," Invited Article, *Science* **283**, 1670-1676 (1999).

167. M. A. Díaz-García, D. Wright, J. D. Casperson, B. Smith, E. Glazer, W. E. Moerner, L. I. Sukhomlinova, and R. J. Twieg, "Photorefractive Properties of Poly(N-Vinyl Carbazole)-Based Composites for High Speed Applications," *Chem. Mater.* **11**, 1784-1791 (1999).
168. W. E. Moerner, A. Grunnet-Jepsen, D. Wright, J. D. Casperson, M. S. DeClue, J. S. Siegel, and R. J. Twieg, "Understanding Photorefractivity in High-Performance Polymer Composites," *OSA Trends in Optics and Photonics Volume 27*, Advances in Photorefractive Materials, Effects, and Devices, P. E. Andersen, P. M. Johansen, H. C. Pedersen, P. M. Petersen, and M. Saffman, Eds. (Optical Society of America, Washington, DC, 1999), pp. 164-172.
169. R. J. Twieg, M. He, L. Sukhomlinova, F. You, W. E. Moerner, M. A. Diaz-Garcia, D. Wright, J. D. Casperson, R. Wortmann, C. Glania, P. Kraemer, K. Lukaszuk, R. Matschiner, K. D. Singer, V. Ostoverkhov, and R. Petschek, "Design and Optimization of Chromophores for Liquid Crystal and Photorefractive Applications," *Proc. Mater. Res. Soc.* **561**, 119-130 (1999).
170. E. J. G. Peterman, S. Brasselet, and W. E. Moerner, "The Fluorescence Dynamics of Single Molecules of Green Fluorescent Protein," *J. Phys. Chem. A* **103**, 10553-10560 (1999).
171. S. Brasselet, E. J. G. Peterman, A. Miyawaki, and W. E. Moerner, "Single-Molecule Fluorescence Resonant Energy Transfer in Calcium-Concentration-Dependent Cameleon," *J. Phys. Chem. B* **104**, 3676-3682 (2000).
172. P. Schwille, S. Kummer, A. A. Heikal, W. E. Moerner, and W. W. Webb, "Fluorescence Correlation Spectroscopy Reveals Fast Optical Excitation-Driven Intermolecular Dynamics of Yellow Fluorescent Proteins," *Proc. Nat. Acad. Sci. USA* **97**, 151-156 (2000).
173. S. Brasselet and W. E. Moerner, "Fluorescence Behavior of Single-Molecule pH Sensors," *Single Molecules* **1**, 15-21 (Inaugural issue, 2000).
174. A. Goonesekera, D. Wright, and W. E. Moerner, "Image Amplification and Novelty Filtering in a Photorefractive Polymer," *Appl. Phys. Lett.* **76**, 3358-3360 (2000).
175. W. E. Moerner, "Photorefractive Polymers," in Encyclopedia of Materials: Science and Technology, Ed. D. D. Nolte; Senior Eds.: K.H. Jürgen Buschow, Robert W. Cahn, Merton C. Flemings, Bernhard Ilschner, Edward J. Kramer, Subhash Mahajan (Elsevier Science Ltd., Oxford, 2001) pp. 6961-6969.
176. B. Lounis and W. E. Moerner, "Single Photons on Demand from a Single Molecule at Room Temperature," *Nature* **407**, 491-493(2000).
177. W. E. Moerner, "Thirteen Years of Single-Molecule Spectroscopy in Physical Chemistry and Biophysics," in Single-Molecule Spectroscopy: Nobel Conference Lectures, R. Rigler, M. Orrit, Th. Basche, Editors, Springer Series in Chemical Physics, Volume 67 (Springer-Verlag, Heidelberg, 2001), pp. 32-61.
178. M. A. Diaz-Garcia, D. Wright, J. D. Casperson, B. Smith, El Glazer, W. E. Moerner, L. I. Sukhomlinova, and R. J. Twieg, "High Speed PVK-Based Photorefractive Polymer Composites," *Nonlinear Optics* **25**, 189-194 (2000).
179. B. Lounis, H. A. Bechtel, D. Gerion, P. Alivisatos, and W. E. Moerner, "Photon Antibunching in Single Quantum Dot Fluorescence," *Chem. Phys. Lett.* **329**, 399-404

(2000).

180. H. Sosa, E. J. G. Peterman, W. E. Moerner, and L. S. B. Goldstein, "ADP-Induced Rocking of the Kinesin Motor Domain Revealed by Single-Molecule Fluorescence Polarization Microscopy," *Nature Struct. Biol.* **8**, 540-544 (2001).
181. D. Wright, U. Gubler, M. B. Klein, and W. E. Moerner, "Photorefractive Polymers for Laser-Based Ultrasound Detection," *Proc. Soc. Photo-Opt. Instrum. Engr.* **4104**, 110-117 (2000).
182. B. Lounis, J. Deich, F. I. Rosell, S. G. Boxer, and W. E. Moerner, "Photophysics of DsRed, a Red Fluorescent Protein, from the Ensemble to the Single-Molecule Level," *J. Phys. Chem. B* **105**, 5048-5054 (2001).
183. M. He, R. J. Twieg, U. Gubler, D. Wright, and W. E. Moerner, "Synthesis and Properties of Some Composite Organic Photorefractive Materials," *Polym. Preprints* **42**, 510-511 (2001).
184. E. J. G. Peterman, H. Sosa, L. S. B. Goldstein, and W. E. Moerner, "Polarized Fluorescence Microscopy of Individual and Many Kinesin Motors Bound to Microtubules," *Biophys. J.* **81**, 2851-2863 (2001).
185. M. F. Paige, E. J. Bjerneld, and W. E. Moerner, "A Comparison of Through-the-Objective Total Internal Reflection Microscopy and Epi-fluorescence Microscopy for Single-Molecule Fluorescence Imaging," *Single Molecules* **2**, 191-201 (2001).
186. D. Wright, U. Gubler, S. Sadhukhan, W. E. Moerner, M. He, R. J. Twieg, M. DeClue, and J. Siegel, "Organic Photorefractive Material Design Strategies," *Proc. Soc. Photo-Opt. Instrum. Engr.* **4462**, 125-138 (2001).
187. W. E. Moerner, "A Dozen Years of Single-Molecule Spectroscopy in Physics, Chemistry, and Biophysics, (**Invited Feature Article**)," *J. Phys. Chem. B* **106**, 910-927 (2002).
188. U. Gubler, D. Wright, W. E. Moerner, and M. B. Klein, "Photochromic Polymers for the Optical Homodyne Detection of Ultrasonic Surface Displacements," *Opt. Lett.* **27**, 354-356 (2002).
189. D. Wright, U. Gubler, Y. Roh, W. E. Moerner, M. He, and R. J. Twieg, "A High Performance Photorefractive Polymer Composite with 2-dicyanomethylene-3-cyano-2,5-dihydrofuran Chromophore," *Appl. Phys. Lett.* **79**, 4274-4276 (2001).
190. U. Gubler, M. He, D. Wright, Y. Roh, R. J. Twieg, and W. E. Moerner, "Monolithic Photorefractive Organic Glasses with Large Coupling Gain and Strong Beam Fanning," *Adv. Mater.* **14**, 313-317 (2002).
191. M. F. Paige, D. P. Fromm, and W. E. Moerner, "Biomolecular Applications of Single-Molecule Measurements: Kinetics and Dynamics of a Single Enzyme Reaction," *Proc. Soc. Photo-Opt. Instrum. Engr.* **4634**, 92-103 (2002).
192. O. Ostroverkhova, D. Wright, U. Gubler, W. E. Moerner, M. He, A. Sastre-Santos, R. J. Twieg, "Recent Advances in the Understanding and Development of Photorefractive Polymers and Glasses," *Adv. Func. Mater.* **12**, 621-629 (2002).
193. N. B. Bowden, K. A. Willets, W. E. Moerner, and R. M. Waymouth, "Synthesis of Fluorescently-Labeled Polymers and Their Use in Single-Molecule Imaging,"

Macromolecules **35**, 8122-8125 (2002).

194. M. Vrljic, S. Y. Nishimura, S. Brasselet, W. E. Moerner, and H. M. McConnell, "Translational Diffusion of Individual Class II MHC Membrane Proteins in Cells," *Biophys. J.* **83**, 2681-2692 (2002).
195. W. E. Moerner, "Single-Molecule Optical Spectroscopy of Autofluorescent Proteins," **Invited Review**, *J. Chem. Phys.* **117**, 10925-10937 (2002).
196. M. He, R. J. Twieg, U. Gubler, D. Wright, and W. E. Moerner, "Synthesis and Photorefractive Properties of Multifunctional Glasses," *Chem. Mater.* **15**, 1156-1164 (2003).
197. M. He, R. Twieg, U. Gubler, D. Wright, and W. E. Moerner, "Synthesis and Properties of Glassy Organic Multifunctional Photorefractive Materials," *Opt. Mater.* **21**, 353-357 (2002).
198. M. He, R. J. Twieg, O. Ostroverkhova, U. Gubler, D. Wright, W. E. Moerner, "Dicyanomethylenedihydrofuran photorefractive materials," *Proc. Soc. Photo-Opt. Instrum. Engr.* **4802**, 9-20 (2002).
199. O. Ostroverkhova, M. He, R. J. Twieg, W. E. Moerner, "High Performance Photorefractive Organic Glasses: Understanding Mechanisms and Limitations," *Proc. Soc. Photo-Opt. Instrum. Engr.* **4802**, 21-32 (2002).
200. W. E. Moerner and D. P. Fromm, "Methods of Single-Molecule Fluorescence Spectroscopy and Microscopy," **Invited Review**, *Rev. Sci. Instrum.* **74**, 3597-3619 (2003).
201. K. A. Willets, O. Ostroverkhova, M. He, R. J. Twieg, and W. E. Moerner, "New Fluorophores for Single-Molecule Spectroscopy," *J. Amer. Chem. Soc.* **125**, 1174-1175 (2003) (10.1021/ja029100q, 11 January 2003).
202. O. Ostroverkhova, W. E. Moerner, "High-Performance Photorefractive Organic Glass with Near-Infrared Sensitivity," *Appl. Phys. Lett.* **82**, 3602-3604 (2003).
203. O. Ostroverkhova, M. He, R. J. Twieg, and W. E. Moerner, "Role of Temperature in Controlling Performance of Organic Photorefractive Glasses," *ChemPhysChem* **4**, 732-744 (2003).
204. J. Hwang, M. M. Fejer, and W. E. Moerner, "Exploring Novel Methods of Interferometric Detection of Ultrasmall Phase Shifts," *Proc. SPIE* **4962**, 110-120 (2003).
205. D. Wright, U. Gubler, W. E. Moerner, M. DeClue, and J. S. Siegel, "Photorefractive Properties of Poly(siloxane)-triarylamine-Based Composites for High Speed Applications," *J. Phys. Chem. B* **107**, 4732-4737 (2003) (10.1021/jp027456i).
206. W. E. Moerner, "Optical Measurements of Single Molecules in Cells," *Trends Analyt. Chem.* **22**, 544-548 (2003).
207. Z. Chen, M. Asaro, O. Ostroverkhova, W. E. Moerner, M. He, and R. J. Twieg, "Self-trapping of light in a photorefractive organic glass," *Opt. Lett.* **28**, 1-3 (2003).
208. Ellen M. Judd, Kathleen R. Ryan, W. E. Moerner, Lucy Shapiro, Harley H. McAdams, "Fluorescence bleaching reveals asymmetric compartment formation prior to cell division in *Caulobacter*," *Proc. Nat. Acad. Sci. (USA)* **100**, 8235-8240 (2003).

209. K. A. Willets, O. Ostroverkhova, S. Hess, M. He, R. J. Twieg, and W. E. Moerner, "Novel Fluorophores for Single-Molecule Imaging," *Proc. SPIE* **5222**, 150-157 (2003).
210. E. Thrush, O. Levi, W. Ha, G. Carey, L. J. Cook, J. Deich, S. J. Smith, W. E. Moerner, and J. S. Harris, Jr., "Integrated Semiconductor Vertical-Cavity Surface-Emitting Lasers and PIN Photodetectors for Bio-Medical Fluorescence Sensing," *IEEE J. Quant. Electr.* **40**, 491-498 (2004).
211. E. J. G. Peterman, H. Sosa, and W. E. Moerner, "Single-Molecule Fluorescence Spectroscopy and Microscopy of Biomolecular Motors," **Invited Review**, *Ann. Rev. Phys. Chem.* **55**, 79-96 (2004).
212. O. Ostroverkhova and W. E. Moerner, "Organic Photorefractives: Mechanisms, Materials, and Applications," **Invited Review**, *Chem. Revs.* **104**, 3267-3314 (2004).
213. E. Thrush, O. Levi, L. J. Cook, J. Deich, A. Kurtz, S. J. Smith, W. E. Moerner, and J. S. Harris Jr., "Monolithically integrated semiconductor fluorescence sensor for microfluidic applications," *Sensors and Actuators B: Chemical* **105**, 393-399 (2005).
214. J. Matteo, D. P. Fromm, Y. Yuen, P. J. Schuck, W. E. Moerner, and L. Hesselink, "Spectral Analysis of Strongly Enhanced Visible Light Transmission Through Single C-Shaped Nano-Apertures," *Appl. Phys. Lett.* **85**, 648-650 (2004).
215. J. Deich, E. M. Judd, H. H. McAdams, and W. E. Moerner, "Visualization of the Movement of Single Histidine Kinase Molecules in Live *Caulobacter* cells," *Proc. Nat. Acad. Sci. (USA)* **101**, 15921-15926 (2004) (published online Nov. 2, 2004, 10.1073/pnas.0404200101).
216. M. Vrljic, S. Y. Nishimura, W. E. Moerner, and H. M. McConnell, "Cholesterol depletion suppresses the translational diffusion of class II MHC proteins in the plasma membrane," *Biophys. J.* **88**, 334-347 (2005).
217. K. A. Willets, P. Callis, and W. E. Moerner, "Experimental and Theoretical Investigations of Environmentally Sensitive Single-Molecule Fluorophores," (**G. J. Small Festschrift**) *J. Phys. Chem. B* **108**, 10465-10473 (2004) (published online 17 April 2004, 10.1021/jp049684d).
218. E. Thrush, O. Levi, W. Ha, G. Carey, L. J. Cook, J. Deich, S. J. Smith, W. E. Moerner and J. S. Harris, Jr., "Laser background rejection optimization in integrated optoelectronic fluorescence sensor," *Proceedings of μTAS* **1**, 363-366 (2003).
219. D. P. Fromm, A. Sundaramurthy, P. J. Schuck, G. Kino, and W. E. Moerner, "Gap-Dependent Optical Coupling of Single 'Bowtie' Nanoantennas Resonant in the Visible," *Nano Lett.* **4**, 957-961 (2004) (published online March 25, 2004, 10.1021/nl049951r).
220. W. E. Moerner, "Single-Photon Sources Based on Single Molecules in Solids," *New Journal of Physics* **6**, 88-109 (2004).
221. K. A. Willets, R. J. Twieg, and W. E. Moerner, "Single-Molecule Magic," *OEMagazine* **4**, 13-15 (2004).
222. G. S. Kino, A. Sundaramurthy, P. J. Schuck, D. P. Fromm, and W. E. Moerner, "Optical Field Enhancement with Plasmon Resonant Bowtie Nanoantennas," Chapter 9 of Surface Plasmon Nanophotonics, M. Brongersma and P. Kik, Editors (Kluwer, Dordrecht, The Netherlands, appearing March 2007).

223. S. Y. Kim, A. N. Semyonov, R. J. Twieg, A. L. Horwich, J. Frydman, and W. E. Moerner, "Probing the Sequence of Conformational Changes in the Molecular Chaperonin GroEL with Fluorescence Spectroscopy," *J. Phys. Chem. B* **109**, 24517-24525 (2005).
224. K. A. Willets, S. Y. Nishimura, P. J. Schuck, R. J. Twieg, and W. E. Moerner, "Nonlinear Optical Chromophores as Nanoscale Emitters for Single-Molecule Spectroscopy," **Invited Review**, *Accounts Chem. Res.* **38**, 549-556 (2005) (published online 28 Jan 2005).
225. P. J. Schuck, D. P. Fromm, A. Sundaramurthy, G. S. Kino, and W. E. Moerner, "Improving the Mismatch Between Light and Nanoscale Objects with Gold Bowtie Nanoantennas," *Phys. Rev. Lett.* **94**, 017402 (2005).
226. A. E. Cohen and W. E. Moerner, "A Method for Trapping and Manipulating Nanoscale Objects in Solution," *Appl. Phys. Lett.* **86**, 093109 (2005).
227. P. J. Schuck, K. A. Willets, D. P. Fromm, R. J. Twieg, and W. E. Moerner, "A Novel Fluorophore for Single-Molecule Two-Photon-Excited Fluorescence," *Chem. Phys.* **318**, 7-11 (2005).
228. K. Mauring, J. Deich, F. I. Rosell, T. B. McAnaney, W. E. Moerner, and S. G. Boxer, "Enhancement of the Blue Fluorescent Protein's Fluorescence by High Pressure or Low Temperature," *J. Phys. Chem. B* **109**, 12976-12981 (2005).
229. R. Twieg, H. Wang, Z. Lu, S. Y. Kim, S. Lord, S. Nishimura, P. J. Schuck, K. A. Willets, and W. E. Moerner, "Synthesis, Properties and Applications of Dicyanomethylenedihydrofuran (DCDHF) Single-Molecule Fluorophores," *Nonlinear Optics, Quantum Optics* **34**, 241-246 (2005).
230. M. Asaro, M. Sheldon, Z. Chen, O. Ostroverkhova, and W. E. Moerner, "Soliton-induced Waveguides in an Organic Photorefractive Glass," *Opt. Lett.* **30**, 519-521 (2005).
231. A. E. Cohen and W. E. Moerner, "The Anti-Brownian ELectrrophoretic Trap (ABEL Trap): Fabrication and Software," *Proc. SPIE* **5699**, 296-305 (2005).
232. E. M. Judd, L. R. Comolli, J. C. Chen, K. H. Downing, W. E. Moerner, and H. H. McAdams, "Distinct Constrictive Processes, Separated in Time and Space, Divide *Caulobacter* Inner and Outer Membranes," *J. Bacteriol.* **187**, 6874-6882 (2005).
233. S. Y. Nishimura, M. Vrljic, L. O. Klein, H. M. McConnell, and W. E. Moerner, "Cholesterol depletion induces solid-like regions in the plasma membrane," *Biophys. J.* **90**, 927-938 (2006).
234. A. E. Cohen and W. E. Moerner, "An All-Glass Microfluidic Cell for the ABEL Trap: Fabrication and Modeling," *Proc. SPIE* **5930**, 59300S-1-S-8 (2005).
235. A. Sundaramurthy, K. B. Crozier, G. S. Kino, D. P. Fromm, P. J. Schuck, and W. E. Moerner, "Field enhancement and gap-dependent resonance in a system of two opposing tip-to-tip Au nanotriangles," *Phys. Rev. B* **72**, 165409-1-6 (2005).
236. D. P. Fromm, A. Sundaramurthy, A. Kinkhabwala, P. J. Schuck, G. S. Kino, and W. E. Moerner, "Exploring the Chemical Enhancement for Surface-Enhanced Raman Scattering with Au Bowtie Nanoantennas," *J. Chem. Phys. Commun.* **124**, 061101 (2006).
237. A. Sundaramurthy*, P. J. Schuck*, N. R. Conley, D. P. Fromm, G. S. Kino, and W. E. Moerner, "Toward Nanometer-scale Optical Photolithography: Utilizing the Near-Field of

Bowtie Optical Nanoantennas," *Nano Lett.* **6**, 355-360 (2006) (web release 9 Feb 2006)
(*equal contributions).

238. J. Hwang, M. M. Fejer, and W. E. Moerner, "Scanning Interferometric Microscopy for the Detection of Ultrasmall Phase Shifts in Condensed Matter," *Phys. Rev. A Rapid Commun.* **73**, 021802R (2006).
239. A. E. Cohen and W. E. Moerner, "Suppressing Brownian Motion of Individual Biomolecules in Solution," *Proc. Nat. Acad. Sci. (USA)* **103**, 4362-4365 (2006).
240. S. Y. Nishimura, S. J. Lord, L. O. Klein, K. A. Willets, M. He, Z. Lu, R. J. Twieg, and W. E. Moerner, "Diffusion of Lipid-Like Single-Molecule Fluorophores in the Cell Membrane," *J. Phys. Chem. B* **110**, 8151-8157 (2006).
241. C. A. Werley and W. E. Moerner, "Single-Molecule Nanoprobes Explore Defects in Spin-Grown Crystals," **R. J. Silbey Festschrift, J. Phys. Chem. B** **110**, 18939- 18944 (2006), web release date 19 April 2006.
242. M. Vrljic, S. Y. Nishimura, and W. E. Moerner, "Single-Molecule Tracking," Chapter 14 in *Methods in Molecular Biology, Vol. 398: Lipid Rafts*, Thomas. J. McIntosh, Ed. (Humana Press, Totowa, NJ, 2009), pp. 193-219.
243. S. Y. Kim, Z. Gitai, A. Kinkhabwala, L. Shapiro, and W. E. Moerner, "Single Molecules of the Bacterial Actin MreB Undergo Directed Treadmilling Motion in *Caulobacter crescentus*," *Proc. Nat. Acad. Sci. (USA)* **103**, 10929-10934 (2006).
244. W. E. Moerner, P. J. Schuck, D. P. Fromm, A. Kinkhabwala, S. J. Lord, S. Y. Nishimura, K. A. Willets, A. Sundaramurthy, G. Kino, M. He, Z. Lu, R. J. Twieg, "Nanophotonics and Single Molecules," Chapter 1 of Single Molecules and Nanotechnology, R. Rigler and H. Vogel, Eds. (Springer-Verlag, Berlin, Heidelberg, 2008), pp. 1-24.
245. C. von Borczyskowski, J. Koehler, W. E. Moerner, M. Orrit, and J. Wrachtrup, "Single-Molecule Electron Spin Resonance," *Appl. Magn. Reson.* (special issue honoring George Feher) **31**, 665-676 (2007).
246. W. E. Moerner, "Single-Molecule Mountains Yield Nanoscale Cell Images," *Nature Methods* **3**, 781-782 (2006).
247. G. T. Gavranovic, S. Csihony, N. B. Bowden, C. J. Hawker, R. M. Waymouth, W. E. Moerner, G. G. Fuller, "Well-Controlled Living Polymerization of Perylene-Labeled Polyisoprenes and Their Use in Single-Molecule Imaging," *Macromolecules* **39**, 8121-8127 (2006).
248. H. Wang, Z. Lu, S. J. Lord, K. A. Willets, J. A. Bertke, S. D. Bunge, W. E. Moerner, R. J. Twieg, "The Influence of Tetrahydroquinoline Rings in Dicyanomethylenedihydrofuran (DCDHF) Single-Molecule Fluorophores," *Tetrahedron* **63**, 103-114 (2007).
249. Z. Lu, S. J. Lord, H. Wang, W. E. Moerner, and R. J. Twieg, "A Long-Wavelength Analog of PRODAN: Synthesis and Properties of Anthradan, a Fluorophore with a 2,6-Donor-Acceptor Anthracene Structure," *J. Org. Chem.* **71**, 9651-9657 (2006).
250. A. E. Cohen and W. E. Moerner, "Internal Mechanical Response of a Polymer in Solution," *Phys. Rev. Lett.* **98**, 116001-(1-4) (2007).
251. A. E. Cohen and W. E. Moerner, "Principal-Components Analysis of Shape Fluctuations

- of Single DNA Molecules," *Proc. Nat. Acad. Sci. (USA)* **104**, 12622-12627 (2007).
252. W. E. Moerner, "New Directions in Single-Molecule Imaging and Analysis," Invited Perspective, *Proc. Nat. Acad. Sci. (USA)* **104**, 12596-12602 (2007); Erratum *Proc. Nat. Acad. Sci. (USA)* **104**, 15584 (2007).
253. H. Wang, Z. Lu, S. J. Lord, W. E. Moerner, and R. J. Twieg, "Modifications of DCDHF Single-Molecule Fluorophores to Impart Water Solubility," *Tet. Lett.* **48**, 3471-3474 (2007).
254. N. R. Conley, A. Kurtz Pomerantz, H. Wang, R. J. Twieg, and W. E. Moerner, "Bulk and Single-Molecule Characterization of an Improved Molecular Beacon Utilizing H-Dimer Excitonic Behavior," *J. Phys. Chem. B Letters* **111**, 7929-7931 (Web release 21 July 2007).
255. S. J. Lord, Z. Lu, H. Wang, K. A. Willets, P. J. Schuck, H. D. Lee, S. Y. Nishimura, R. J. Twieg, and W. E. Moerner, "Photophysical Properties of Acene DCDHF Fluorophores: Long-Wavelength Single-Molecule Emitters Designed for Cellular Imaging," *J. Phys. Chem. A* **111**, 8934-8941 (2007).
256. F. Jäckel, A. Kinkhabwala, and W. E. Moerner, "Gold bowtie nanoantennas for surface-enhanced Raman scattering under controlled electrochemical potential," *Chem. Phys. Lett.* **446**, 339-343 (2007).
257. J. Hwang and W. E. Moerner, "Interferometry of a Single Nanoparticle Using the Gouy Phase of a Focused Laser Beam," *Opt. Commun.* **280**, 487-491 (published online, Sept. 4, 2007).
258. H.-L. Lee, E. A. Dubikovskaya, H. Hwang, A. N. Semyonov, H. Wang, L. R. Jones, R. J. Twieg, W. E. Moerner, and P. A. Wender, "Single-Molecule Motions of Oligoarginine Transporter Conjugates on the Plasma Membrane of CHO Cells," *J. Amer. Chem. Soc.* **130**, 9364-9370 (published online, June 26, 2008).
259. A. E. Cohen and W. E. Moerner, "Controlling Brownian motion of single protein molecules and single fluorophores in aqueous buffer," *Optics Express* **16**, 6941-6956 (2008).
260. S. J. Lord, N. R. Conley, H.-L. D. Lee, R. Samuel, Na Liu, R. J. Twieg, and W. E. Moerner, "A Photoactivatable Push-Pull Fluorophore for Single-Molecule Imaging in Live Cells," *J. Amer. Chem. Soc.* **130**, 9204-9205 (published online, June 24, 2008).
261. G. R. Bowman, L. R. Comolli, J. Zhu, M. Eckart, M. Koenig, K. H. Downing, W. E. Moerner, T. Earnest, L. Shapiro, "A polymeric protein anchors the chromosomal origin/ParB complex at a bacterial cell pole," *Cell* **134**, 945-955 (2008).
262. N. R. Conley, J. S. Biteen, and W. E. Moerner, "Cy3-Cy5 Covalent Heterodimers for Single-Molecule Photoswitching," *J. Phys. Chem. B Lett.* **112**, 11878-11880 (published online, 28 August 2008).
263. Y. Jiang, Q. Wang, A. E. Cohen, N. Douglas, J. Frydman, and W. E. Moerner, "Hardware-based anti-Brownian electrokinetic trap (ABEL trap) for single molecules: Control loop simulations and application to ATP binding stoichiometry in multi-subunit enzymes," *Proc. SPIE* **7038**, 703807 (2008).
264. W. E. Moerner, "Single-Molecule Optical Spectroscopy and Imaging: From Early Steps to

Recent Advances," in Single Molecule Spectroscopy in Chemistry, Physics and Biology: Nobel Symposium 138, Springer Series in Chemical Physics Vol. 96, A. Gräslund, R. Rigler, J. Widengren, Eds. (Springer-Verlag, Berlin, 2009), pp. 25-60.

265. S. J. Lord, N. R. Conley, H.-L. D. Lee, S. Y. Nishimura, A. K. Pomerantz, K. A. Willets, Z. Lu, H. Wang, N. Liu, R. Samuel, R. Weber, A. Semyonov, M. He, R. J. Twieg, and W. E. Moerner, "DCDHF Fluorophores for Single-Molecule Imaging in Cells," *Chem Phys Chem* 10th Anniversary Issue **10**, 55-65 (2009).
266. A. K. Pomerantz, W. E. Moerner, and E. T. Kool, "Visualization of Long Human Telomere Mimics by Single-Molecule Fluorescence Imaging," *J. Phys. Chem. B Lett.* **112**, 13184-13187 (2008), published online 26 September 2008.
267. J. S. Biteen, M. A. Thompson, N. K. Tselenitis, G. R. Bowman, L. Shapiro, W. E. Moerner, "Superresolution Imaging in Live *Caulobacter Crescentus* Cells Using Photoswitchable EYFP," *Nature Meth.* **5**, 947-949 (2008), published online 15 September 2008.
268. Z. Lu, N. Liu, S. J. Lord, S. D. Bunge, W. E. Moerner, and R. J. Twieg, "Bright-Red Single-Molecule Emitters: Synthesis and Properties of Environmentally Sensitive Dicyanomethylenedihydrofuran (DCDHF) Fluorophores with Bisaromatic Conjugation," *Chem. Mater.* **21**, 797-810 (2009).
269. S. R. P. Pavani*, M. A. Thompson*, J. S. Biteen, S. J. Lord, N. Liu, R. J. Twieg, R. Piestun, and W. E. Moerner, (*equal contributions), "Three-Dimensional Single-Molecule Fluorescence Imaging Beyond the Diffraction Limit Using a Double-Helix Point Spread Function," *Proc. Nat. Acad. Sci. (USA)* **106**, 2995-2999 (2009), published online 11 February 2009.
270. J. K. Lee, F. Jäckel, W. E. Moerner, and Z. Bao, "Micron-sized DNA-Single Fluorophore-DNA Supramolecule: Synthesis and Single-Molecule Characterization," *Small* **5**, 2418-2423 (2009), published online June 10, 2009.
271. R. Won and W. E. Moerner, "Eyes on Super-resolution," *Nature Photonics* **3**, 368-369 (2009).
272. A. Kinkhabwala, Z. Yu, S. Fan, Y. Avlasevich, K. Müllen, and W. E. Moerner, "Large Single-Molecule Fluorescence Enhancements Produced by a Bowtie Nanoantenna," *Nature Photonics* **3**, 654-657 (2009), published online, October 18, 2009.
273. K. Rivoire, A. Kinkhabwala, F. Hatami, W. T. Masselink, Y. Avlasevich, K. Müllen, W.E. Moerner, and Jelena Vuckovic, "Lithographic Positioning of Fluorescent Molecules on High-Q Photonic Crystal Cavities," *Appl. Phys. Lett.* **95**, 123113-1-3 (2009).
274. M. Orrit and W. E. Moerner, "High Resolution Single-Molecule Spectroscopy in Condensed Matter," Chapter 12 of Physics and Chemistry at Low Temperatures, L. Khriachtchev, Ed. (Pan Stanford Publishing, Singapore, 2011), pp. 381-417.
275. S. J. Lord, H-L. D. Lee, R. Samuel, R. Weber, N. Liu, N. R. Conley, M. A. Thompson, R. J. Twieg, and W. E. Moerner, "Azido Push-Pull Fluorogens Photoactivate to Produce Bright Fluorescent Labels," *J. Phys. Chem. B* **114**, 14157-14167 (2010), **Michael R. Wasielewski Festschrift**, published online October 27, 2009.
276. S. J. Lord, N. R. Conley, H-L. D. Lee, N. Liu, R. Samuel, R. J. Twieg, and W. E. Moerner, "Photoactivatable DCDHF Fluorophores for Single-Molecule Imaging," *Proc. SPIE* **7190**,

719013 (2009).

277. J. S. Biteen and W. E. Moerner, "Single-Molecule and Superresolution Imaging in Live Bacterial Cells," in Cell Biology of Bacteria, L. Shapiro and R. Losick, Eds., Cold Spring Harbor Perspectives in Biology 2010; 2:a000448 (Cold Spring Harbor Laboratory Press, 2011), first published online February 3, 2010.
278. Q. Wang and W. E. Moerner, "Optimal Strategy for Trapping Single Fluorescent Molecules in Solution Using the ABEL Trap," *Appl. Phys. B* **99**, 23-30 (2010), published online December 12, 2009.
279. M. A. Thompson*, M. D. Lew*, M. Badieirostami, and W. E. Moerner, (*equal contributions), "Localizing and Tracking Single Nanoscale Emitters in Three Dimensions with High Spatio-Temporal Resolution Using a Double-Helix Point Spread Function," *Nano Letters* **10**, 211 (2010), published online December 15, 2009.
280. R. Goldsmith and W. E. Moerner, "Watching Conformational- and Photo-Dynamics of Single Fluorescent Proteins in Solution," *Nature Chemistry* **2**, 179-186 (2010), published online January 31, 2010.
281. S. J. Lord, H.-L. D. Lee, and W. E. Moerner, "Single-Molecule Spectroscopy and Imaging of Biomolecules in Living Cells," **Perspective, Anal. Chem.** **82**, 2192-2203 (2010), published online February 17, 2010.
282. M. D. Lew, M. A. Thompson, M. Badieirostami, and W. E. Moerner, "In-vivo Three-Dimensional Superresolution Fluorescence Tracking using a Double-Helix Point Spread Function," *Proc. SPIE* **7571**, 75710Z-1-75710Z-13 (2010).
283. J. S. Biteen, L. Shapiro, and W. E. Moerner, "Exploring Protein Superstructures and Dynamics in Live Bacterial Cells Using Single-Molecule and Superresolution Imaging," Ch. 8 of Single-Molecule Techniques: Methods and Protocols, E. J. G. Peterman and G. J. L. Wuite, Eds., *Methods in Molecular Biology* Volume **783** (Humana Press, New York, 2011), pp. 139-158.
284. M. A. Thompson, J. S. Biteen, S. J. Lord, N. R. Conley, and W. E. Moerner, "Molecules and Methods for Super-Resolution Imaging," in *Methods in Enzymology*, Volume **475**, Nils G. Walter, Editor (Elsevier, New York, 2010), Chapter 2, pp. 27-59.
285. Jerod L. Ptacin, Steven F. Lee, Ethan C. Garner, Esteban Toro, Michael Eckart, Luis R. Comolli, W.E. Moerner, and Lucy Shapiro, "A spindle-like apparatus guides bacterial chromosome segregation," *Nature Cell Biology* **12**, 791-798 (2010), published online July 25, 2010.
286. S. Y. Kim, E. J. Miller, J. Frydman, and W. E. Moerner, "Action of the chaperonin GroEL/ES on a non-native substrate observed with single-molecule FRET," *J. Molec. Biol.* **401**, 553-563 (2010), published online 30 June 2010.
287. Michael A. Thompson, Jason M. Casolari, Majid Badieirostami, Patrick O. Brown, and W.E. Moerner, "Three-dimensional tracking of single mRNA particles in *S. cerevisiae* using a Double-Helix Point Spread Function," **Inaugural Article, Proc. Nat. Acad. Sci. (USA)** **107**, 17864-17871 (2010), published online 4 October 2010.
288. Hsiao-lu D. Lee, Samuel J. Lord, Shigeki Iwanaga, Ke Zhan, Hexin Xie, Jarrod C. Williams, Hui Wang, Grant R. Bowman, Erin D. Goley, Lucy Shapiro, Robert J. Twieg,

- Jianghong Rao, and W. E. Moerner, "Superresolution Imaging of Targeted Proteins in Fixed and Living Cells Using Photoactivatable Organic Fluorophores," *J. Am. Chem. Soc.* **132**, 15099-15101 (2010), published online October 11, 2010.
289. Majid Badieirostami, Matthew D. Lew, Michael A. Thompson, and W. E. Moerner, "Three-Dimensional Localization Precision of the Double-Helix Point Spread Function versus Astigmatism and Biplane," *Appl. Phys. Lett.* **97**, 161103 (2010), published online October 18, 2010.
290. Matthew D. Lew, Steven F. Lee, Majid Badieirostami, and W. E. Moerner, "Corkscrew point spread function for far-field three-dimensional nanoscale localization of point objects," *Optics Lett.* **36**, 202-204 (2011), published online December 14, 2010.
291. Steven F. Lee*, Michael A. Thompson*, Monica Schwartz, Lucy Shapiro, and W. E. Moerner, (*equal contributions), "Super-Resolution Imaging of the Nucleoid-Associated Protein HU in *Caulobacter crescentus*," *Biophys. J. Lett.* **100**, L31-L33 (2011).
292. Julie S. Biteen and W. E. Moerner, "Live-cell single-molecule and superresolution imaging of proteins in bacteria," *Proc SPIE* **7905**, 79050Q-1-79050Q-8 (2011).
293. Lana Lau, Yin Loon Lee, Maja Matis, Jeff Axelrod, Tim Stearns, and W. E. Moerner, "STED Super-resolution Microscopy in Drosophila Tissue and in Mammalian Cells," *Proc SPIE* **7910**, 79101N-1-79101N-8 (2011).
294. A. E. Cohen and W. E. Moerner, "Anti-Brownian Traps," in Encyclopedia of Biophysics, G. C. K. Roberts (Ed.) (Springer, Berlin, Heidelberg, 2012), pp. 95-97.
295. Quan Wang and W. E. Moerner, "An Adaptive Anti-Brownian ELeckokinetic Trap with Real-time Information on Single-Molecule Diffusivity and Mobility," *ACS Nano* **5**, 5792-5799 (2011), published online May 25, 2011.
296. Whitney C. Duim, Bryan Chen, Judith Frydman, and W. E. Moerner, "Sub-Diffraction Imaging of Huntington Protein Aggregates by Fluorescence Blink-Microscopy and Atomic Force Microscopy," *ChemPhysChem* **12**, 2387-2390 (2011), published online July 6, 2011.
297. Yan Jiang, Nicholai R. Douglas, Nicholas R. Conley, Erik J. Miller, Judith Frydman, and W. E. Moerner, "Sensing Cooperativity in ATP Hydrolysis for Single Multi-Subunit Enzymes in Solution," *Proc. Nat. Acad. Sci. (USA)* **108**, 16962-16967 (2011), published online 6 September 2011. **Highlighted** in a Commentary by Taekjip Ha and Sua Myong, "A single-molecule view of chaperonin cooperativity," *Proc. Natl. Acad. Sci. (USA)* **108**, 16865-16866 (2011).
298. Randall H. Goldsmith, Leandro C. Tabares, Dorota Kostrz, Christopher Dennison, Thijs J. Aartsma, Gerard W. Canters, and W. E. Moerner, "Redox cycling and kinetic analysis of single molecules of solution-phase nitrite reductase," *Proc. Nat. Acad. Sci. (USA)* **108**, 17269-17274 (2011), published online 3 October 2011.
299. Matthew D. Lew*, Steven F. Lee*, Jerod L. Ptacin, Marissa K. Lee, Robert J. Twieg, Lucy Shapiro, and W. E. Moerner, "Three-dimensional super-resolution co-localization of intracellular protein superstructures and the cell surface in live *Caulobacter crescentus*," *Proc. Nat. Acad. Sci. (USA)* **108**, E1102-E1110 (2011) and **108**, 18577-18578 (2011), published online 26 October 2011.
300. Samuel Bockenhauer, Alexandre Fürstenberg, Xiao Jie Yao, Brian Kobilka, and W. E.

Moerner, "Conformational Dynamics of Single G Protein-Coupled Receptors in Solution," *J. Phys. Chem. B* **115**, 13328-13338 (2011), published online 19 September 2011.

301. Julie Biteen, Erin D. Goley, Lucy Shapiro, and W. E. Moerner, "Three-Dimensional Super-Resolution Imaging of the Midplane Protein FtsZ in Live *Caulobacter crescentus* Cells Using Astigmatism, *ChemPhysChem* **13**, 1007-1012 (2012), published online January 20, 2012.
302. Michael A. Thompson, Matthew D. Lew, and W. E. Moerner, "Extending Microscopic Resolution with Single-Molecule Imaging and Active Control," *Annual Reviews of Biophysics* **41**, 321-342 (published online 9 Jun 2012).
303. Matthew D. Lew, Steven F. Lee, Michael A. Thompson, Hsiao-lu D. Lee, and W. E. Moerner, "Single-Molecule Photocontrol and Nanoscopy," in Far-Field Optical Nanoscopy, P. Tinnefeld, C. Eggeling, and S. W. Hell, Eds., Springer Series on Fluorescence (Springer, Berlin, Heidelberg, 2012), published online 21 February 2012.
304. Nicholas R. Conley, Anca Dragulescu-Andrasi, Jianghong Rao, and W. E. Moerner, "A Selenium Analogue of Firefly D-Luciferin with Red-Shifted Bioluminescence Emission," *Angew. Chemie Int. Ed. Engl.* **51**, 3350-3353 (2012), published online 17 February 2012.
305. Stephanie C. Weber, Michael A. Thompson, W. E. Moerner, Andrew J. Spakowitz, and Julie A. Theriot, "Analytical tools to distinguish the effects of localization error, confinement and medium elasticity on the velocity autocorrelation function," *Biophys. J.* **102**, 2443-2450 (2012).
306. Hsiao-lu D. Lee*, Steffen J. Sahl*, Matthew D. Lew, and W. E. Moerner, (*equal contributions), "The double-helix microscope super-resolves extended biological structures by localizing single blinking molecules in three dimensions with nanoscale precision," *Appl. Phys. Lett.* **100**, 153701 (2012), published online 9 April 2012.
307. Samuel Bockenhauer, Alexandre Fürstenberg, Xiao Jie Yao, Brian K. Kobilka, and W. E. Moerner, "Anti-Brownian ELEctrokinetic (ABEL) Trapping of Single β_2 -Adrenergic Receptors in the Absence and Presence of Agonist," *Proc. SPIE* **8228**, 822805(1-16), (2012).
308. Jason M. Casolari, Michael A. Thompson, Julia Salzman, Lowry M. Champion, W. E. Moerner, and Patrick O. Brown, "Widespread mRNA Association with Cytoskeletal Motor Proteins and Identification and Dynamics of Myosin-Associated mRNAs in *S. cerevisiae*," *PLoS ONE* **7**(2), e31912(1-20) (2012), published 16 Feb 2012.
309. Quan Wang, Randall H. Goldsmith, Yan Jiang, Samuel D. Bockenhauer, and W.E. Moerner, "Probing single biomolecules in solution using the Anti-Brownian ELEctrokinetic (ABEL) trap," *Acc. Chem. Res.* **45**, 1955-1964 (**Paul Barbara Special Issue**) (2012), published online 22 May 2012.
310. W. E. Moerner, "Microscopy beyond the diffraction limit using actively controlled single molecules," *J. Microsc.* **246**, 213-220 (2012), published online 12 April 2012, DOI: 10.1111/j.1365-2818.2012.03600.x
311. Anika A. Kinkhabwala, Zongfu Yu, Shanhui Fan, and W.E. Moerner, "Fluorescence correlation spectroscopy at high concentrations using gold bowtie nanoantennas," *Chem. Phys.* **406**, 3-8 (2012), published online 21 April 2012; **406C**, 3-8 (2012).

312. Lana Lau, Yin Loon Lee, Steffen J. Sahl, Tim Stearns, and W. E. Moerner, “STED Microscopy with Optimized Labeling Density Reveals 9-fold Arrangement of a Centriole Protein,” *Biophys. J.* **102**, 2926-2935 (2012), published online 19 June 2012.
313. Samuel Bockenhauer, Quan Wang, and W. E. Moerner, “Spectrally Resolved Anti-Brownian Electrokinetic (ABEL) Trapping of Single Peridinin-Chlorophyll-Proteins in Solution,” *Proc. SPIE* **8427**, 84274C(1-9) (2012).
314. Alison E. Ondrus*, Hsiao-lu D. Lee*, Shigeki Iwanaga, William H. Parsons, Brian M. Andresen, W. E. Moerner, and J. Du Bois (*equal contributions), “Fluorescent Saxitoxins for Live Cell Imaging of Single Voltage-Gated Sodium Ion Channels Beyond the Optical Diffraction Limit,” *Chemistry and Biology* **19**, 902-912 (2012), published online 26 July 2012.
315. Marissa K. Lee, Jarrod Williams, Robert J. Twieg, Jianghong Rao, and W. E. Moerner, “Enzymatic Activation of Nitro-Aryl Fluorogens in Live Bacterial Cells for Enzymatic Turnover-Activated Localization Microscopy,” *Chemical Science* **4** (1), 220-225 (2013), published online 5 October 2012.
316. Mikael P. Backlund*, Matthew D. Lew*, Adam S. Backer, Steffen J. Sahl, Ginni Grover, Anurag Agrawal, Rafael Piestun, and W. E. Moerner (*equal contributions), “Simultaneous, accurate measurement of the 3D position and orientation of single molecules,” *Proc. Nat. Acad. Sci. (USA)* **109**, 19087-19092 (2012), published online 5 November 2012.
317. Steffen J. Sahl*, Lucien E. Weiss*, Whitney C. Duim, Judith Frydman, and W. E. Moerner (*equal contributions), “Cellular Inclusion Bodies of Mutant Huntington Exon 1 Obscure Small Fibrillar Aggregate Species,” *Scientific Reports* **2**, 895 (2012).
318. Quan Wang and W. E. Moerner, “Lifetime and spectrally resolved characterization of the photodynamics of single fluorophores in solution using the Anti-Brownian Electrokinetic trap,” **Special Issue in memory of Paul F. Barbara**, *J. Phys. Chem. B* **117**, 4641-4648 (2013), published online 30 November 2012.
319. Matthew D. Lew*, Mikael P. Backlund*, and W. E. Moerner (*equal contributions), “Rotational Mobility of Single Molecules Affects Localization Accuracy in Super-Resolution Fluorescence Microscopy,” *Nano Lett.* **13**, 3967-3972 (2013), DOI:10.1021/nl304359p, published online January 29, 2013.
320. Andreas Gahlmann, Jerod L. Ptacin, Ginni Grover, Sean Quirin, Alexander R. S. von Diezmann, Marissa K. Lee, Mikael P. Backlund, Lucy Shapiro, Rafael Piestun, and W. E. Moerner, “Quantitative Multicolor Subdiffraction Imaging of Bacterial Protein Ultrastructures in Three Dimensions,” *Nano Lett.* **13**, 987-993 (2013), published online February 15, 2013.
321. Matthew D. Lew*, Alexander R. S. von Diezmann,* and W. E. Moerner (*equal contributions), “Easy-DHPSF open-source software for three-dimensional localization of single molecules with precision beyond the optical diffraction limit,” *Protocol Exchange* doi: 10.1038/protex.2013.026, published online 25 February 2013.
322. Mikael P. Backlund*, Matthew D. Lew*, Adam S. Backer, Steffen J. Sahl, Ginni Grover, Anurag Agrawal, Rafael Piestun, and W. E. Moerner (*equal contributions), “The double-helix point spread function enables precise and accurate measurement of 3D single-

- molecule position and orientation," *Proc. SPIE* **8590**, 85900L1-11 (2013).
- 323. Adam S. Backer, Mikael P. Backlund, Matthew D. Lew, and W. E. Moerner, "Single-molecule orientation measurements with a quadrated pupil," *Optics Lett.* **38**, 1521-1523 (2013), published online March 15, 2013.
 - 324. G.S. Schlau-Cohen, Q. Wang, J. Southall, R.J. Cogdell, W.E. Moerner, "Single-molecule spectroscopy reveals LH₂ complexes switch between emissive states," *Proc. Nat. Acad. Sci. (USA)* **110**, 10899-10903 (2013), published online 19 June 2013.
 - 325. S. Bockenhauer and W. E. Moerner, "Photo-Induced Conformational Flexibility in Single Solution-Phase Peridinin-Chlorophyll-Proteins," *J. Phys. Chem. A* **117**, 8399-8406 (2013), DOI: 10.1021/jp405790a, published online 6 August 2013.
 - 326. Steffen J. Sahl and W. E. Moerner, "Super-Resolution Fluorescence Imaging with Single Molecules," *Curr. Opin. Struct. Biol.* **23**, 778-787 (2013), DOI: 10.1016/j.sbi.2013.07.010, published online 8 August 2013.
 - 327. Christopher P. Calderon, Michael A. Thompson, Jason M. Casolari, Randy C. Paffenroth, and W. E. Moerner, "Quantifying Transient 3D Dynamical Phenomena of Single mRNA Particles in Live Yeast Cell Measurements," **Michael D. Fayer Festschrift, J. Phys. Chem. B** **117**, 15701-15713 (2013) (DOI: 10.1021/jp4064214, published online September 9, 2013).
 - 328. Andreas Gahlmann and W. E. Moerner, "Exploring bacterial cell biology with single-molecule tracking and super-resolution imaging," *Nature Reviews Microbiology* **12**, 9-22 (2014), (DOI: 10.1038/nrmicro3154, published online December 16, 2013).
 - 329. Mikael P. Backlund, Matthew D. Lew, Adam S. Backer, Steffen J. Sahl, and W. E. Moerner, "The role of molecular dipole orientation in single-molecule fluorescence microscopy and implications for super-resolution imaging," **Minireview, ChemPhysChem** **15**, 587-599 (2014) (DOI: 10.1002/cphc.201300880, published online December 30, 2013).
 - 330. Samuel D. Bockenhauer, Thomas M. Duncan, W. E. Moerner and Michael Börsch, "The regulatory switch of F1-ATPase studied by single-molecule FRET in the ABEL Trap," *Proc. SPIE* **8950**, 89500H 1-14 (2014), DOI: 10.1117/12.2042688.
 - 331. Adam S. Backer, Mikael P. Backlund, Matthew D. Lew, Alexander R. Diezmann, Steffen J. Sahl, and W. E. Moerner, "Single-molecule orientation measurements with a quadrated pupil," *Proc. SPIE* **8950**, 89500L 1-6 (2014), DOI:10.1117/12.2042097.
 - 332. Quan Wang and W. E. Moerner, "Spectroscopic and transport measurements of single molecules in solution using an electrokinetic trap," *Proc. SPIE* **8950**, 895004 1-10 (2014), DOI:10.1117/12.2038320.
 - 333. Quan Wang and W. E. Moerner, "Single-molecule motions enable direct visualization of biomolecular interactions in solution," *Nature Methods* **11**, 555-558 (2014) (DOI:10.1038/nmeth.2882, published online March 9, 2014).
 - 334. Jerod L. Ptacin, Andreas Gahlmann, Grant R. Bowman, Adam M. Perez, Alexander R. S. von Diezmann, Michael R. Eckart, W. E. Moerner, and Lucy Shapiro, "Bacterial scaffold directs pole-specific centromere segregation," *Proc. Nat. Acad. Sci. (USA)* **111**, E2046-E2055 (2014) (DOI:10.1073/pnas.1405188111, published online 28 April 2014).

335. Gabriela S. Schlau-Cohen, Samuel Bockenhauer, Quan Wang, and W. E. Moerner, “Single-molecule spectroscopy of photosynthetic proteins in solution: exploration of structure–function relationships,” **Minireview**, *Chem. Sci.* **5**, 2933-2939 (2014) (DOI:10.1039/C4SC00582A, published online 15 April 2014).
336. Christopher P. Calderon, Lucien E. Weiss, and W. E. Moerner, “Robust hypothesis tests for detecting statistical evidence of two-dimensional and three-dimensional interactions in single-molecule measurements,” *Phys. Rev. E* **89**, 052705(8) (2014) (DOI: 10.1103/PhysRevE.89.052705, published online 12 May 2014).
337. A. S. Backer, M. P. Backlund, A. R. von Diezmann, S. J. Sahl, and W. E. Moerner, “A bisected pupil for studying single-molecule orientational dynamics and its application to 3D super-resolution microscopy,” *Appl. Phys. Lett.* **104**, 193701(5) (2014).
338. Adam S. Backer and W. E. Moerner, “Extending Single-Molecule Microscopy Using Optical Fourier Processing,” **James Skinner Festschrift, J. Phys. Chem. B** **118**, 8313-8329 (2014) (DOI: 10.1021/jp501778z, published online April 18, 2014).
339. Yin Loon Lee, Joshua Santé, Colin J. Comerci, Benjamin Cyge, Luis F. Menezes, Feng-Qian Li, Gregory G. Germino, W. E. Moerner, Ken-Ichi Takemaru, and Tim Stearns, “Cby1 promotes Ahi1 recruitment to a ring-shaped domain at the centriole–cilium interface and facilitates proper cilium formation and function,” *Mol. Biol. Cell* **25** (19) 2919-2933 (2014) (DOI: 10.1091/mbc.E14-02-0735, published online August 7, 2014.)
340. Yoav Shechtman, Steffen J. Sahl, Adam S. Backer, and W. E. Moerner, “Optimal Point Spread Function Design for 3D Imaging,” *Phys. Rev. Lett.* **113**, 133902 (2014), (DOI: 10.1103/PhysRevLett.113.133902, published online September 26, 2014)
341. Marissa K. Lee, Prabin Rai, Jarrod Williams, Robert J. Twieg, and W. E. Moerner, “Small-Molecule Labeling of Live Cell Surfaces for Three-Dimensional Super-Resolution Microscopy,” *J. Amer. Chem. Soc.* **136**, 14003-14006 (2014) (DOI: 10.1021/ja508028h, published online, September 15, 2014)
342. Matthew D. Lew and W. E. Moerner, “Azimuthal polarization filtering for accurate, precise, and robust single-molecule localization microscopy,” *Nano Lett.* **14**, 6407-6413 (2014) (DOI:10.1021/nl502914k, published online October 1, 2014).
343. Mikael P. Backlund, Ryan Joyner, Karsten Weis, and W. E. Moerner, “Correlations of three-dimensional motion of chromosomal loci in yeast revealed by the double-helix point spread function microscope,” *Mol. Biol. Cell* **25** (22) 3619-3629 (2014) (DOI: 10.1091/mbc.E14-06-1127, published online October 15, 2014).
344. Whitney C. Duim, Yan Jiang, Koning Shen, Judith Frydman, and W. E. Moerner, “Super-Resolution Fluorescence of Huntingtin Reveals Growth of Globular Species into Short Fibers and Coexistence of Distinct Aggregates,” *ACS Chem. Biol.* **9**, 2767-2778 (2014) (DOI: 10.1021/cb500335w, published online October 20, 2014).
345. Adam S. Backer and W. E. Moerner, “Determining the rotational mobility of a single molecule from a single image: a numerical study,” *Optics Express* **23**, 4255-4276 (2015). (DOI: 10.1364/OE.23.004255, published online February 11, 2015).
346. Gabriela S. Schlau-Cohen, Hsiang-Yu Yang, Tjaart P. J. Krüger, Pengqi Xu, Michal Gwizdala, Rienk van Grondelle, Roberta Croce, and W. E. Moerner, “Single-Molecule

- Identification of Quenched and Unquenched States of LHCII,” *J. Phys. Chem. Lett.* **6**, 860-867 (2015). (DOI: 10.1021/acs.jpclett.5b00034, published online February 18, 2015).
347. Mikael P. Backlund and W. E. Moerner, “Motion of chromosomal loci and the mean-squared displacement of a fractional Brownian motion in the presence of static and dynamic errors,” *Proc. SPIE* **9331**, 933106 (2015) (DOI: 10.1117/12.2079703, published online March 9, 2015).
348. Hsiang-Yu Yang, Gabriela S. Schlau-Cohen, Michal Gwizdala, Tjaart Krüger, Pengqi Xu, Roberta Croce, Rienk van Grondelle, W. E. Moerner, “Single-Molecule Exploration of Photoprotective Mechanisms in Light-Harvesting Complexes,” *Proc. SPIE* **9331**, 933109 (2015) (DOI: 10.1117/12.2083628, published online March 9, 2015).
349. Yoav Shechtman, Lucien E. Weiss, Adam S. Backer, Steffen J. Sahl, and W. E. Moerner, “Precise Three-Dimensional Scan-Free Multiple-Particle Tracking over Large Axial Ranges with Tetrapod Point Spread Functions,” *Nano Lett.* **15**, 4194-4199 (2015) (DOI: 10.1021/acs.nanolett.5b01396, published online May 5, 2015).
350. Ljiljana Milenkovic*, Lucien E. Weiss*, Joshua Yoon, Theodore L. Roth, YouRong S. Su, Steffen J. Sahl, Matthew P. Scott, and W. E. Moerner (*equal contributions), “Single-molecule imaging of Hedgehog pathway protein Smoothened in primary cilia reveals binding events regulated by Patched1,” *Proc. Nat. Acad. Sci. (USA)* **112**, 8320-8325 (2015) (DOI: 10.1073/pnas.1510094112, published online June 22, 2015).
351. Mikael P. Backlund, Ryan Joyner, and W. E. Moerner, “Chromosomal locus tracking with proper accounting of static and dynamic errors,” *Phys. Rev. E* **91**, 062716 1-12 (2015) (DOI: 10.1103/PhysRevE.91.062716, published online June 29, 2015).
352. Steffen J. Sahl, Lana Lau, Willianne I. M. Vonk, Lucien E. Weiss, Judith Frydman, and W. E. Moerner, “Delayed emergence of subdiffraction-sized mutant huntingtin fibrils following inclusion body formation,” *Quart Revs Biophys* **49**, e2, 1-13 (2016) (DOI:10.1017/S0033583515000219, published online 9 September 2015)
353. W. E. Moerner, “Single-Molecule Spectroscopy, Imaging, and Photocontrol: Foundations for Super-Resolution Microscopy (**Nobel Lecture**),” *Angew. Chem. Int. Ed.* **54**, 8067-8093 (2015) (DOI: 10.1002/anie.201501949, published online June 18, 2015).
354. Quan Wang and W. E. Moerner, “Dissecting pigment architecture of individual photosynthetic antenna complexes in solution,” *Proc. Nat. Acad. Sci. (USA)* **112**, 13880-13885 (2015) (DOI: 10.1073/pnas.1514027112, published online October 5, 2015).
355. Alex von Diezmann, Maurice Y. Lee, Matthew D. Lew, and W. E. Moerner, “Correcting field-dependent aberrations with nanoscale accuracy in three-dimensional single-molecule localization microscopy,” *Optica* **2**, 985-993 (2015) (DOI: 10.1364/OPTICA.2.000985, published online November 19, 2015).
356. W. E. Moerner, Yoav Shechtman, and Quan Wang, “Single-molecule spectroscopy and imaging over the decades,” **Introductory Article**, *Faraday Discuss.* **184**, 9-36 (2015) (DOI:10.1039/c5fd00149h, published online November 30, 2015).
357. W. E. Moerner, “Single-Molecule Spectroscopy, Imaging, and Photocontrol: Foundations for Super-Resolution Microscopy (**Nobel Lecture**),” *Rev. Mod. Phys.* **87**, 1183-1212 (2015) (DOI: 10.1103/RevModPhys.87.1183, published online October 21, 2015).

358. Mikael P. Backlund, Amir Arbabi, Petar N. Petrov, Ehsan Arbabi, Saumya Saurabh, Andrei Faraon, and W. E. Moerner, "Removing orientation-induced localization biases in single-molecule microscopy using a broadband metasurface mask," *Nat. Photonics* **10**, 459-462 (DOI: 10.1038/NPHOTON.2016.93, published online May 16, 2016).
359. Adam E. Backer, Maurice Y. Lee, and W. E. Moerner, "Enhanced DNA imaging using super-resolution microscopy and simultaneous single-molecule orientation measurements," *Optica* **3**, 659-666 (2016) (DOI: 10.1364/optica.3.000659, published online 17 June 2016).
360. Yoav Shechtman, Lucien E. Weiss, Adam S. Backer, Maurice Lee, and W. E. Moerner, "Multicolour localization microscopy by point-spread-function engineering," *Nat. Photonics* **10**, 590-594 (2016). (DOI: 10.1038/nphoton.2016.13, published online 8 August 2016).
361. Saumya Saurabh, Adam M. Perez, Colin J. Comerci, Lucy Shapiro, and W. E. Moerner, "Super-resolution imaging of live bacteria cells using a genetically-directed, highly photostable fluoromodule," *J. Amer. Chem. Soc.* **138** (33), 10398-10401 (2016) (DOI: 10.1021/jacs.6b05943, web publication date 1 August 2016).
362. Alex von Diezmann, Yoav Shechtman, and W. E. Moerner, "Three-Dimensional Localization of Single Molecules for Super-Resolution Imaging and Single-Particle Tracking," *Chem. Revs.* **117**, 7244-7275 (2017), Special Issue on Super-Resolution and Single-Molecule Imaging (DOI: 10.1021/acs.chemrev.6b00629, published online 2 February 2017).
363. Petar Petrov, Yoav Shechtman, and W. E. Moerner, "Measurement-based estimation of global pupil functions in 3D localization microscopy," *Optics Express* **25** (7), 7945-7959 (2017) (DOI: 10.1364/OE.25.007945, published online 28 March 2017).
364. Anna Lippert*, Agnieszka A. Janeczek*, Alexandre Fürstenberg, Aleks Ponjavić, W. E. Moerner, Roel Nusse, Jill A. Helms, Nicholas D. Evans, and Steven F. Lee, (*equal contributions), "Single-molecule imaging of Wnt3A protein diffusion on living cell membranes," *Biophys. J.* **113**, 2762–2767 (2017) (DOI: 10.1016/j.bpj.2017.08.060, published online 19 December 2017).
365. Allison H. Squires and W. E. Moerner, "Direct single-molecule measurements of phycocyanobilin photophysics in monomeric C-phycocyanin," *Proc. Nat. Acad. Sci. (USA)* **114**, 9779-9784 (2017) (DOI: 10.1073/pnas.1705435114, published online 28 August 2017).
366. Yoav Shechtman, Anna-Karin Gustavsson, Petar N. Petrov, Elisa Dultz, Maurice Y. Lee, Karsten Weis, and W.E. Moerner, "Observation of live chromatin dynamics in cells via 3D localization microscopy using Tetrapod point spread functions," *Biomed Opt Expr* **8**, 5735-5748 (2017) (DOI: 10.1364/BOE.8.005735, published online 21 November 2017).
367. Saumya Saurabh, Adam M. Perez, Colin J. Comerci, Lucy Shapiro, and W. E. Moerner, "Super-resolution microscopy and single-protein tracking in live bacteria using a genetically encoded, photostable fluoromodule," *Current Protocols in Cell Biology* **75**, 4.32.1–4.32.22 (2017). (DOI: 10.1002/cpcb.21, published online June 2017).
368. Quan Wang, Andrew J. Serban, Rebekka M. Wachter, and W. E. Moerner, "Single-molecule diffusometry reveals the nucleotide-dependent oligomerization pathways of

- Nicotiana tabacum* Rubisco activase," *J. Chem. Phys.* **148**, 123319 (2018) (DOI: 10.1063/1.5005930, published online 9 January 2018).
369. Anna-Karin Gustavsson, Petar N. Petrov, Maurice Y. Lee, Yoav Shechtman, and W.E. Moerner, "3D single-molecule super-resolution microscopy with a tilted light sheet," *Nature Commun.* **9**, 123 (2018) (DOI: 10.1038/s41467-017-02563-4, published online 9 January 2018).
370. Anna-Karin Gustavsson, Petar N. Petrov, Maurice Y. Lee, Yoav Shechtman, and W.E. Moerner, "Tilted light sheet microscopy with 3D point spread functions for single-molecule super-resolution imaging in mammalian cells," *Proc. of SPIE* **10500**, 105000M (2018). (DOI: 10.1117/12.2288443, published online 20 February 2018).
371. Camille A. Bayas, Jiarui Wang, Marissa K. Lee, Jared M. Schrader, Lucy Shapiro, and W. E. Moerner, "Spatial organization and dynamics of RNase E and ribosomes in *Caulobacter crescentus*," *Proc. Nat. Acad. Sci. (USA)* **115**, E3712-E3721 (2018). (DOI: 10.1073/pnas.1721648115, published online April 2, 2018).
372. Anna-Karin Gustavsson, Petar N. Petrov, and W. E. Moerner, "Light sheet approaches for improved precision in 3D localization-based superresolution imaging in mammalian cells [Invited]," *Optics Express* **26**, 13122-13147 (2018). (DOI: 10.1364/OE.26.013122, published online 7 May 2018).
373. Hsiang-Yu Yang and W. E. Moerner, "Resolving Mixtures in Solution by Single-Molecule Rotational Diffusivity," *Nano Lett.* **18**, 5279-5287 (2018) (DOI: 10.1021/acs.nanolett.8b02280, published online 12 July 2018).
374. Peter D. Dahlberg, Annina M. Sartor, Jiarui Wang, Saumya Saurabh, Lucy Shapiro, and W. E. Moerner, "Identification of PAmKate as a Red Photoactivatable Fluorescent Protein for Cryogenic Super-Resolution Imaging," *J. Amer. Chem. Soc.* **140**, 12310-12313 (2018) (DOI: 10.1021/jacs.8b05960, published online 17 September 2018).
375. Allison H. Squires, Adam E. Cohen, and W. E. Moerner, "Anti-Brownian Traps," in G. C. K. Roberts, A. Watts, European Biophysical Societies (eds.), *Encyclopedia of Biophysics*. Springer, Berlin, Heidelberg, 2018. (DOI: 10.1007/978-3-642-35943-9_486-1).
376. W. E. Moerner, "Localization microscopy of single molecules enhanced by 3D imaging and light sheet illumination," *J. Phys. D: Appl. Phys.* **52**, 011001 (2019) (DOI: 10.1088/1361-6463/aae632, published online 24 October 2018).
377. Joshua Yoon, Colin J. Comerci, Lucien E. Weiss, Ljiljana Milenkovic, Tim Stearns, and W. E. Moerner, "Revealing the nanoscale morphology of the primary cilium using super-resolution fluorescence microscopy," *Biophys. J.* **116**, 319-329 (2019) (DOI: 10.1016/j.bpj.2018.11.3136, published online 7 December 2018).
378. Lucien E. Weiss*, Ljiljana Milenkovic*, Joshua Yoon, Tim Stearns, and W. E. Moerner, (*equal contributions), "Motional dynamics of single Patched1 molecules in cilia are controlled by Hedgehog and cholesterol," *Proc. Nat. Acad. Sci. (USA)* **116**, 5550-5557 (2019) (DOI: 10.1073/pnas.1816747116, published online 28 February 2019).
379. Allison H. Squires, Peter D. Dahlberg, Haijun Liu, Nikki Cecil M. Magdaong, Robert E. Blankenship, and W.E. Moerner, "Single-molecule trapping and spectroscopy reveals photophysical heterogeneity of phycobilisomes quenched by Orange Carotenoid Protein."

Nature Commun. **10**, article 1172 (2019) (DOI: 10.1038/s41467-019-09084-2, published online 12 March 2019).

380. Camille Bayas, Alex von Diezmann, Anna-Karin Gustavsson, and W. E. Moerner, “Easy-DHPSF 2.0: open-source software for three-dimensional localization and two-color registration of single molecules with nanoscale accuracy,” 24 April 2019, PROTOCOL (Version 1) available at Protocol Exchange DOI: 10.21203/rs.2.9151/v1; 10 June 2019, PROTOCOL (Version 2) available at Protocol Exchange DOI: 10.21203/rs.2.9151/v2
381. Carolyn R. Shurer, Joe Chin-Hun Kuo, LaDeidra Mone´t Roberts, Jay G. Gandhi, Marshall J. Colville, Thais A. Enoki, Hao Pan, Jin Su, Jade M. Noble, Michael J. Hollander, John P. O’Donnell, Rose Yin, Kayvon Pedram, Leonhard Möckl, Lena F. Kourkoutis, W. E. Moerner, Carolyn R. Bertozzi, Gerald W. Feigenson, Heidi L. Reesink, and Matthew J. Paszek, “Physical Principles of Membrane Shape Regulation by the Glycocalyx,” *Cell* **177**, 1-14 (2019) (DOI: 10.1016/j.cell.2019.04.017, published online 2 May 2019).
382. Leonhard Möckl*, Kayvon Pedram*, Anish R. Roy, Venkatesh Krishnan, Anna-Karin Gustavsson, Oliver Dorigo, Carolyn R. Bertozzi, W. E. Moerner, (*equal contributions), “Quantitative Super-Resolution Microscopy of the Mammalian Glycocalyx,” *Dev. Cell* **50**, 57-72 (2019) (DOI: 10.1016/j.devcell.2019.04.035, published online 16 May 2019).
383. Colin J. Comerci*, Jonathan Herrmann*, Joshua Yoon, Fatemeh Jabbarpour, Xiaofeng Zhou, John F. Nomellini, John Smit, Lucy Shapiro, Soichi Wakatsuki, and W.E. Moerner, (*equal contributions), “Topologically-Guided Continuous Protein Crystallization Controls Bacterial Surface Layer Self-Assembly,” *Nature Commun.* **10**, 2731 (2019) (DOI: 10.1038/s41467-019-10650-x, published online 21 June 2019).
384. Allison H. Squires, Abhijit A. Lavania, Peter D. Dahlberg, and W.E. Moerner, “Interferometric scattering enables fluorescence-free electrokinetic trapping of single nanoparticles in free solution,” *Nano Letters* **19**, 4112-4117 (2019) (DOI: 10.1021/acs.nanolett.9b01514, published online 22 May 2019).
385. Xiaofeng Zhou, Jiarui Wang, Jonathan Herrmann, W. E. Moerner, and Lucy Shapiro, “Asymmetric division yields progeny cells with distinct modes of regulating cell cycle-dependent chromosome methylation,” *Proc. Nat. Acad. Sci. (USA)* **116** (31) 15661-15670 (2019) (DOI: 10.1073/pnas.1906119116, published online 17 July 2019).
386. Leonhard Möckl, Petar N. Petrov, and W. E. Moerner, “Accurate phase retrieval of complex 3D point spread functions with deep residual neural networks,” *Appl. Phys. Lett.* **115**, 251106 (2019) (DOI: 10.1063/1.5125252, published online 18 December 2019).
387. Leonhard Möckl*, Anish E. Roy*, Petar N. Petrov, and W. E. Moerner (*equal contributions), “Accurate and rapid background estimation in single-molecule localization microscopy using the deep neural network BGnet,” *Proc. Nat. Acad. Sci. (USA)* **117**, 60-67 (2020) (DOI: 10.1073/pnas.1916219117, published online 23 December 2019).
388. Henrietta W. Bennett*, Anna-Karin Gustavsson*, Camille A. Bayas, Petar N. Petrov, Nancie Mooney, W. E. Moerner, and Peter K. Jackson, (*equal contributions), “Novel fibrillar structure in the inversin compartment of primary cilia revealed by 3D single-molecule super-resolution microscopy,” *Molec. Biol. Cell* **31**, 619-639 (2020) (DOI: 10.1091/mbc.E19-09-0499, published online 2 January 2020).
389. Keren Lasker*, Lexy von Diezmann*, Xiaofeng Zhou, Daniel G. Ahrens, Thomas H.

- Mann, W. E. Moerner, and Lucy Shapiro, (*equal contributions), "Selective sequestration of signalling proteins in a membraneless organelle reinforces the spatial regulation of asymmetry in *Caulobacter crescentus*," *Nature Microbio.* **5**, 418-419 (2020) (DOI: 10.1038/s41564-019-0647-7, published online 20 January 2020).
390. Annina M. Sartor, Peter D. Dahlberg, Jiarui Wang, Saumya Saurabh, Lucy Shapiro, and W.E. Moerner, "Cryogenic single-molecule active control microscopy with a photoactivatable fluorescent protein," *Proc. SPIE* **11246**, Single Molecule Spectroscopy and Superresolution Imaging XIII, 112460G (13 February 2020) (DOI: 10.1117/12.2546333).
391. Abhijit A. Lavania, Allison H. Squires, Peter D. Dahlberg, W. E. Moerner, "Interferometric scattering for fluorescence-free electrokinetic trapping of single nanoparticles in free solution," *Proc. SPIE* **11246**, Single Molecule Spectroscopy and Superresolution Imaging XIII, 112460W (13 February 2020) (DOI: 10.1117/12.2546638).
392. Leonhard Möckl, Anish R. Roy, and W. E. Moerner, "Deep learning in single-molecule microscopy: fundamentals, caveats, and recent developments," Invited review, *Biomed Opt Expr* **11**, 1633-1661 (2020) (DOI: 10.1364/BOE.386361, published online 27 February 2020).
393. Peter D. Dahlberg*, Davis Perez*, Zhaoming Su, Wah Chiu, and W.E. Moerner, (*these authors contributed equally), "Cryogenic Correlative Single-Particle Photoluminescence Spectroscopy and Electron Tomography for Investigation of Nanomaterials," *Angew. Chem. Int. Ed.* **59**, 15642-15648 (in press, 2020) (DOI: 10.1002/anie.202002856, published online 24 April 2020).
394. Petar N. Petrov and W. E. Moerner, "Addressing systematic errors in axial distance measurements in single-emitter localization microscopy," *Opt Expr* **28**, 18616 (2020) (DOI: 10.1364/OE.391496, published online 8 June 2020).
395. Peter D. Dahlberg, Saumya Saurabh, Annina M. Sartor, Jiarui Wang, Patrick G. Mitchell, Wah Chiu, Lucy Shapiro, and W. E. Moerner, "Cryogenic single-molecule fluorescence annotations for electron tomography reveal in situ organization of key proteins in *Caulobacter*," *Proc. Nat. Acad. Sci. (USA)* **117**, 13937-13944 (in press, 2020) (DOI: 10.1073/pnas.2001849117, published online 8 June 2020).
396. Damien Garbett, Anjali Bisaria, Changsong Yang, Dannielle G. McCarthy, Arnold Hayer, W. E. Moerner, Tatyana M. Svitkina, and Tobias Meyer, "T-Plastin reinforces membrane protrusions to bridge matrix gaps during cell migration," *Nature Commun.* **11**, 4818 (2020) (DOI: 10.1038/s41467-020-18586-3, published online 23 September 2020).
397. Marjoke F. Debets*, Omur Y. Tastan*, Simon P. Wisnovsky, Stacy A. Malaker, Nikolaos Angelis, Leonhard K. R. Moeckl, Junwon Choi, Helen Flynn, Lauren J. S. Wagner, Ganka Bineva-Todd, Aristotelis Antononopoulos, Anna Cioce, William M. Browne, Zhen Li, David C. Briggs, Holly L.Douglas, Gaelen T. Hess, Anthony J. Agbay, Chloe Roustan, Svend Kjaer, Stuart M. Haslam, Ambrosius P. Snijders, Michael C. Bassik, W. E. Moerner, Vivian S. W. Li, Carolyn R. Bertozzi, and Benjamin Schumann (*equal contributions), "Metabolic precision labeling enables selective probing of O-linked N-acetylgalactosamine glycosylation," *Proc. Nat. Acad. Sci. (USA)* **117**, 25293-25301 (2020) (DOI: 10.1073/pnas.2007297117, published online 28 Sept 2020).

398. Bo Gu*, Colin J. Comerci*, Dannielle G. McCarthy*, Saumya Saurabh, W. E. Moerner, and Joanna Wysocka (*these authors contributed equally), “Opposing effects of cohesin and transcription on CTCF organization revealed by super-resolution imaging,” *Molec. Cell* **80**, 699-711 (2020) (DOI: 10.1016/j.molcel.2020.10.001, published online 21 October 2020).
399. Leonhard Möckl and W. E. Moerner, “Super-resolution microscopy with single molecules in biology and beyond – essentials, current trends, and future challenges,” **Perspective Article**, *J. Am. Chem. Soc.* **142**, 17828-17844 (2020) (DOI: 10.1021/JACS.0c08178, published online 9 October 2020).
400. W. E. Moerner, “Viewpoint: Single Molecules at 31: What’s Next?” *Nano Lett* **20**, 8427-8429 (2020) (DOI: 10.1021/acs.nanolett.0c04042, published online 10 November 2020).
401. Simon Wisnovsky, Leonhard Möckl, Stacy A. Malaker, Kayvon Pedram, Gaelen T. Hess, Nicholas M. Riley, Melissa A. Gray, Benjamin A.H. Smith, Michael C. Bassik, W.E. Moerner, and Carolyn R. Bertozzi, “Genome-Wide CRISPR Screens Reveal a Specific Ligand for the Glycan-Binding Immune Checkpoint Receptor Siglec-7,” *Proc. Nat. Acad. Sci. (USA)* **118**, e2015024118 (2021) (DOI: 10.1073/pnas.2015024118, published online 25 January 2021).
402. Peter D. Dahlberg and W. E. Moerner, “Cryogenic Super-Resolution Fluorescence and Electron Microscopy Correlated at the Nanoscale,” *Ann. Revs. Phys. Chem.* **72**, 253-78 (April 2021) (DOI: 10.1146/annurevophyschem-090319-051546, published online 13 January 2021).
403. Jiarui Wang, Lucy Shapiro, and W. E. Moerner, “A localized adaptor protein performs distinct functions at the *Caulobacter* cell poles,” *Proc. Nat. Acad. Sci. (USA)* **118**, e2024705118 (2021) (DOI: 10.1073/pnas.2024705118, published online 22 March 2021).
404. Anish R. Roy, Wei Zhang, Zeinab Jahed, Ching-Ting Tsai, Bianxiao Cui, and W. E. Moerner, “Exploring Cell Surface–Nanopillar Interactions with 3D Super-Resolution Microscopy,” *ACS Nano* **16**, 192-210 (2022) (DOI: 10.1021/acsnano.1c05313, published online 28 September 2021).
405. Saumya Saurabh, Trisha N. Chong, Camille Bayas, Peter D. Dahlberg, Heather N. Cartwright, W. E. Moerner, and Lucy Shapiro, “ATP-responsive biomolecular condensates tune bacterial kinase signaling,” *Sci. Advances* **8**, eabm6570 (2022) (DOI: 10.1126/sciadv.abm6570, published online 16 February 2022).
406. Alison H. Squires*, Quan Wang*, Peter D. Dahlberg*, and W. E. Moerner (*co-first authors), “A bottom-up perspective on photodynamics and photoprotection in light-harvesting complexes using anti-Brownian trapping,” *J. Chem. Phys.* **156**, 070901 (2022) (DOI: 10.1063/5.0079042, published online 16 February 2022).
407. W. E. Moerner, “Autobiography of W. E. (William Esco) Moerner,” published as part of *The Journal of Physical Chemistry* virtual special issue “W. E. Moerner Festschrift,” wish Publications, Curriculum vitae, and Colleagues as Supporting Information, *J. Phys. Chem. B* **126**, 1159-1159 (2022). (DOI: 10.1021/acs.jpcb.2c00137, published online 17 February 2022).
408. Jiarui Wang*, Mengting Han*, Anish R. Roy, Haifeng Wang, Leonhard Möckl, Leiping Zeng, W.E. Moerner, and Lei S. Qi (*equal contribution), ” Multi-color super-resolution

imaging to study human coronavirus RNA during cellular infection," *Cell Reports Methods* **2**, 100170 (2022) (DOI: 10.1016/j.crmeth.2022.100170, published online 28 February 2022).

409. Anna-Karin Gustavsson, Rajarshi P. Ghosh, Petar N. Petrov, Jan T. Liphardt, and W. E. Moerner, "Fast and parallel nanoscale three-dimensional tracking of heterogeneous mammalian chromatin dynamics," *Molec Biol Cell* **33**(6), (2022) (DOI: 10.1091/mbc.E21-10-0514, published online 30 March 2022).
410. William B. Carpenter, Abhijit A. Lavania, Julia S. Borden, Luke M. Oltrogge, Davis Perez, Peter D. Dahlberg, David F. Savage, and W. E. Moerner, "Ratiometric Sensing of Redox Environments Inside Individual Carboxysomes Trapped in Solution, *J. Phys. Chem Lett.* **13**, 4455-4462 (2022) (DOI: 10.1021/acs.jpclett.2c00782, published online May 13, 2022).
411. Davis Perez, Peter D. Dahlberg, Jiarui Wang, Annina M. Sartor, Julia S. Borden, Lucy Shapiro, and W.E. Moerner, "Identification and demonstration of roGFP2 as an environmental sensor for cryogenic correlative light and electron microscopy," *J. Struct. Biol.* **214**, 107881 (2022) (DOI: 10.1016/j.jsb.2022.107881, published online 8 July 2022).
412. Peter D. Dahlberg, Davis Perez, Corey W. Hecksel, Wah Chiu, and W.E. Moerner, "Metallic support films reduce optical heating in cryogenic correlative light and electron tomography," *J. Struct. Biol.* **214**, 107901 (2022) (DOI: 10.1016/j.jsb.2022.107901, published online 1 October 2022).
413. Abhijit A. Lavania, William B. Carpenter, Luke M. Oltrogge, Davis Perez, Julia B. Turnšek, David F. Savage, and W. E. Moerner, "Exploring Masses and Internal Mass Distributions of Single Carboxysomes in Free Solution Using Fluorescence and Interferometric Scattering in an Anti-Brownian Trap," Part of Special Issue "Steven G. Boxer Festschrift," *J. Phys. Chem. B* **126**, 8747-8759 (2022) (DOI: 10.1021/acs.jpcb.2c05939, published online 25 October 2022).
414. Annina M. Sartor, Peter D. Dahlberg, Davis Perez, and W. E. Moerner, "Characterization of mApple as a Red Fluorescent Protein for Cryogenic Single-Molecule Imaging with Turn-Off and Turn-On Active Control Mechanisms," Part of Special Issue "Early-Career and Emerging Researchers in Physical Chemistry Volume 2," *J. Phys. Chem. B* **127**, 2690-2700 (2023) (DOI: 10.1021/acs.jpcb.2c08995, published online 21 March 2023).
415. Pierre Jouchet, Anish R. Roy, and W.E. Moerner, "Combining deep learning approaches and point spread function engineering for simultaneous 3D position and 3D orientation measurements of fluorescent single molecules," *Opt. Commun.* **542**, 129589 (2023). (DOI: 10.1016/j.optcom.2023.129589, published online 11 May 2023).
416. Colin J. Comerci, Dannielle G. McCarthy, Mehdi Nosrati, Kevin B. Kim, Mohammed Kashani-Sabet, W. E. Moerner, and Stanley P. Leong, "Nanometer-scale distribution of PD-1 in the melanoma tumor microenvironment," *J. Radiol. Oncol.* **7**, 020-025 (2023) (DOI: 10.29328/journal.jro.1001048, published online 10 May 2023).
417. Atanu Maiti, Cosmo Z. Buffalo, Saumya Saurabh, Felipe Montecinos-Franjola, Justin S. Hachey, William J. Conlon, Geraldine N. Tran, Mikhail Drobizhev, W. E. Moerner, Partho Ghosh, Hiroshi Matsuo, Roger Y. Tsien, John Y. Lin, and Erik A. Rodriguez,

“Structural and photophysical characterization of the small ultra-red fluorescent protein, *Nature Commun.* **14**, 4155 (2023), (DOI: 10.1038/s41467-023-39776-9, published online 12 July 2023).

418. Davis Perez, Peter D. Dahlberg, and W. E. Moerner, “Advanced Cryogenic Light Microscopy Stage to Enable 3D Super-resolved Cryogenic Correlative Light and Electron Microscopy,” *Microscopy and Microanalysis*, **29**, Issue Supplement_1, 1941-1942 (2023) (DOI: 10.1093/micmic/ozad067.1005, published 22 July 2023).
419. William B. Carpenter, Abhijit A. Lavania, Julia S. Borden, Luke M. Oltrogge, Davis D. Perez, Peter D. Dahlberg, David F. Savage, and W. E. Moerner, "Monitoring physical and chemical properties of individual carboxysomes trapped in solution," *Proc. SPIE* **12649**, Optical Trapping and Optical Micromanipulation XX, 1264903 (2023) (DOI: 10.1117/12.2679514, published online 5 October 2023).

Published Conference Abstracts

1. W. E. Moerner, E. J. Peterman, H. Sosa, S. Brasselet, R. M. Dickson, S. Kummer, R. Sakowicz, and L. S. B. Goldstein, "Single-Molecule Studies of Fluorescent Proteins and Enzymes," *Biophys. J.* **76**, A20-A20 (1999).
2. P. Schwille, S. Kummer, W. E. Moerner, and W. W. Webb, "Fluorescence Correlation Spectroscopy (FCS) of Different GFP Mutants Reveals Fast Light-Driven Intramolecular Dynamics", *Biophys. J.* **76**, A260-A260 (1999).
3. E. J. Peterman, S. Brasselet, and W. E. Moerner, "The Fluorescence Dynamics of Single Molecules of Green Fluorescent Protein: Effect of Mutations, pH and Matrix", *Biophys. J.* **76**, A445-A445 (1999).
4. H. J. Sosa, E. J. Peterman, W. E. Moerner, and L. S. B. Goldstein, "Orientation and Dynamics of Kinesin Motors Revealed by Fluorescence Polarization Microscopy of Many and Single Molecules", *Biophys. J.* **80**, 572A-572A (2001).
5. M. F. Paige, E. Bjerneld, and W. E. Moerner, "A Comparison of Through-the-Objective Total Internal Reflection and Epifluorescence Microscopies for Single-Molecule Fluorescence Experiments", *Biophys. J.* **82**, 45A-46A (2002).
6. J. Deich, B. Lounis, F. I. Rosell, S. G. Boxer, and W. E. Moerner, "Photophysics of DsRed, a Red Fluorescent Protein, from the Ensemble to the Single-Molecule Level", *Biophys. J.* **82**, 46A-47A (2002).
7. J. Deich, K. Mauring, F. I. Rosell, T. B. McAnaney, W. E. Moerner, and S. G. Boxer, "Enhancement of the Blue Fluorescent Protein's Fluorescence by High Pressure or Low Temperature", *Biophys. J.* **82**, 427A-427A (2002).
8. M. Vrljic, S. Y. Nishimura, S. Brasselet, W. E. Moerner, H. M. McConnell, "Uncorrelated Diffusion of MHC Class II Proteins in the Plasma Membrane", *Biophys. J.* **82**, 523A-523A (2002).
9. S. Y. Kim, D. Fromm, S. Hess, R. J. Twieg, G. W. Farr, A. L. Horwich, J. Frydman, and W. E. Moerner, "Probing Local Polarity Changes in GroEL/ES with Fluorescence Spectroscopy," *Biophys. J.* **84**, 26A-26A (2003).
10. M. Vrljic, S. Y. Nishimura, W. E. Moerner, and H. M. McConnell, "The Effect of Varying Cholesterol Concentrations on the Translational Diffusion of Individual Class II MHC Membrane Proteins in Cells," *Biophys. J.* **84**, 325A-325A (2003).
11. A. Kurtz, E. T. Kool, and W. E. Moerner, "Real-Time Observations of T7 DNA Polymerase Activity by Single-Molecule Fluorescence Spectroscopy," Biophysical Society 1757-Pos, February, 2005.
12. S. Nishimura, M. Vrljic, H. M. McConnell, and W. E. Moerner, "Evidence for Condensed Complexes in the Plasma Membrane," Biophysical Society 377-Pos, February, 2005.
13. S. Y. Kim, Z. Gitai, L. Shapiro, and W. E. Moerner, "Motion of Single MreB Proteins in Caulobacter Imply Short, Oriented Filaments," Biophysical Society 2853-Pos, February, 2006.
14. Yasuhiro M. Umemura, Takahiro K. Fujiwara, Kenichi G. N. Suzuki, Marija Vrljic, Stefanie Y. Nishimura, W E. Moerner, and Akihiro Kusumi, "Both MHC class II and its GPI-

anchored form undergo hop diffusion as observed by single-molecule tracking," Biophysical Society, 2515-POS/B730, March, 2007.

15. Whitney C. Duim, Jian Cui, Erik J. Miller, So Yeon Kim, Dmitriy Gremyachinskiy, Klaus M. Hahn, Robert J. Twieg, Judith Frydman, and W. E. Moerner, "Probing TRiC-Mediated Folding of Actin *in vitro* With Bulk and Single-Molecule Fluorescence Measurements," 2008 Biophysical Society Meeting Abstracts. *Biophysical Journal* **94**, 2488-PoS (2008).
16. H.-L. Lee, E. A. Goun, H. Hwang, A. N. Semyonov, H. Wang, L. R. Jones, R. J. Twieg, P. A. Wender, and W. E. Moerner, "Single-Molecule Motions of Oligoarginine Cell-Penetrating Peptides on the Plasma Membrane of CHO Cells Imply Multiple Entry Mechanisms," 2008 Biophysical Society Meeting Abstracts. *Biophysical Journal*, *Biophysical Journal* **94**, 2495-PoS (2008).
17. Squires, A. H., Dahlberg, P. D., Liu, H., Blankenship, R. E., & Moerner, W. E., "Single-Molecule Measurements of Quenching and Photophysical Heterogeneity in Phycobiliproteins," *Biophysical Journal*, **114** (3), 522a-523a (2018).
18. Dahlberg, P. D., Squires, A. H., Sartor, A. M., Liu, H., Blankenship, R. E., & Moerner, W. E., "Cryogenic Dissection of the Phycobilisome's Electronic Structure," *Biophysical Journal*, **114** (3), 169a, (2018).
19. Yang, H. Y., & Moerner, W. E., "Precise Measurement of Single-Molecule Rotational Diffusivity in Solution," *Biophysical Journal*, **114** (3), 170a, (2018).
20. Alex von Diezmann, Keren Lasker, Thomas H. Mann, Daniel G. Ahrens, Lucy Shapiro, W. E. Moerner, "A Polar Matrix Microdomain Constrains Diffusion and Regulates Intracellular Signaling," *Biophysical Journal*, **114** (3), 548a, (2018).
21. Gustavsson, A. -K., Petrov, P. N., Lee, M. Y., Shechtman, Y., Moerner, W. E., "3D Single-Molecule Super-Resolution Microscopy in Mammalian Cells Using a Tilted Light Sheet," *Biophysical Journal*, **114** (3) 14a, (2018).
22. Wang, J., Shapiro L., & Moerner, W.E., "Probing Asymmetric Behavior of a Cell Cycle Regulatory Protein in Live *Caulobacter* using Single-Molecule Imaging," *Biophysical Journal*, **114** (3), 350a, (2018).
23. Lee, M. Y., Chen, X., Gustavsson, A.-K., Chang, H. Y., & Moerner, W. E., "In Situ Imaging of Spatial Organization of Accessible Chromatin at the Nanoscale with ATAC-see and Single-Molecule Super-resolution Fluorescence Microscopy," *Biophysical Journal*, **114** (3), 539a, (2018).
24. Comerci, C. J., Herrmann, J., Shapiro, L., Wakatsuki, S., Moerner, W. E., "Two-Color STED Microscopy to Visualize S-Layer Biogenesis in *Caulobacter Crescentus*," *Biophysical Journal*, **114** (3), 613a, (2018).
25. Moeckl, L., Pedram, K., Roy, A. R., Bertozzi, C., & Moerner, W. E., "Quantitative Super-Resolution Imaging Reveals Mammalian Glycocalyx Dynamics, *Biophysical Journal*, **114** (3), 537a–538a, (2018).
26. Sartor, A. M., Dahlberg, P. D., Wang, J., Shapiro, L., & Moerner, W. E., "A Red Fluorescent Protein for Cryogenic Single-Molecule Superresolution Imaging," *Biophysical Journal*, **114** (3), 529a-530a, (2018).
27. Bayas, C. A., Wang, J., Lee, M. K., Schrader, J. M., Shapiro, L., & Moerner, W. E., "Spatial

- Organization and Dynamics of RNA Processing in *Caulobacter crescentus*,” *Biophysical Journal*, **114** (3), 251a, (2018).
28. Comerci, C. J., Herrmann, J., Yoon, J., Jabbarpour, F., Zhou, X., Nomellini, J. F., Smit, J., Shapiro, L., Wakatsuki, S., Moerner, W. E., “Continuous, Topologically Guided Protein Crystallization Drives Self-Assembly of a Bacterial Surface Layer,” *Biophysical Journal* **118** (3), 201A–202A (2020).
29. Dahlberg, P. D., Saurabh, S., Wang, J., Sartor, A. M., Chiu, W., Shapiro, L., Moerner, W. E., “Cryogenic Superresolution Fluorescence Correlated with Cryogenic Electron Tomography: Combining Specific Labeling and High Resolution,” *Biophysical Journal* **118** (3), 20A–21A (2020).
30. Saurabh, S., Chong, T., Bayas, C., Dahlberg, P. D., Moerner, W. E., Shapiro, L., “Robust Modulation of a Bacterial Kinase by Protein Phase Separation,” *Biophysical Journal* **118** (3), 203A (2020).
31. Anish R. Roy, Wei Zhang, Zeinab Jahed, Ching-Ting Tsai, Bianxiao Cui, W. E. Moerner, “Exploring cell-surface nanopillar interactions with 3D superresolution microscopy,” *Biophysical Journal* **121**, Issue 3 Supplement, p278a (2022).
32. Peter D. Dahlberg, Davis Perez, W. E. Moerner, “Custom metallic electron microscopy grids reduce sample heating in super-resolved cryogenic correlative light and electron microscopy experiments,” *Biophysical Journal* **121**, Issue 3 Supplement, p128a (2022).
33. Davis Perez, Peter D. Dahlberg, Annina M. Sartor, Jiarui Wang, Julia Borden, and W.E. Moerner, “roGFP2 as an environmental sensor for cryogenic correlative light and electron microscopy,” *Biophysical Journal* **121**, Issue 3 Supplement, p128a (2022).
34. Abhijit A. Lavania, William B. Carpenter, Luke M. Oltrogge, Julia Borden, Davis Perez, Allison H. Squires, Peter D. Dahlberg, David F. Savage, and W. E. Moerner, “Characterizing physical properties of single carboxysomes in the Interferometric Scattering Anti-Brownian ELectrokinetic trap,” *Biophysical Journal* **121**, Issue 3 Supplement, p431a (2022).
35. William B. Carpenter, Julia Borden, Luke M. Oltrogge, Abhijit Lavania, Davis Perez, Peter D. Dahlberg, David Savage, and W. E. Moerner, “Redox sensing inside individual carboxysomes in the ISABEL trap,” *Biophysical Journal* **121**, Issue 3 Supplement, p104a (2022).
36. Pierre Jouchet, Anish R. Roy, and W. E. Moerner, “Simultaneous position and orientation measurements of single molecules using deep learning and PSF engineering approaches,” *Biophysical Journal* **121**, Issue 3 Supplement, p412a-413a (2022).
37. Ashwin Balaji, Peter D. Dahlberg, Li-av Segev-Zarko, Stella Sun, Wah Chiu, John Boothroyd, and W. E. Moerner, “Characterizing the distribution of myosin H in the apical complex of conoid protruded and conoid retracted *Toxoplasma gondii*,” *Biophysical Journal* **121**, Issue 3 Supplement, p409a (2022).
38. Roy, Anish R., Jiarui Wang, Mengting Han, Haifeng Wang, Leonhard Möckl, Leiping Zeng, William E. Moerner, and Lei S. Qi. "Multicolor super-resolution imaging to study human coronavirus RNA during cellular infection." *Biophysical Journal* **122**, no. 3 (2023): 16a.
39. Carpenter, William B., Abhijit A. Lavania, Julia B. Turnšek, Davis Perez, Luke M. Oltrogge,

Peter D. Dahlberg, David F. Savage, and William E. Moerner. "Ratiometric sensing of redox environments inside individual carboxysomes trapped in solution." Biophysical Journal **122**, no. 3 (2023): 304a.