

Curriculum Vitae: Xiaowei Zhuang

Howard Hughes Medical Institute Investigator

David B. Arnold Professor of Science
Professor of Chemistry and Chemical Biology
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Education

1987-1991 B.S., Physics, University of Science and Technology of China
1991-1996 Ph.D., Physics, University of California, Berkeley
1997-2001 Chodorow Postdoctoral Fellow, Stanford University

Positions

2015- Director, Center for Advanced Imaging at Harvard
2014- David B. Arnold Professor of Science, Harvard University
2006- Professor, Department of Chemistry and Chemical Biology,
Department of Physics, Harvard University
2005- Investigator, Howard Hughes Medical Institute
2005 Associate Professor, Department of Chemistry and Chemical Biology,
Department of Physics, Harvard University
2001-2005 Assistant Professor, Department of Chemistry and Chemical Biology,
Department of Physics, Harvard University

Honors

Elected Membership

Member, US National Academy of Sciences
Member, American Academy of Arts and Sciences
Fellow, American Association of the Advancement of Science
Fellow, American Physical Society
Foreign member, Chinese Academy of Sciences
Foreign member, European Molecular Biology Organization (EMBO)
Honorary fellow, Royal Microscopical Society

Awards

2016 Doctor of Philosophy *Honoris Causa*, Stockholm University
2015 National Academy of Sciences Award in Molecular Biology
2015 Research Excellence Award, Univ. of Pennsylvania Nano/Bio Interface Center
2015 Pearse Prize, Royal Microscopical Society
2014 World Technology Award for Biotechnology
2011 Raymond & Beverly Sackler International Prize in Biophysics
2010 Max Delbruck Prize in Biological Physics, American Physical Society
2008 HHMI collaborative Innovation Award
2008 Coblentz Award
2006 Pure Chemistry Award, American Chemical Society
2005 Camille Dreyfus Teacher-Scholar Award
2004 Sloan Research Fellowship
2004 Technology Review Worlds Top 100 Young Innovators Award
2003 MacArthur Fellowship
2003 Packard Fellowship for Science and Engineering

- 2003 Searle Scholar
- 2003 CAREER award, National Science Foundation
- 2003 Beckman Young Investigator Award
- 2002 Young Investigator Award, Office of Naval Research

Partial List of Distinguished Lectureship

- 2016 Keynote Lecture, Gordon Research Conference on Single-molecule approaches to biology
- 2016 Herbert Lecture, Vollum Institute
- 2016 Commencement speech, Departments of Physics and Astronomy, University of California at Berkeley
- 2016 Kavli Lecture, American Physical Society Annual Meeting
- 2015 Keynote Lecture, ASBMB Annual Meeting
- 2016 University Lecture, UT Southwestern Medical Center
- 2016 Honors Lecture, New York University School of Medicine
- 2015 Andrew Huxley Lecture, Cambridge Neuroscience Symposium, University of Cambridge
- 2015 IUBMB Lecture, FEBS Congress
- 2015 Astbury Lecture, Astbury Center for Structural Molecular Biology, University of Leeds
- 2015 Pearse Prize Lecture, Microsciences Microscopy Conference
- 2015 Ferry Lecture, University of Wisconsin, Madison
- 2015 Keynote Lecture, Gordon Research Conference on Three Dimensional Electron Microscopy
- 2015 Keynote Lecture, Gordon Research Conference on Proteins
- 2014 President's Plenary Lecture, American College of Neuropsychopharmacology Annual Meeting
- 2014 Krimm Lecture, University of Michigan
- 2014 Harvey Lecture, Harvey Society
- 2014 Huck Distinguished Lecture, Penn State University
- 2014 Laureate Lecture, University of Pittsburg
- 2014 McLean Lecture, Baylor College
- 2014 Caspar Lecture, Florida State University
- 2014 Keynote Lecture, Conference on Labeling and Nanoscopy
- 2013 Dow Lecture, University of British Columbia
- 2013 Global Lecture, Peking University
- 2013 Keynote Lecture, American Society of Virology Annual Meeting
- 2012 Danny Thomas Lecture, St Jude Research Hospital
- 2012 Sproul Lecture, Cornell University
- 2012 Wang Ying-Lai Lecture, University of Texas Medical Branch
- 2012 Leica Scientific Forum Lectures, California (UCSF, UCLA, UCSD)
- 2011 Leica Scientific Forum Lectures, Germany (Munich, Heidelberg, Berlin)
- 2011 Greenfield Lecture, Case Western University
- 2011 Fredric Fay Lecture, University of Massachusetts School of Medicine
- 2011 Closs Lecture, University of Chicago
- 2011 Max Delbruck Prize Lecture, American Physical Society Annual Meeting
- 2011 Maggie & Nick DeWolf Public Lecture, Aspen Center for Physics
- 2010 Director's WALs Lecture, National Institutes of Health
- 2010 Magomedov-Shcherbinina Memorial Prize Lecture, University of Rochester
- 2009 Keynote Lecture, Annual Dutch Meeting on Molecular & Cellular Biophysics
- 2009 Keynote Lecture, Cold Spring Harbor Conference on Single Cell Analysis
- 2008 ST Huang Memorial Lecture, Hong Kong University
- 2008 Brockman Lecture, University of Michigan
- 2008 Morrison Lecture, Cornell University
- 2008 Coblentz Award Lecture, International Symposium on Molecular Spectroscopy

- 2006 Seymour Rothchild Lecture, University of Rochester
 2004 Gunnar and Gunnel Kallén Memorial Lecture, Lund University, Sweden
 2004 Jean-Francois Lefèvre Lecture in Biophysics, Ecole Supérieure de Biotechnologie de Strasbourg, France

Partial List of Professional Services

Editorial board positions

- Cell* (editorial advisory board)
eLife (reviewing editorial board)
Annual Review on Biophysics (Editorial board, associate editor)
ACS Central Science (editorial advisory board)
ACS Photonics (editorial advisory board)

Scientific advisory board positions

- Scientific Advisory Board, The Welch Foundation
 Pew Scholars National Advisory Committee, The Pew Foundation
 External advisory Board, NSF Center for the Physics of Living Cells (CPLC), UIUC
 Scientific Advisory Board, School of Life Sciences, University of Science of Technology of China
 Scientific Advisory Board, ICFO – Institute of Photonics Science, Barcelona, Spain

Partial List of other profession services

- Co-Chair, Cold Spring Harbor Conference on "New Advances in Optical Imaging of Live Cells and Organisms" (2011, 2013)
 Chair, American Society of Cell Biology Meeting, Symposium on "Breaking the diffraction barrier" (2009)
 Co-Chair, 355th Xiangshan Science Conference, "Single-Molecule Imaging, Spectroscopy and Manipulation of Biological Systems," Beijing, 2009
 Co-chair, Gordon Research Conference on "Single Molecule Approaches to Biology" (2008)
 Co-chair, American Chemical Society National Meeting, Symposium on "Single-molecule imaging, spectroscopy, and manipulation of biomolecular systems" (2007)
 Co-vice chair, Gordon Research Conference on "Single Molecule Approaches to Biology" (2006)
 Member, NIH College of CSR Reviewers (2010-)
 NIH Study Sections: Review Panel for the NIH Director's Pioneer Award (2007, 2012, 2014), Review panel for the Nanomedicine Development Centers for the NIH Roadmap (2005, 2008), Study section on Molecular Structure and Function C (2007), Study section on Cell Structure and Function (2006), Study section on Bioanalytical, Engineering, and Chemistry Emphasis (2003)

Publications

- S. Wang, J. –H. Su, B. J. Beliveau, B. Bintu, J. R. Moffitt, C. –t. Wu, X. Zhuang. Spatial organization of chromatin domains and compartments in single chromosomes. **Science** **353**, 733-737 (2016).
- C. Wang, B. Han, R. Zhou, X. Zhuang. Real-time imaging of translation on single mRNA transcripts in live cells. **Cell** **165**, 990-1001 (2016).
- A. N. Boettiger, B. Bintu, J. R. Moffitt, S. Wang, B. J. Beliveau, G. Fudenberg, M. Imakaev, L. A. Mirny, C. –t. Wu, X. Zhuang. Super-resolution imaging reveals distinct chromatin folding for different epigenetic states. **Nature** **529**, 418-422 (2016).
- J. B. French, S. A. Jones, H. Deng, A. M. Pedley, D. Kim, C. Y. Chan, H. Hu, R. J. Pugh, H. Zhao, Y. Zhang, T. J. Huang, Y. Fang, X. Zhuang, S. J. Benkovic. Spatial colocalization and functional link of purinosomes with mitochondria. **Science** **529**, 733-737 (2016).

- J. He, R. Zhou, Z. Wu, M. Carrasco, P. Kurshan, J. Farley, D. Simon, G. Wang, B. Han, J. Hao, E. Heller, M. R. Freeman, K. Shen, T. Maniatis, M. Tessier-Lavigne, X. Zhuang. Prevalent presence of periodic actin-spectrin-based membrane skeleton in a broad range of neuronal cell types and animal species. **PNAS** **113**, 6029-6034 (2016)
- J. R. Moffitt, S. Pandey, A. N. Boettiger, S. Wang, X. Zhuang. Spatial organization shapes the turnover of a bacterial transcriptome. **eLife**, e13065 (2016). DOI: 10.7554/eLife.13065
- S. Wang, J.H. Su, F. Zhang, X. Zhuang. An RNA-aptamer-based two-color CRISPR labeling system. **Sci. Rep.** **6**, 26857 (2016)
- B. T. Harada, W. L. Hwang, S. Deindl, N. Chatterjee, B. Bartholomew, X. Zhuang. Stepwise nucleosome translocation by RSC remodeling complexes. **eLife** e10051 (2016) DOI: 10.7554/elife.10051
- A. Wani, A. N. Boettiger, P. Schorderet, A. Ergun, C. Munger, R. Sadreyev, X. Zhuang, R. Kingston, N. Francis. Chromatin topology is coupled to Polycomb group protein subnuclear organization. **Nat. Communications** **7**: 10291(2016) DOI:10.1038/ncomms10291
- Y. M. Sigal, C. M. Speer, H. P. Babcock, X. Zhuang. Mapping synaptic input fields of neurons with super-resolution imaging. **Cell** **163**, 493-505 (2015)
- K. H. Chen, A. N. Boettiger, J. R. Moffitt, S. Wang, X. Zhuang. Spatially resolved, highly multiplexed RNA profiling in single cells. **Science** **348**, 412, aaa6090 (2015) DOI: 10.1126/science.aaa6090.
- S. Viswanathan, M. E. Williams, E. B. Bloss, T. J. Stasevich, C. M. Speer, A. Nern, B. D. Pfeiffer, B. M. Hooks, W. -P. Li, B. P. English, T. Tian, G. L. Henry, J. J. Macklin, R. Patel, C. R. Gerfen, X. Zhuang, Y. Wang, G. M. Rubin, L. L. Looger. High-performance probes for light and electron microscopy. **Nat. Methods** **12**, 568-576 (2015).
- B. Beliveau, A. Boettiger, M. Avendaño, R. Jungmann, R. McCole, E. Joyce, C. Kim-Kiselak, F. Bantignies, C. Fonseka, J. Erceg, M. Hannan, H. Hoang, D. Colognori, J. Lee, W. Shih, P. Yin, X. Zhuang, C. -t. Wu. Single-molecule super-resolution imaging of chromosomes and in situ haplotype visualization using Oligopaint FISH probes. **Nat. Communications** **6**, 7147 (2015) DOI: 10.1038/ncomms8147.
- D. Kim, T. J. Deerinck, Y. M. Sigal, H. P. Babcock, M. H. Ellisman, X. Zhuang. Correlative Stochastic Optical Reconstruction Microscopy and Electron Microscopy. **PLoS ONE** **10**: e0124581 (2015). DOI: 10.1371/journal.pone.0124581
- C. Y. Chan, H. Zhao, R. J. Pugh, A. M. Pedley, J. French, S. A. Jones, X. Zhuang, H. Jinnah, T. J. Huang, S. J. Benkovic. Purinosome formation as a function of the cell cycle. **Proc. Natl. Acad. Sci. USA** **112**, 1368-1373 (2015).
- G. Zhong, J. He, R. Zhou, D. Lorenzo, H. P. Babcock, V. Bennett, X. Zhuang. Developmental mechanism of the periodic membrane skeleton in axons. **eLife** e04581 (2014) DOI: 10.7554/eLife.04581
- T. Shemesh, R. W. Klemm, F. B. Romano, S. Wang, J. C. Vaughan, X. Zhuang, H. Tukachinsky, M. M. Kozlov, T. A. Rapoport. A model for the generation and interconversion of ER morphologies. **Proc. Natl. Acad. Sci. USA** **111**, E5243-E5251 (2014)
- D. N. Lorenzo, A. Badea, J. Q. Davis, J. Hostettler, J. He, G. Zhong, X. Zhuang, V. Bennett. A PIK3C3–Ankyrin-B–Dynactin pathway promotes axonal growth and multiorganelle transport. **J. Cell Biol** **207**, 735-752 (2014).
- W. L. Hwang, S. Deindl, B. T. Harada, X. Zhuang. Histone H4 tail mediates allosteric regulation of nucleosome remodelling by linker DNA. **Nature** **512**, 213-217 (2014).

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- S. Wang, J. R. Moffit, G. T. Dempsey, X. S. Xie, X. Zhuang. Characterization and development of photoactivatable fluorescent proteins for single-molecule-based superresolution imaging. ***Proc. Natl. Acad. Sci. USA* 111**, 8452-8457 (2014).
- J. -J. Chung, S. -H. Shim, R. A. Everley, S. P. Gygi, X. Zhuang, D. E. Clapham. Structurally Distinct Ca²⁺ Signaling Domains of Sperm Flagella Orchestrate Tyrosine Phosphorylation and Motility. ***Cell* 157**, 808-822 (2014)
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- A. M. Avalos, A. M. Bilate, M.D. Witte, A. K. Tai, J. He, M. P. Frushicheva, P. D. Thill, F. Meyer-Wentrup, C. S. Theile, A. K. Chakraborty, X. Zhuang, H. L. Ploegh. Monovalent engagement of the BCR activates ovalbumin-specific transnuclear B cells. ***J. Exp. Med.* 211**, 365-79 (2014)
- K. Xu, G. Zhong, X. Zhuang. Actin, spectrin and associated proteins form a periodic cytoskeleton structure in axons. ***Science* 339**, 452-456 (2013).
- Y. Doksani, J. Wu, T. de Lange, X. Zhuang. Super-resolution fluorescence imaging of telomeres reveals TRF2-dependent t-loop formation. ***Cell* 155**, 345-356 (2013).
- S. Deindl, W. L. Hwang, S. K. Hota, T. R. Blosser, P. Prasad, B. Bartholomew, X. Zhuang. ISWI remodelers slide nucleosomes with coordinated multi-base-pair entry steps and single-base-pair exit steps. ***Cell* 152**, 442-452 (2013).
- H. Babcock, J. Moffitt, Y. Zhao, X. Zhuang. Fast compressed sensing analysis for super-resolution imaging using L1-homotopy. ***Optics Express* 21**, 28583-28596 (2013).
- J. He, E. Sun, M. B. Bujny, D. Kim, M. W. Davidson, X. Zhuang. Dual function of CD81 in influenza uncoating and budding. ***PLoS Pathogen* 9**, e1003701 (2013).
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- E. Sun, J. He, X. Zhuang. Dissecting the role of COPI complexes on influenza virus infection. ***J. Virol.* 87**, 2673-2685(2013)
- I. Kim, W. Pan, S. A. Jones, Y. Zhang, X. Zhuang, D. Wu. Clathrin and AP2 are required for PtdIns(4,5)P₂-mediated formation of LRP6 signalosomes. ***J. Cell Biol.* 200**, 419-428 (2013).
- J. Vaughan, S. Jia, X. Zhuang. Ultra-bright Photoactivatable Fluorophores Created by Reductive Caging. ***Nat. Methods* 9**, 1181-1184 (2012).
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- H. Babcock, Y. Sigal, X. Zhuang. A high-density 3D localization algorithm for stochastic optical reconstruction microscopy. *Nanoscopy* **1**: 6 (2012).
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- M. Lakadamyali, H. Babcock, M. Bates, X. Zhuang, J. Lichtman. 3D Multicolor Super-Resolution Imaging Offers Improved Accuracy in Neuron Tracing. *PLoS One* **7**: e30826 (2012)
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- J. C. Vaughan, X. Zhuang. New fluorescent probes for super-resolution imaging. *Nat. Biotechnol.* **29**, 880-881 (2011)
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- S. Jones, S.-H. Shim, J. He, X. Zhuang. Fast three-dimensional super-resolution imaging of live cells. *Nat. Methods* **8**, 499-505 (2011).
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- B. Huang, H. Babcock, X. Zhuang, Breaking the diffraction barrier: Super-resolution imaging of cells. *Cell* **143**, 1047-1058 (2010).
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- A. Dani, B. Huang, J. Bergan, C. Dulac, X. Zhuang. Super-resolution imaging of chemical synapses in the brain. *Neuron* **68**, 843-856 (2010)
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- S. Chung, M. Wendeler, J. W. Rausch, G. Beilhartz, M. Gotte, B. R. O'Keefe, A. Bermingham, J. A. Beutler, S. Liu, X. Zhuang, S. F.J. Le Grice. Structure-Activity Analysis of Vinylogous Urea Inhibitors of Human Immunodeficiency Virus-Encoded Ribonuclease H. *Antimicrob Agents Chemother* **54**, 3913-3921 (2010)

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- M. Bates, B. Huang, M. Rust, G. Dempsey, W. Wang, X. Zhuang. Sub-diffraction-limit Imaging with Stochastic Optical Reconstruction Microscopy (STORM). ***Nobel Volume on Single Molecule Spectroscopy in Chemistry***, Springer Publishing (2009).
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- J. Vaughan, B. Brandenburg, J. Hogle, X. Zhuang. Rapid actin-dependent viral motility in live cells. ***Biophysical Journal* 97**, 1647-1656 (2009)
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- S. Liu, E. Abbondanzieri, J. W. Rausch, S. F. J. Le Grice, X. Zhuang. Slide into action: dynamic shuttling of HIV reverse transcriptase on nucleic acid substrate. ***Science* 322**, 1092-1097 (2008).
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