

Kevin M. Dean, Ph.D.

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PROFESSIONAL ACCOMPLISHMENTS

My research portfolio includes 43 peer-reviewed manuscripts that have been cited 2800 times (h-index of 29). I am a MPI on an NCI Cellular Cancer Biology Imaging Research Center (U54CA268072) grant, an NIGMS Biomedical Technology Development and Dissemination Center (RM1GM145399) grant, and a Harold C. Simmons Comprehensive Cancer Center Translational Research Pilot grant. Additionally, I was the recipient of the Distinguished Researcher Award from the President's Research Council at UT Southwestern.

EDUCATION

Ph.D., Biochemistry

GPA: 3.9

University of Colorado, Boulder, CO, USA.

2007 - 2013

Dissertation: Fluorescent Proteins: Spectroscopic Studies, Microfluidic Analysis, and Generation of Improved Variants. Research conducted under the guidance of Drs. Amy E. Palmer and Ralph Jimenez.

B.A., Chemistry

GPA: 3.64

Willamette University, Salem, OR, USA.

December 2002 - 2006

Thesis: Laser Light Scattering Investigations of the Isobutyric Acid/Water Binary Liquid System. Research conducted under the guidance of Dr. J. Charles Williamson.

RESEARCH AND WORK ACTIVITIES

Tenure-Track Assistant Professor

2022 – Present

Lyda Hill Department of Bioinformatics and Cecil H. and Ida Green Center for Systems Biology, UT Southwestern Medical Center, Dallas, TX, USA.

My lab aims to establish a broadly generalizable method for studying cell biological processes within complex tissues such as the hematopoietic niche. This includes creating advanced tissue processing techniques that enable interrogation of the location and activation state for 20 different proteins with 80 nm resolution, deep tissue imaging microscopes that adapt to and optimally probe the biological specimen, and cutting-edge software that comprehensively analyzes the architecture of single cells throughout entire tissues. Ultimately, our goal is to bridge the gap between traditional cell biology and the complex reality of living organisms, providing deeper insights into health and disease. Member of the Biomedical Engineering and Molecular Biophysics Graduate Programs.

Research-Track Assistant Professor, and Director of the Microscopy Innovation Lab 2018 – 2022
Department of Cell Biology, UT Southwestern Medical Center, Dallas, TX, USA.

The pace of microscopy technology development far outstrips the rate at which it can be commercialized and delivered to the greater biological community. The Microscopy Innovation Lab

at UT Southwestern works to eliminate this delay by developing potentially transformative instrumentation that is tailored to address specific biological questions, and engaging in close collaborations with life scientists to gain molecular insight into physiological and pathophysiological phenomena. Towards these means, I work one-on-one with diverse biomedical scientists and physicians to develop custom imaging workflows that synergistically combine advances in optical probes, sample preparation, instrument design and operation, and computer vision-based analyses of TB-scale datasets.

Postdoctoral Fellow, Fiolka and Danuser Laboratories

2014 – 2018

Lyda Hill Department of Bioinformatics, UT Southwestern Medical Center, Dallas, TX, USA.

Development and application of light-sheet microscopy and computer vision technologies to elucidate mechanisms of cell-extracellular matrix adhesions, Rho GTPase signaling, and cytoskeletal dynamics of breast cancer cells disseminating into 3D tissue-like environments. Ruth L. Kirschstein Postdoctoral Fellow. Research conducted under the guidance of Drs. Reto Fiolka and Gaudenz Danuser.

Director, BioFrontiers Advanced Imaging Resource

2013 – 2014

BioFrontiers Institute, University of Colorado, Boulder, CO, USA.

Established first campus-wide microscopy facility and expanded user base expanded to over 100 users from eight departments, two universities, and two biotechnology firms. Led a collaborative team in the building and development of novel microscopy and super-resolution instrumentation and techniques; executed independent research; provided facility strategic vision; organized analytical training for users; worked with researchers to develop customized protocols and assays; collaborated with faculty to compete for grants and contracts to support facility research activities and lead infrastructure grants; interfaced and worked closely with industrial users. Directly reported to the Chief Scientific Officer, Dr. Leslie Leinwand, and Dr. Tom Cech.

Graduate Research Assistant, Palmer Laboratory.

2007 – 2013

Department of Biochemistry, University of Colorado, Boulder, CO, USA.

Investigated the role of site-specific mutations in dark-state conversion and irreversible photobleaching for red-fluorescent proteins; developed high-throughput microfluidic cell-sorter capable of measuring fluorescence lifetime and the rate of photobleaching on single mammalian cells; directed-evolution of red-fluorescent proteins for improved photostability; collaborated with other lab members on the development and evaluation of optical biosensors. Research conducted under the guidance of Drs. Amy E. Palmer and Ralph Jimenez.

Undergraduate Research Assistant, Williamson Laboratory.

2003 – 2006

Department of Chemistry, Willamette University, Salem, OR, USA.

Development of semi-automated laser light scattering instrumentation and the measurement of highly accurate and precise binary liquid-liquid phase diagrams. Research conducted under the guidance of Dr. J. Charles Williamson.

PEER-REVIEWED PUBLICATIONS

1. Jinlong Lin et al, Mechanically sheared Axially Swept Light-Sheet Microscopy. *Submitted*.
2. Zach Marin, Xiaoding Wang et al, navigate: an open-source platform for smart light-sheet microscopy. *Submitted*
3. Benjamin Nanes et al, Keratin isoforms modulate motility signals during wound healing. *Sub-*

mitted.

4. Tadamoto Isogai, Kevin M. Dean et al, Direct Arp2/3-vinculin binding is essential for cell spreading, but only on compliant substrates and in 3D. *Submitted.*
5. Erik S. Welf et al, Proteolysis-free amoeboid migration through crowded environments via bleb-driven worrying. *Accepted, Dev. Cell.*
6. Robert J. Ju et al, Compression-dependent microtubule reinforcement comprises a mechano-stat which enables cells to navigate confined environments. *Accepted, Nat. Cell Biol.*
7. Pancheng Xie et al, Mammalian circadian clock proteins form dynamic interacting microbodies distinct from phase separation. *Proc. Nat. Acad. Sci. USA.* 2023 Dec; (120) e2318274120.
8. Philippe Roudot et al, u-track 3D: measuring and interrogating intracellular dynamics in three dimensions. *Cell Rep. Methods.* 2023 Dec; (3) 100655.
9. Mohamad I. Cheikh et al, A comprehensive model of Drosophila epithelium reveals the role of embryo geometry and cell topology in mechanical responses. *eLife.* 2023. Oct; (12) e85569.
10. Andrew D. Weems et al, Blebs Promote Cell Survival by Assembling Oncogenic Signaling Hubs. *Nature.* 2023 Mar; (615) 517-525.
11. Alec Bancroft et al, Discoidin Domain Receptor 2 regulates aberrant mesenchymal progenitor cell fate and matrix organization. *Sci. Advances.* 2022 Dec; (51) eabq6152.
12. Bingying Chen et al, Increasing the field-of-view in oblique plane microscopy via optical tiling. *Biomed. Opt. Exp.* 2022 Nov; (13) 5616-5627.
13. Bingying Chen et al, Resolution doubling in light-sheet microscopy via oblique plane structured illumination. *Nat. Methods* 2022 Nov; (11) 1419-1426.
14. Kevin M. Dean et al, Isotropic imaging across spatial scales with axially swept light-sheet microscopy. *Nat. Protoc.* 2022 Jul; (17) 2025-2053.
15. Sue Y. Kim et al, Particle Retracking Algorithm Capable of Quantifying Large, Local Matrix Deformation for Traction Force Microscopy. *PLoS ONE.* 2022 Jun; (17) e0268614.
16. Iliodora V Pop et al, Structure of long-range direct and indirect spinocerebellar pathways as well as local spinal circuits mediating proprioception. *Neurosci.* 2022 Jan; (42) 581-600.
17. Hao Liu et al, Heterozygous mutation of Vegfr3 decreases renal lymphatics but is dispensable for renal function. *J. Am. Soc. Neph.* 2021 Sep; (32) 3099-3113.
18. Bo-Jui Chang et al, Real-time multi-angle projection imaging of biological dynamics. *Nat. Methods.* 2021 Jun; (18) 829-834.
19. Sangyoon J. Han et al, Pre-complexation of talin and vinculin without tension is required for efficient nascent adhesion maturation. *eLife.* 2021 Mar; (10) e66151. *Co-corresponding author.*
20. Erik S. Welf et al, Actin-membrane release initiates cell protrusion. *Dev. Cell.* 2020 Dec; (55) 723-736.
21. Etai Sapoznik et al, A versatile Oblique Plane Microscope for large-scale and high-resolution imaging of subcellular dynamics. *eLife.* 2020 Nov; (9) e57681. *Co-corresponding author.*
22. Kyung-min Lee et al, Proline rich 11 (PRR11) overexpression amplifies PI3K signaling and promotes antiestrogen resistance in breast cancer. *Nat. Comm.* 2020 Oct; (11) 1-15.

23. Tonmoy Chakraborty, Bingying Chen et al, Converting Lateral Scanning Into Axial Focusing to Speed Up 3D Microscopy. *Light Sci. Appl.* 2020 Sep; (9) 00401-00409.
24. Bo-Jui Chang, Kevin M. Dean, and Reto Fiolka. Systematic and quantitative comparison of lattice and Gaussian light-sheets. *Opt. Express*. 2020 Aug; (28) 27052-27077.
25. Bingying Chen, Tonmoy Chakraborty et al, Extended depth of focus multiphoton microscopy via incoherent pulse splitting. *Biomed. Opt. Express*. 2020 Jun; (11) 3830-3842.
26. Tonmoy Chakraborty et al, Light-sheet microscopy of Cleared Tissues with Isotropic, Subcellular Resolution. *Nat. Methods*. 2019 Nov; (16), 1109-1113. *Co-corresponding author*.
27. Meghan K. Driscoll et al, Robust and automated detection of subcellular morphological motifs in 3D microscopy images. *Nat. Methods*. 2019 Sept; (16) 1037-1044.
28. Ashwathi S. Mohan et al, Enhanced dendritic actin network formation in lamellipodia drives proliferative signaling in growth-challenged Rac1^{P29S} melanoma cells. *Dev. Cell*. 2019 May; (49) 444-460.
29. Bo-Jui Chang, Mark Kittisopikul et al, Universal Light-Sheet Generation with Field Synthesis. *Nat. Methods*. 2019 Feb; (16) 235-238.
30. Kevin M. Dean and Reto Fiolka. Lossless Three-Dimensional Parallelization in Digitally Scanned Light-Sheet Fluorescence Microscopy. *Sci. Rep.* 2017 Aug; (7), 9332.
31. Kevin M. Dean et al, Imaging Subcellular Dynamics with Fast and Light-Efficient Volumetrically Parallelized Microscopy. *Optica*. 2017 Feb; (4), 263-271.
32. Jun Chu et al, A Bright Cyan-Excitable Orange Fluorescent Protein for Dual-Emission Microscopy and Highly Sensitive Bioluminescence Imaging In Vivo. *Nat. Biotechnol.* 2016 May 30; (34), 760-767.
33. J. Charles Williamson et al. Determination of Liquid-Liquid Critical Point Composition Using 90° Laser Light Scattering. *Phys. Rev. E*. 2016 Apr 21; (93), 042610.
34. Kevin M. Dean, Philippe Roudot et al, Diagonally Scanned Light-Sheet Microscopy for Fast Volumetric Imaging of Adherent Cells. *Biophys. J.* 2016 Mar 29; (110), 1456-1465.
35. Erik S. Welf, Meghan K. Driscoll et al, Quantitative Multiscale Cell Imaging in Controlled 3D Microenvironments. *Dev. Cell*. 2016 Feb 22; (36), 462-475.
36. Kevin M. Dean et al. Deconvolution-Free Subcellular Imaging with Axially Swept Light Sheet Microscopy. *Biophys. J.* 2015 Jun 16; 108(12), 2807-2815.
37. Kevin M. Dean et al, High-Speed Multiparameter Photophysical Analyses of Fluorophore Libraries. *Anal. Chem.* 2015 Apr 21; 87(10), 5026-30.
38. Kevin M. Dean et al, Microfluidics-Based Selection of Red-Fluorescent Proteins with Decreased Rates of Photobleaching. *Int. Biol.* 2014 Nov 21; 7(2), 263-73.
39. Kevin M. Dean and Reto Fiolka. Uniform and Scalable Light-Sheets Generated by Extended Focusing. *Opt. Express*. 2014 Oct 16;22(21),26141-26152.
40. Kevin M. Dean and Amy E. Palmer. Advances in Fluorescence Labeling Strategies for Dynamic Cellular Imaging. *Nat. Chem. Biol.* 2014 May 16;10(7):512-23.
41. Yan Qin et al, Direct Comparison of a Genetically Encoded Sensor and Small Molecule Indicator: Implications for Quantification of Cytosolic Zn²⁺. *ACS Chem. Biol.* 2013 Aug 30;8(11):2366-71.

42. Lloyd M. Davis et al, Microfluidic Cell sorter for Use in Developing Red Fluorescent Proteins with Improved Photostability. *Lab Chip*. 2013 Jun 21;13(12):2320-7.
43. Kevin M. Dean, Yan Qin, and Amy E. Palmer. Visualizing Metal Ions in Cells: An Overview of Analytical Techniques, Approaches, and Probes. *Biochim. et Biophys. Acta*. 2012 Sep;1823(9):1406-15.
44. Jennifer L. Lubbeck et al, Microfluidic Flow Cytometer for Quantifying Photobleaching of Fluorescent Proteins in Cells. *Anal. Chem*. 2012 May 1;84(9):3929-37.
45. Kevin M. Dean et al, Analysis of Red-Fluorescent Proteins Provides Insight Into Dark-State Conversion and Photodegradation. *Biophys. J*. 2011 Aug 17;101(4):961-9.
46. Kevin M. Dean and J. Charles Williamson. The Stir-Settle Approach to Semiautomated Light Scattering Determination of Liquid-Liquid Coexistence Curves. *J. Chem. Eng. Data*. 2011 Jan 26;56(4):1433-7.
47. Kevin M. Dean et al, The Accuracy of Liquid-Liquid Phase Transition Temperatures Determined from Semiautomated Light Scattering Measurements. *J. Chem. Phys.* 2010 Aug 21;133, 074506.

PATENTS

1. 13,360,706 – Optically Integrated Microfluidic Cytometer for High Throughput Screening of Photophysical Properties of Cells or Particles.
2. 62,155,980 – Uniform and Scalable Light-Sheets Generated by Extended Focusing.
3. 16,093,561 – Light-Sheet Microscope with Parallelized 3D Image Acquisition.

INVITED TALKS

1. Light Microscopy Australia. Melbourne, VIC, Australia, 2024.
2. Microscopy & Microanalysis. Minneapolis, MN, USA, 2023.
3. EMBL-Janelia Bioimaging Seminar Series. Virtual. 2023.
4. MC2 Image Analysis Working Group. Virtual. 2023.
5. Willamette University. Salem, OR, USA. 2023.
6. Photonics Media Webinar Series. Virtual. 2022.
7. CLEO: Laser Science to Photonic Applications Technical Conference. San Jose, CA, USA. 2022.
8. Light-Sheet Conference and Workshop, MBL. Woods Hole, MA, USA. 2022.
9. IQ Health Science & Engineering, Michigan State University. Lansing, MI, USA. 2021.
10. Photonics Media Webinar Series. Virtual. 2020.
11. Imaging ONE WORLD Series. Virtual. 2020.
12. Next Generation Microscopy Workshop. Cambridge, U.K. 2019.
13. Cell Biology Seminar Series, Denver University, Denver, CO, USA. 2017.
14. Andor Academy, University of Colorado, Boulder, CO, USA. 2014.
15. American Chemical Society, Orlando, FL, USA. 2019.