**Douglas Shepherd**

Center for Biological Physics

Department of Physics

Arizona State University

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**Appointments**

Assistant Professor of Physics 2019-present

*Center for Biological Physics*

*Arizona State University*

* Biophysics research: Interplay between environmental buffering and diversity generation of gene expression in vascular progenitor vascular cells during mammalian organogenesis, methods development for optical tissue clearing, fluorescent labeling in optically cleared tissue, high-throughput single-molecule, single-cell imaging, structured illumination microscopy, light-sheet fluorescence microscopy, and computational modeling of gene expression.

Assistant Research Professor of Pharmacology 2017-2019

*University of Colorado Anschutz Medical Campus*

* Biophysics research: Interplay between environmental buffering and diversity generation of gene expression in vascular progenitor vascular cells during mammalian organogenesis, methods development for optical tissue clearing, fluorescent labeling in optically cleared tissue, high-throughput single-molecule, single-cell imaging, structured illumination microscopy, light-sheet fluorescence microscopy, and computational modeling of gene expression.
* Director of Molecular Ion Beam Imaging center

Assistant Professor of Physics 2013-2017

*University of Colorado Denver*

* Biophysics research: Single-cell gene expression heterogeneity in vascular progenitor cells, methods development for high-throughput single-molecule, single-cell gene expression imaging, computation modeling of gene expression, Bayesian data analysis for single-molecule RNA imaging, slight-sheet fluorescence microscopy.
* Teaching: Introduction to Physics, College Physics I, Biophysics Outlook, Biophysics of the Body, Biophysics of the Cell, Introduction to Quantitative Spectroscopy.

Postdoctoral Fellow 2011-2013

*Los Alamos National Laboratory*

* Center for Integrated Nanotechnologies and Center for Nonlinear Studies
* Biophysics research: small RNA regulation of virulence in *Yersinia Pestis,* methods development for single-molecule bacterial RNA imaging and modeling of gene expression

**Education**

Ph.D. Physics

*Colorado State University*

“Extending single molecule spectroscopic techniques to multi-particle systems of semiconductor nanocrystals.“

Thesis advisors: Martin Gelfand (Physics) / Alan van Orden (Chemistry)

BS Physics

*University of California Santa Barbara*

Research honors, Academic/Researcher advisor: David Awschalom (Physics)

**Peer-reviewed journal articles**

12. Justin B Sambur, Douglas P Shepherd, Mahdi Hesari, Michael Van Erdewyk, Eric Choudhary, Peng Chen, “Correlated Single-Molecule Reaction Imaging and Photocurrent Measurements Reveal Underlying Rate Processes in Photoelectrochemical Water Splitting”, *Journal of the Electrochemical Society,* 166(5) H3286-H3293 2019.

11. Brian Munsky, Guoliang Li, Zachary R Fox, Douglas P Shepherd, Gregor Neuert, “Distribution shapes govern the discovery of predictive models for gene regulation”, *Proceedings of the National Academy of Sciences* 115(29) 7533-7538 2018.

10. Elizabeth A Gould, Nicolas Busquet, Douglas Shepherd, Robert M Dietz, Paco S Herson, Fabio M Simoes de Souza, Anan Li, Nicholas M George, Diego Restrepo, Wendy B Macklin, “Mild myelin disruption elicits early alteration in behavior and proliferation in the subventricular zone”, *eLife* 7 e34783 2018.

9. Jasmine N Singh, Taylor M Nowlin, Gregory J Seedorf, Steven H Abman, Douglas P Shepherd, “Quantifying three-dimensional rodent retina vascular development using optical tissue clearing and light-sheet microscopy”, *Journal of Biomedical Optics* 22(7) 076011 2017.

8. Duncan P Ryan, Elizabeth A Gould, Gregory J Seedorf, Omid Masihzadeh, Steven H Abman, Sukumar Vijayaraghavan, Wendy B Macklin, Diego Restrepo, Douglas P Shepherd, “Automatic and adaptive heterogeneous refractive index compensation for light-sheet microscopy”, *Nature Communications* 8(1) 612 2017.

7. Megan A Ahern, Claudine P Black, Gregory J Seedorf, Christopher D Baker, Douglas P Shepherd, “Hyperoxia impairs pro-angiogenic RNA production in preterm endothelial colony forming cells”, *AIM Biophysics* 4(2) 284-297 2017.

6. Koushik Ghosh, Eva Rose M Balog, Jennifer L Kahn, Douglas P Shepherd, Jennifer S Martinez, Reginaldo C Rocha, “Multicolor luminescence from conjugates of genetically encoded elastin-like polymers and terpyridine-lanthanides”, *Macromolecular Chemistry and Physics* 216(18) 1856-1861 2015.

5. Douglas P Shepherd, “Life away from the coverslip”, *Physics of Life Reviews* 13 144-145 2015.

4. Christa Brelsford, Douglas Shepherd, “Using mixture-tuned match filtering to measure changes in subpixel vegetation area in Las Vegas, Nevada” *Journal of Applied Remote Sensing* 8(1) 083660 2014.

3. Douglas P Shepherd, Nan Li, Sofiya N Micheva-Viteva, Brian Munsky, Elizabeth Hong-Geller, James H Werner, “Counting small RNA in pathogenic bacteria”, *Analytical Chemistry* 85(10) 4938-4943 2013. **Featured on cover.**

2. Douglas P Shepherd, Justin B Sambur, Yong-Qi Liang, Bruce A Parkinson, Alan Van Orden, “In situ studies of photoluminescence quenching and photocurrent yield in quantum dot sensitized single crystal TiO2 and ZnO electrodes”, *The Journal of Physical Chemistry C* 116(39) 21069-21076 2012.

1. Douglas P Shepherd, Kevin J Whitcomb, Kenneth K Milligan, Peter M Goodwin, Martin P Gelfand, Alan Van Orden, “Fluorescence intermittency and energy transfer in small clusters of semiconductor nanocrystals”, *The Journal of Physical Chemistry C* 114(35) 14831-14837 2010.

**Conference proceedings**

2. Evan P Perillo, Leyma De Haro, Mary E Phipps, Jennifer S Martinez, Hsin-Chih Yeh, Andrew K Dunn, Douglas P Shepherd, James H Werner, “Enhanced 3D localization of individual RNA transcripts via astigmatic imaging”, *SPIE Proceedings Volume 8950 Single Molecule Spectroscopy and Superresolution Imaging VII* 895003-895014 2014.

1. Douglas P Shepherd, Nan Li, Elizabeth Hong-Geller, Brian Munsky, James H Werner, “New tools for discovering the role sRNA plays in cellular regulation”, *SPIE Proceedings Volume 8228 Single Molecule Spectroscopy and Superresolution Imaging V* 822808-822818 2012.

**Patent Applications**

* US20180275389A1: Remote Focusing All-Optical Digital Scanning Light Sheet Microscopy for Optically Cleared Tissue Sections. Filed: 09/27/2018

**External Funding**

* National Institute of Health (NIH), National Heart, Lung, and Blood Institute, *R01: Role of VEGF in Perinatal Hypertension*, Role: PI (2019-2023)

**External Funding [continued]**

* Chan Zuckerberg Institute (CZi), Human Cell Atlas Seed Network, *Human Lung Cell Atlas v1.0*, Role: CO-PI (2019-2022)
* NIH National Heart, Lung, and Blood Institute, *R56: Role of VEGF in Perinatal Hypertension*, Role: PI (2018-2019)
* NIH National Eye Institute, *R21: 3D-Fast Optical Interface for Rapid Volumetric Neural Sensing and Modulation*, Role: CO-I (2018-2020)
* The Brain Tumors Charity, *GN-00522: Identifying Directed Therapies for Adamantinomatous Craniopharyngioma using Advanced Biological Techniques and Genetically Engineered Mouse Models*, Role: CO-I (2018-2023)
* NIH National Institute of Aging, *R21: Linking Olfactory deficits to Neurodegenerative Disorders*, Role: CO-I (2016-2018)

**Competitive Internal Funding**

* CU Anschutz RNA Bioscience Initiative, *RNA Biology Grant:* *High-throughput, spatial quantification of RNA expression in mouse olfaction after exposure to viral agents*, Role: PI (2018-2019)
* CU Anschutz School of Medicine Academic Enrichment Fund, *Strategic Infrastructure for Research Committee: Purchase of Molecular Ion Beam Imaging instrumentation*, Role: CO-PI (2017-2020)
* CU Denver College of Liberal Arts and Sciences (CLAS), *Research Innovation Seed Program*, Role: PI (2016-2017)
* CU Denver, *Office of Research Services Award*, Role: PI (2014-2015)
* CU Denver CLAS, *Research Innovation Seed Program*, Role: PI (2014-2015)

**Invited seminars (since 2015)**

2018

* Colloquium speaker, Department of Physics, University of New Mexico, Albuquerque, NM, USA
* Speaker, Center for Integrated Nanotechnologies Annual Meeting, Santa Fe, NM, USA
* Colloquium speaker, Department of Physics, Arizona State University, Tempe, AZ, USA
* Speaker, Annual Light Sheet Fluorescence Microscopy Meeting, Dresden, Germany
* Speaker, Single Molecule Workshop: Theory Meets Experiment, Telluride, CO, USA
* Speaker and organizer, q-Bio Summer School, Rice University, Houston, NM, USA
* Neuroscience session chair and speaker, Annual Biophysical Society Meeting, San Francisco, CA, USA

2017

* Speaker, Deciphering Complex Energy Landscape and Kinetic Network from Single Molecules to Cells: A New Challenge to Make Theories Meet Experiments, Dijon, France
* Speaker, The Complexity of Dynamics and Kinetics from Single Molecules to Cells, Telluride, CO, USA
* Speaker and organizer, q-Bio Summer School, Colorado State University, Fort Collins, CO, USA

2016

* Speaker and session organizer, Statistical Methods in Imaging Annual Meeting, Denver, CO, USA
* Speaker, Math Bio Institute: Modeling and Inference from Single-Molecules to Cells, Ohio State University, Columbus, OH, USA
* Colloquium speaker, Department of Biology, California Institute of Technology, Pasadena, CA, USA

2015

* Speaker, Annual Cotton Club Conference, Winter Park, CO, USA
* Keynote speaker, American Association of Physics Teachers CO/WY Zone Meeting, Denver, CO, USA
* Colloquium speaker, Department of Applied Mathematics, University of Alabama, Tuscaloosa, AL, USA
* Speaker and organizer, q-Bio Summer School, Colorado State University, Fort Collins, CO, USA

**Theses supervised**

2016

* Jasmine N. Singh, MS, “Three-dimensional quantification of the spatiotemporal co-evolution of the vascular and neuronal network within intact eyes.”

**Service activities**

Internal

* Thesis committee member for one Pharmacology Program and two Neuroscience Program Ph.D. students, AMC, 2017-present
* Advisory committee member, Advanced Light Microscopy Core, University of Colorado Anschutz Medical Campus (AMC), 2015-present
* Member, College of Liberals Arts and Sciences Information Technology committee, University of Colorado Denver (UCD) 2015-2017
* Member, UCD high impact practices task force 2015
* Member, UCD Department of Physics Biophysics curriculum design committee 2014-2017
* Faculty participant, UCD graduation ceremonies 2014-2016
* Member, Joint MSU Denver - UCD Department of Physics learning outcomes working group and document preparation 2014
* Thesis committee member for two Integrative Ph.D. students, UCD, 2013-2016
* Faculty participant, UCD new student convocation 2013
* Faculty judge, American Physical Society 4 Corners meeting 2013

External

* Member, q-Bio Conference organizing committee, 2016-present
* Organizer, q-Bio Summer School 2013-present
* Faculty participant, gtPathways Faculty 2 Faculty Colorado state science curriculum design 2013-2015
* Ad-hoc peer review for Nature Methods, Nature Communications, Journal of Biomedical Optics, Optics Express, Journal of American Chemistry Society, Journal of Physical Chemistry C, Physics of Life Reviews, RSC Nanoscale 2011-present

**Teaching**

University of Colorado Denver (2013-2017)  
Course and Instructor evaluations on 6.0-point scale.   
Full evaluations available from <https://fcq.colorado.edu/ucddata.htm>

* Biophysics of the Body, PHYS 3251\*
  + Fall 2013: Course overall 3.6; Instructor Overall 4.0
  + Fall 2014: Course overall 6.0; Instructor Overall 6.0
* Biophysics of the Cell, PHYS 3451\*
  + Spring 2014: Course overall 4.7; Instructor Overall 5.0
  + Spring 2015: Course overall 5.7; Instructor Overall 6.0
* Biophysics Outlook II
  + Spring 2017: Course overall 5.3 Instructor Overall 5.7
* College Physics I, PHYS 2010^
  + Fall 2014: Course overall 4.2; Instructor Overall 4.6
  + Fall 2015: Course overall 4.6; Instructor Overall 5.0
  + Spring 2016: Course overall 4.8; Instructor Overall 5.6
* College Physics I, PHYS 2010^ [continued]
  + Fall 2106: Course overall 4.4 Instructor Overall 4.8
* Introduction to Physics, PHYS 1000
  + Spring 2016: Course overall 4.9; Instructor overall 5.4

**Teaching [continued]**

* Special Topics: Introduction to Quantitative Spectroscopy, PHYS 4401/MINS 5000/BIOL 7050\*
  + Spring 2015: Course overall 5.2 Instructor overall 5.6
  + Spring 2017: Course overall 6.0 Instructor overall 6.0

\* created the course.

^ part of teaching grant to reform Introductory Physics in the Life Sciences. Worked to utilize peer educators, flipped classroom strategies, and open-source digital textbooks.