

## RYAN MCGORTY

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### ACADEMIC POSITIONS

<b>Department Chair</b>	<b>2022–present</b>
<b>Associate Professor</b>	<b>2021–present</b>
<b>Assistant Professor</b>	<b>2015–2021</b>
Department of Physics and Biophysics, University of San Diego	
<b>Postdoctoral Researcher</b>	<b>2011–2015</b>
University of California, San Francisco	

### EDUCATION

<b>Harvard University</b> , Cambridge, MA	
Ph.D. in Physics	<b>2011</b>
<b>University of Massachusetts</b> , Amherst, MA	
B.S. in Physics and Journalism	<b>2005</b>

### EXTERNAL GRANTS

National Institutes of Health <i>Phage Pathways: Hunting Bacteria Across the Human Transmucosal Environment</i>	<b>Pending</b>
National Science Foundation – Biological Infrastructure <i>Collaborative Research: Innovation of a Novel Imaging System for One-Pot Biomolecular Condensate Phase Separation Measurements</i>	<b>Pending</b>
Chan Zuckerberg Initiative – Scialog Award <i>3D Dynamics Quantification with Differential Dynamic Light-Field Microscopy</i> , \$57.5k	<b>2023-2024</b>
National Science Foundation – International Research Experience <i>Collaborative Research: RUI: IRES Track I: From fundamental to applied soft matter: research experiences in Mexico</i> , \$300k	<b>2023-2026</b>
Research Corporation – Cottrell Postbac Award <i>Micro- and macro-rheology of topologically-active DNA-based materials</i> , \$50k	<b>2022-2023</b>
National Institutes of Health – R15 <i>Biomimetic cytoskeleton and advanced microscopy to reveal intracellular DNA dynamics and distributions</i> , \$395k Co-PI with Rae M. Robertson-Anderson	<b>2021-2024</b>
Research Corporation – Cottrell Instrumentation Supplements <i>Upgraded laser-scanning confocal microscope system for research and teaching</i> , \$10k	<b>2020-2021</b>
National Science Foundation – Major Research Instrumentation <i>MRI: Acquisition of a rheometer for interdisciplinary material science research and training of undergraduate researchers</i> , \$264k Co-PIs: P. Iovine, J. Prairie & R.M. Robertson-Anderson	<b>2019-2022</b>

Research Corporation – Cottrell Scholars Award <i>Optical microscopy of sheared phase-separating soft matter systems</i> , \$100k	<b>2019-2022</b>
National Institutes of Health – R15, GM123420 <i>A novel in vitro microscopy suite to elucidate intracellular transport and conformational dynamics of nucleic acids</i> , \$391k Co-PI with Rae M. Robertson-Anderson	<b>2017-2020</b>
American Chemical Society – Petroleum Research Fund Undergraduate New Investigator Award <i>Nucleation of a fluid phase in a colloid-polymer system studied with light-sheet microscopy</i> , \$55k	<b>2017-2020</b>

## AWARDS AND RECOGNITION

Scialog Advanced BioImaging Fellow	<b>2022–2023</b>
OUR's Outstanding Undergraduate Research Mentor Award	<b>2019</b>
Cottrell Scholars Award	<b>2019</b>

PUBLICATIONS AND CONFERENCE PROCEEDINGS WHILE AT USD (2015–) [[FULL LIST](#)](undergraduates, postdocs<sup>#</sup>)A total of **30** undergraduate student co-authors (plus 2 high school student co-authors) with **12** students having first-author papers

35. G. Martinez, J. Siu, S. Dang, D. Gage, E. Kao, J.C. Avila, R. You, **R. McGorty**. “Convolutional neural networks applied to differential dynamic microscopy reduces noise when quantifying heterogeneous dynamics,” *Soft Matter* **20**, 7880-7890 (2024). DOI: 10.1039/D4SM00881B
34. K.R. Peddireddy<sup>#</sup>, **R. McGorty**, R.M. Robertson-Anderson. “Mapping deformation dynamics to composition of topologically-active DNA blends,” *Soft Matter* (2024). DOI: 10.1039/D4SM01065E
33. K.R. Peddireddy<sup>#</sup>, **R. McGorty**, R.M. Robertson-Anderson. “Topological DNA blends exhibit resonant deformation fields and strain propagation dynamics tuned by steric constraints,” *Acta Biomaterialia* (2024). DOI: 10.1016/j.actbio.2024.10.042
32. M.S. Aporvari<sup>#</sup>, **R. McGorty**, R.M. Robertson-Anderson. “Protocol for analyzing DNA dynamics in the presence of crowders and confined within cell-sized droplets,” *STAR Protocols* **5**, 103249 (2024). DOI: 10.1016/j.xpro.2024.103249
31. P. Neill, N. Crist, **R. McGorty**, R.M. Robertson-Anderson. “Enzymatic cleaving of entangled DNA rings drives scale-dependent rheological trajectories,” *Soft Matter* **20**, 2750-2766 (2024). DOI: 10.1039/D3SM01641B
30. N. Flecher, D. Achiriloaie, B. Lee, **R. McGorty**, J. Sheung. “Design and Building of a Customizable, Single-Objective, Light-Sheet Fluorescence Microscope for the Visualization of Cytoskeleton Networks,” *J. Vis. Exp.* (2024). DOI: 10.3791/65411
29. **R. McGorty**, C.J. Currie, J. Michel, M. Sasanpour, C., K.A. Lindsay, M.J. Rust, P. Katira, M. Das, J.L. Ross, R.M. Robertson-Anderson. “Kinesin and myosin motors compete to drive rich multi-phase dynamics in programmable cytoskeletal composites,” *PNAS Nexus* (2023). DOI: 10.1093/pnasnexus/pgad245
28. J. Marfai, **R. McGorty**, R.M. Robertson-Anderson. “Cooperative Rheological State-Switching of Enzymatically-Driven Composites of Circular DNA And Dextran,” *Advanced Materials* (2023). DOI: 10.1002/adma.202305824
27. J.Y. Sheung, J. Garamella<sup>#</sup>, S.K. Kahl, B.Y. Lee, **R. McGorty**, R.M. Robertson-Anderson. “Motor-driven advection competes with crowding to drive spatiotemporally heterogeneous transport in cytoskeleton composites,” *Frontiers in Physics* 10:1055441 (2022). DOI: 10.3389/fphy.2022.1055441
26. R. Rel, D. Terwilliger, & **R. McGorty**. “Shear-induced vorticity aligned flocs in a temperature responsive colloid-polymer mixture,” *Frontiers in Physics* 10:955006 (2022). DOI:10.3389/fphy.2022.955006

25. M.S. Aporvari<sup>#</sup>, S. Dang, J. Marfai, K. Coursey, **R. McGorty**, & R.M. Robertson-Anderson. “Crowding and confinement act in concert to slow DNA diffusion within cell-sized droplets,” *iScience* **25**, 105122 (2022). DOI: 10.1016/j.isci.2022.105122
24. M. Sasanpour<sup>#</sup>, D.H. Achiriloaie, G. Lee, G. Leech, C. Currie, M. Hendija, K.A. Lindsay, J.L. Ross, **R. McGorty**, & R.M. Robertson-Anderson. “Reconstituting and Characterizing Actin-Microtubule Composites with Tunable Motor-Driven Dynamics and Mechanics,” *J. Vis. Exp.* (186), e64228 (2022). DOI:10.3791/64228
23. K.R. Peddireddy<sup>#</sup>, R. Clairmont, P. Neill, **R. McGorty**, & R.M. Robertson-Anderson, “OpTiDDM (Optical Tweezers integrating Differential Dynamic Microscopy) maps the spatiotemporal propagation of nonlinear strains in polymer blends and composites,” *Nature Communications*, **13**, 5180 (2022). DOI: 10.1038/s41467-022-32876-y
22. H.N. Verwei, G. Lee<sup>#</sup>, G. Leech, I.I. Petitjean, G.H. Koenderink, R.M. Robertson-Anderson, & **R. McGorty**. “Quantifying Cytoskeleton Dynamics Using Differential Dynamic Microscopy,” *J. Vis. Exp.* (184), e63931 (2022). DOI: 10.3791/63931
21. P. Khanal, K.R. Peddireddy<sup>#</sup>, J. Marfai, **R. McGorty**, R.M. Robertson-Anderson, “DNA topology dictates emergent bulk elasticity and hindered macromolecular diffusion in DNA-dextran composites” *Journal of Rheology*, **66**(4), 699-715 (2022). DOI: 10.1122/8.0000447
20. G. Lee<sup>#</sup>, G. Leech, P. Lwin, J. Michel, C. Currie, M.J. Rust, J.L. Ross, **R. McGorty**, M. Das, & R.M. Robertson-Anderson. “Active Cytoskeletal Composites Display Emergent Tunable Contractility and Restructuring,” *Soft Matter*, **17**, 10765-10776 (2021). DOI: 10.1039/D1SM01083B
19. R. You and **R. McGorty**, “Light sheet fluorescence microscopy illuminating soft matter,” *Frontiers in Physics*, 9:760834 (2021). DOI: 10.3389/fphy.2021.760834
18. S. Dang, J. Brady, R. Rel, S. Surineni, C. O’Shaughnessy, & **R. McGorty**, “Core-shell droplets and microcapsules formed through liquid-liquid phase separation of a colloid-polymer mixture,” *Soft Matter*, **17**, 8300-8307 (2021). DOI: 10.1039/D1SM01091C
17. S.J. Anderson, J. Garamella<sup>#</sup>, R. Adalbert, **R. McGorty**, & R.M. Robertson-Anderson, “Subtle changes in crosslinking drive diverse anomalous transport characteristics in actin-microtubule networks,” *Soft Matter*, **17**, 4375-4385 (2021). DOI: 10.1039/D1SM00093D
16. R. You & **R. McGorty**, “Two-color differential dynamic microscopy for capturing fast dynamics,” *Review of Scientific Instruments*, **92**, 023702 (2021). DOI: 10.1063/5.0039177
15. G. Lee, G. Leech, M.J. Rust, M. Das, **R. McGorty**, J.L. Ross, & R.M. Robertson-Anderson, “Myosin-driven actin-microtubule networks exhibit self-organized contractile dynamics,” *Science Advances*, **7**, 6 eabe4334 (2021). DOI: 10.1126/sciadv.abe4334
14. J. Garamella<sup>#</sup>, K. Regan, G. Aguirre, **R. McGorty**, & R.M. Robertson-Anderson, “Anomalous and heterogeneous DNA transport in biomimetic cytoskeleton networks,” *Soft Matter*, **16**, 6344-6353 (2020). DOI: 10.1039/D0SM00544D
13. C.P. Riedstra & **R. McGorty**, “Liquid-liquid phase separation: Undergraduate labs on a new paradigm for intracellular organization,” *The Biophysicist*, 1(1) (2020). DOI: 10.35459/tbp.2019.000104
12. D.M. Wulstein, K.E. Regan, J. Garamella<sup>#</sup>, **R. McGorty**, & R.M. Robertson-Anderson, “Topology-dependent anomalous dynamics of ring and linear DNA are sensitive to cytoskeleton crosslinking,” *Science Advances*, 5(12) (2019). DOI: 10.1126/sciadv.aay5912
11. S.J. Anderson, C. Matsuda, J. Garamella<sup>#</sup>, K.R. Peddireddy, R.M. Robertson-Anderson, & **R. McGorty**, “Filament rigidity vies with mesh size in determining anomalous diffusion in cytoskeleton,” *Biomacromolecules*, **20**, 4380-4388 (2019). DOI: 10.1021/acs.biomac.9b01057
9. J. Wang & **R. McGorty**, “Measuring Capillary Wave Dynamics Using Differential Dynamic Microscopy,” *Soft Matter*, **15**, 7412-7419 (2019). DOI: 10.1039/C9SM01508F
7. K.E. Regan, D.M. Wulstein, H. Rasmussen, **R. McGorty** & R.M. Robertson-Anderson, “Bridging the spatiotemporal scales of macromolecular transport in crowded biomimetic systems,” *Soft Matter*, **15**, 1200-1209 (2019). DOI: 10.1039/C8SM02023J

6. J. Wang, E. Gerald & **R. McGorty**, “Programmable illumination for multimodal microscopy using an electric paper (ePaper) display,” *Optical Tomography and Spectroscopy* (pp JTU3A-17). Optical Society of America (2018). DOI: 10.1364/TRANSLATIONAL.2018.JTu3A.17
5. D.M. Wulstein & **R. McGorty**, “Point-spread function engineering enhances digital Fourier microscopy,” *Optics Letters*, **42**, 4603-4606 (2017). DOI: 10.1364/OL.42.004603
1. D.M. Wulstein, K.E. Regan, R.M. Robertson-Anderson & **R. McGorty**, “Light-sheet microscopy with digital Fourier analysis measures transport properties over large field-of-view,” *Optics Express*, **24**, 20881-20894 (2016). DOI: 10.1364/OE.24.020881

#### INVITED TALKS (*SINCE 2023*)

Colloquium at Chemistry Institute of the National Autonomous University of Mexico (UNAM) “Dynamics and rheology of active biomaterials and gels quantified with optical microscopy tools”	<b>7/2024</b>
Invited talk at the APS March Meeting “Dynamics and rheology of active biomaterials and gels quantified with optical microscopy tools”	<b>3/2024</b>
Colloquium at SDSU Department of Physics “Soft and Active Materials Explored with Rheo-Optical Methods”	<b>3/2024</b>
Frontiers in Soft Matter and Macromolecular Networks “Soft and Active Materials Explored with Rheo-Optical Methods”, <i>invited keynote</i>	<b>10/2023</b>
Colloquium at University of Guanajuato, Mexico “Soft and Active Materials Explored with Rheo-Optical Methods”	<b>5/2023</b>
Colloquium at CIMAV Monterrey, Mexico “Soft and Active Materials Explored with Rheo-Optical Methods”	<b>5/2023</b>

#### STUDENT NATIONAL PRESENTATIONS [[MORE DETAILED LIST OF STUDENTS' TALKS](#)]

<b>American Physical Society – 2024 March Meeting</b> – Minneapolis, MN I was co-author on 9 presentations, 4 contributed talks and 5 posters. 13 unique undergraduate or high school presenters or co-authors	<b>3/2024</b>
<b>American Physical Society – 2023 March Meeting</b> – Las Vegas, NV I was co-author on 10 presentations, 8 contributed talks and 2 posters. 13 unique undergraduate or high school presenters or co-authors	<b>3/2023</b>
<b>Biophysical Society – 2023 National Meeting</b> – San Diego, CA I was a co-author on 4 presentations, all posters. 4 unique undergraduate presenters or co-authors.	<b>2/2023</b>
<b>American Chemical Society’s Meeting</b> – San Diego, CA I was a co-author on 2 presentations, 1 talk and 1 poster. 4 unique undergraduate presenters or co-authors.	<b>3/2022</b>
<b>American Physical Society – 2022 March Meeting</b> – Chicago, IL I was a co-author on 7 presentations, 3 talks and 4 posters.	<b>3/2022</b>

9 unique undergraduate presenters or co-authors.	
<b>American Physical Society – 2021 March Meeting</b> , virtual I was a co-author on 7 presentations, 3 talks and 4 posters. 7 unique undergraduate presenters or co-authors.	<b>3/2021</b>
<b>International Congress on Rheology</b> , virtual I was a co-author on 1 presentation, a poster. 2 unique undergraduate presenters or co-authors.	<b>12/2020</b>
<b>American Physical Society – 2020 March Meeting</b> , virtual I was a co-author on 6 presentations, 4 talks and 2 posters. 5 unique undergraduate presenters or co-authors.	<b>3/2020</b>
<b>Biophysical Society – 2020 National Meeting</b> – San Diego, CA I was a co-author on 1 presentation, a poster. 1 undergraduate co-author.	<b>2/2020</b>
<b>American Physical Society – 2019 March Meeting</b> – Boston, MA I was a co-author on 7 presentations, 3 talks and 4 posters. 8 unique undergraduate presenters or co-authors.	<b>3/2019</b>
<b>The Optical Society’s Biophotonics Congress: Biomedical Optics</b> – Hollywood, FL I was a co-author on 1 presentation, a poster. 2 unique undergraduate presenters or co-authors.	<b>4/2018</b>
<b>American Physical Society – 2018 March Meeting</b> – Los Angeles, CA I was a co-author on 2 presentations, 1 talk and 1 poster. 4 unique undergraduate presenters or co-authors.	<b>3/2018</b>
<b>American Physical Society – 2017 March Meeting</b> – New Orleans, LA I was a co-author on 3 presentations, all posters. 6 unique undergraduate presenters or co-authors.	<b>3/2017</b>

## DEPARTMENT, COLLEGE, AND UNIVERSITY SERVICE

Stakeholder Group for STEM Initiative	<b>2024–</b>
Chair of Physics and Biophysics Dept.	<b>2022–</b>
Student Affairs Committee of the Board of Trustees	<b>2022–</b>
College DAC on Space	<b>2022–2023</b>
Copley Library Undergraduate Research Award reviewer	<b>2020–</b>
Junior Faculty Council	<b>2019–2021</b>
Academic Review Committee (CAS Math & Sci representative)	<b>2019–2021</b>
Interim Chair of Physics and Biophysics Dept.	<b>Spring 2019</b>
Chair of Campus Goldwater Scholarship Committee	<b>2018–2019</b>
Member of Campus Goldwater Committee	<b>2015–2021, 2024–</b>
New Science Building Early Planning Committee	<b>2018–2020</b>
Leading Dept.’s efforts on 136/137 revisions	<b>2017–2019</b>
Department liaison with Career Services	<b>2017–</b>
Office of Undergraduate Research Advisory Committee	<b>2016–2021</b>
Faculty Research Grant and University Professorship Committee	<b>2016–2018</b>
Summer Undergraduate Research Experience Reviewer	<b>2016–2021, 2024–</b>