Exponent®
Engineering & Scientific Consulting

Cameron Morley, Ph.D.

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Professional Profile

Dr. Morley is a Mechanical Engineer with over a decade of experience in the fields of soft materials and mechanobiology, spanning multiple scales from single cells to organoids and musculoskeletal systems. Drawing on his background in mechanical and materials engineering, he has developed advanced 3D cell culture systems and biomanufacturing platforms to investigate biophysical interactions between cells and their microenvironment that have led to patented systems used in industry. As an Associate at Exponent, Dr. Morley's breadth of experience has enabled him to leverage experimental and theoretical techniques to advise clients on complex engineering problems in proactive and reactive work.

Prior to joining Exponent, Dr. Morley focused on the development of granular hydrogels for use as sacrificial materials in embedded 3D bioprinting and as a shear thinning injectable for cell therapy applications. During his Ph.D. at the University of Florida, he investigated the failure mechanisms of 3D printed cellular microbeams, self-assembly and coalescence of cellular aggregates, and the chemotaxis of engineered T cells to tumoroids. To enable these studies, he designed and tested several innovative 3D cell culture tools, including a microscopy-enabled bioprinter and several passive perfusion bioreactors. This work also included development of 3D printing techniques with a range of polymeric materials. Additionally, Dr. Morley served as the technical lead for a collaboration with Anton Paar, where he performed rheological characterization on a wide range of soft materials, such as hydrogels, emulsions, and polymer blends.

As a postdoctoral researcher at UC Berkeley, Dr. Morley developed a tunable injectable hydrogel with independently adjustable liquid- and solid-like properties. This technology, developed in partnership with a commercial collaborator, aimed to enhance the efficiency of cell therapies, including dopaminergic neuron transplants for Parkinson's disease. Dr. Morley's expertise in reduction to practice has been instrumental in turning innovative concepts into patented technologies that are now licensed, commercialized, and used by biotech companies.

Dr. Morley has technical experience that spans a wide range of disciplines, including microscopy / light-based assays (brightfield, epifluorescence, confocal, SEM, FACS, ELISA), quantitative image analysis (ImageJ, MATLAB), traditional manufacturing (CNC, casting, molding), additive manufacturing (bioreactors, bioprinting, inkjet, SLA, VAM), and polymer functionalization and characterization (NMR, rheology, DMA, SEC, FTIR). He is also experienced in design (SolidWorks, AutoCAD) and microfabrication (microfluidics, photolithography), with particular expertise in developing solutions requiring BSL-2 levels of safety.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, University of Florida, 2020

M.S., Mechanical Engineering, University of Florida, 2018

B.S., Mechanical Engineering, University of Colorado, Boulder, 2016

Best Presentation (Soft Matter Symposium x2)

Graduate Student Fellowship

6-time Academic All-Conference recipient

Academic Appointments

Postdoctoral Scholar, Bioengineering, University of California, Berkeley, 2020-2024

Patents

US Patent 11,879,119: Perfusion bioreactor driven by osmotic pressure gradients, January 2024 (Thomas Ettor Angelini, Tapomoy Bhattacharjee, Wallace Gregory Sawyer, Cameron Morley)

US Patent App: Capillary-driven perfusion systems and methods of use, August 2022 (Thomas E. Angelini, Obiora Azie, Jon P. Dobson, Peter S. McFettridge, Cameron D. Morley, Malissa Sarntinoranont)

US Patent App. 17/565,972: Cellular micro-masonry system, April 2022 (Sarah V Ellison, Thomas Ettor Angelini, Scott Arthur Banks, Duane Mitchell, Cameron Morley, Catherine Flores)

US Patent App. 17/622,102: Systems and methods relating to three-dimensional (3d) cell manufacturing, August 2022 (Thomas Ettor Angelini, Cameron D MORLEY, Christopher S O'bryan, Peter S McFetridge, Malisa Sarntinoranont, Tanmay P Lele, Naohiro Terada)

Publications

Morley, C.D., … Kumar, S. (2023). A Balance Between Inter- and Intra- Microgel Mechanics Governs Stem Cell Viability in Injectable Dynamic Granular Hydrogels. Advanced Materials, 35(44), 2034212.

Morley, C.D., ... & Angelini, T. E. (2022). Spatiotemporal T cell dynamics in a 3D bioprinted immunotherapy model. Bioprinting, 28, e00231.

Morley, C. D., ... & Angelini, T. E. (2020). 3D aggregation of cells in packed microgel media. Soft Matter, 16(28), 6572-6581.

Morley, C.D., ... & Angelini, T. E. (2019). Quantitative characterization of 3D bioprinted structural elements under cell generated forces. Nature communications, 10(1), 1-9.

Peer Reviews

Soft Matter