David T. Corr, Ph.D.
corrd@rpi.edu
Professor
Biomedical Engineering
Rensselaer Polytechnic Institute
Troy, NY

Brief Bio

David T. Corr received his B.S. and M.S. degrees in Engineering Mechanics & Astronautics, and after working as a consultant at NASA's Jet Propulsion Laboratory, he returned to the University of Wisconsin to earn his M.S. in Biomedical Engineering and Ph.D. in Mechanical Engineering. Dr. Corr was an Alberta Ingenuity Fund Postdoctoral Fellow in muscle physiology and modeling at the Human Performance Laboratory, and the Ernst & Young Fellow in Joint Injury and Arthritis Research, at the McCaig Centre, University of Calgary.

Dr. Corr joined the faculty at Rensselaer Polytechnic Institute (RPI) in 2006 and is currently a Full Professor in the Department of Biomedical Engineering. His research specializes in soft tissue biomechanics and laser-based biofabrication techniques to create living tissue constructs. Dr. Corr's research program aims to understand the impact of various microenvironmental and developmental stimuli on cell behavior and fate decisions, and to exploit these to improve functional tissue engineering, as well as leverage unique bioprinting capabilities to create spatially-precise cellular constructs for disease models and *in vitro* diagnostics. He is a Fellow of the American Society of Mechanical Engineers (ASME) and the American Institute for Medical and Biological Engineering (AIMBE), and is the current Chair of the Tissue and Cellular Engineering Technical Committee within ASME's Bioengineering Division.

Abstract:

Biofabricating 2D/3D *in vitro* Tissue Models via Laser Direct Write

Dr. Corr's laboratory aims to understand the impact of various environmental and developmental stimuli on cell behavior in development and disease. This seminar will highlight the development of gelatin-based laser direct write (LDW) bioprinting, and its utility in regenerative medicine and cancer research applications.

Gelatin-based LDW is a CAD/CAM bioprinting technique able to "print" living cells for the creation of *spatially-precise* cellular cultures and co-cultures in 2D. It is uniquely able to target and transfer cells, or other biopayload (e.g., soluble factors, proteins, biomolecules), to a substrate, with spatial precision, and can do so while preserving stem cell pluripotency. Dr. Corr's lab extended this technique to create and pattern 3D hydrogel microbeads, in which the size is controlled by the beam diameter of the laser. Microbeads provide a custom-engineered 3D microenvironment for the cells, and can be printed in layer-by-layer fashion to create thick constructs in which the composition is prescribed with bead-level fidelity. Printed microbeads can be further processed to create spherical microcapsules and tubular microstrands. Taken together, these bio-additive fabrication techniques can create 2D and 3D cellular structures, with customized composition and architecture, for use in tissue engineering and *in vitro* diagnostics. Examples in directing stem cell fate decisions, creating size- and shape-controlled 3D aggregates (e.g., EBs, tumor spheroids), and heterogeneous 3D tumor models will be discussed. Additionally, Dr. Corr will present the lab's latest work utilizing Optical Coherence Tomography (OCT) for label-free quantitative assessment of tumor model 3D morphology, cell viability, and regional density, nondestructively throughout model development and in response to drug.