



3-Dimensional micro- and nanofabrication for new biomedical imaging and sensing platforms

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Today's burgeoning micro- and nanofabrication technologies are impacting an ever-increasing number of research areas, including multiple across the biomedical fields. Most often, micro- and nanotechnology advances in biological and medical related fields take the form of bottom-up chemically synthesized micro- or nanoparticles thanks to their relatively simple production. But, despite increased complexity, there remains much opportunity to advance all of biomedical imaging, sensing, and treatment through new microstructure architectures and material compositions enabled by top-down micro- and nanofabrication technologies. This talk will introduce several such areas where biomedical functionality is enhanced by leveraging equipment more commonly associated with the semiconductor microchip industry to create new biomedically relevant, tailored 3-dimensional microstructures and systems. Examples will include (i) new forms of magnetic resonance imaging (MRI) agents that provide 10 – 100x greater contrast than any chemically synthesized alternatives and enable tracking of single cells deep in vivo for the first time, (ii) new microstructure geometries that bring multispectral, or “color,” capabilities to traditionally black-and-white MRI and (iii) ultrasmall, minimally-invasive, wireless NMR-readable micro- and nanoprobe for in-vivo/remote/embedded sensing applications [1,2]. The talk will also introduce a recent new conformal transfer micropatterning technique [3] with the potential to create new 3-dimensional microstructures with prospective biomedically-related uses in colloidal science, drug delivery, and microrobotics.

References: [1] Nature 453, 1058 (2008), [2] Nature 520, 73 (2015), [3] Science 378, 894 (2022)

ABOUT the SPEAKER

Gary Zabow currently serves as a Project Leader and a Group Leader at the National Institute of Standards and Technology (NIST) while also maintaining an adjunct position at the University of Colorado, Boulder. He has a PhD in physics from Harvard University and was previously a Senior Research Fellow at the National Institutes of Health (NIH), with which he maintains strong collaborative ties. His research focuses on biological cell tracking, NMR/MRI contrast agents and microprobes, magnetism and magnetic micro- and nanoparticles, soft-materials-based sensors, and the development and application of novel micro- and nanofabrication processes.

Monday, September 18 at Noon
1003 Engineering Centers (Tong Auditorium)

