Spring 2024 Joint Colloquium
Materials Department & Materials Research Laboratory

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University of Maryland
College Park, Maryland

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11:00 am | ESB 1001

Colloidal Design at the Nano, Micro, and Macro Scales: Materials that Can Move, Morph, Protect and Heal

Our laboratory seeks to engineer colloidal building blocks (polymers, surfactants, and particles) into a variety of functional fluids and soft materials. Our work extends across the length scales. Many of our systems are 'smart', i.e., their properties can be tuned by an external stimulus.

- At the **nanoscale**, we study molecular self-assembly into micelles, vesicles, and tubules. In addition, we have created self-assembling biopolymers that convert liquid blood into a gel; thereby, these 'hemostatic' materials stop bleeding from injuries. This research has resulted in a commercial product (*Rapid-Seal Wound Gel*) that is available across the USA.
- At the **microscale**, we create polymer capsules inspired by the architecture of biological cells or tissues. Examples include: capsules with many inner compartments; onion-like capsules with multiple layers; capsules that move in water in the presence of a chemical fuel; and capsules that act as 'miniature factories', synthesizing products on-demand.
- At the **macroscale**, we make hydrogels with unusual properties. Examples include: gels that can protect a delicate object from impact, and 'gel-sheets' that absorb more water than cloth or paper towels. We have also found a way to adhere gels to tissues by applying a low electric field, which may enable surgeries to be performed without sutures.

Bio: Srinivasa (Srini) Raghavan received his B.Tech. and Ph.D. in Chemical Engineering from the Indian Institute of Technology, Madras, and North Carolina State University, respectively. His research has resulted in more than 200 publications and 20 patents, which have been cited more than 18,000 times (hindex of 74). At UMD, he has been recognized both for his teaching and his research, including being designated a *Distinguished Scholar-Teacher* in 2017. He has been a four-time nominee for a UMD *Invention of the Year* and won this award in 2009 and 2022. He is also the scientific co-founder of four startup companies based on technologies invented in his laboratory.

https://complexfluids.umd.edu

Hosted by Chris Bates