**Project Title:** Microvascular Networks for Electronically Reconfigurable Materials

**Advisors:** Anthony Griffin (3rd year PhD student in MatSE),  
Prof. Nancy Sottos (MatSE), Prof. Scott White (AE)

**Project Description:**  
Recently developed microvascular polymers and composites have been used to achieve autonomous material functions such as self-healing and temperature-regulation. These materials also show great promise in the emerging area of reconfigurable electronic devices. The movement of a liquid metal in microvascular materials has been shown to alter electromagnetic properties at radio frequencies (RF). Our project seeks to fabricate novel reconfigurable RF devices through incorporating 3D printed vascular structures with various antenna designs (Fig. 1). Device design is dictated by the type of reconfiguration (polarization, frequency, or phase), however fabrication of ideal designs is a challenge. As an undergraduate researcher you will assist in the design and fabrication of 3D printed microvascular structures for wireless electronic applications. Your objectives will be to (a) refine already designed structures for 3D printing in CAD, (b) fabricate 3D printed vascular structures, and (c) improve capabilities of 3D printers.

![Figure 1](a) MicroCT image of a 3D printed vascular structure to achieve phase reconfiguration in a wireless RF device. (b) Simulated relative phase of emitted radiation as a function of frequency for the same microvascular device when liquid metal is present (on-state) and not present (off-state) in the vascular structure.

**Student background and expected research activities:**  
We are seeking an enthusiastic individual, who is interested in 3D printing, CAD, wireless electronics, and composite materials. Experience in the laboratory is preferred, but not mandatory. The student should be capable of operating equipment for fabrication including 3D printing, using CAD software, and possess strong communication skills. Primary duties include CAD, hands on work in the lab with design refinement, fabrication, and data processing.

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