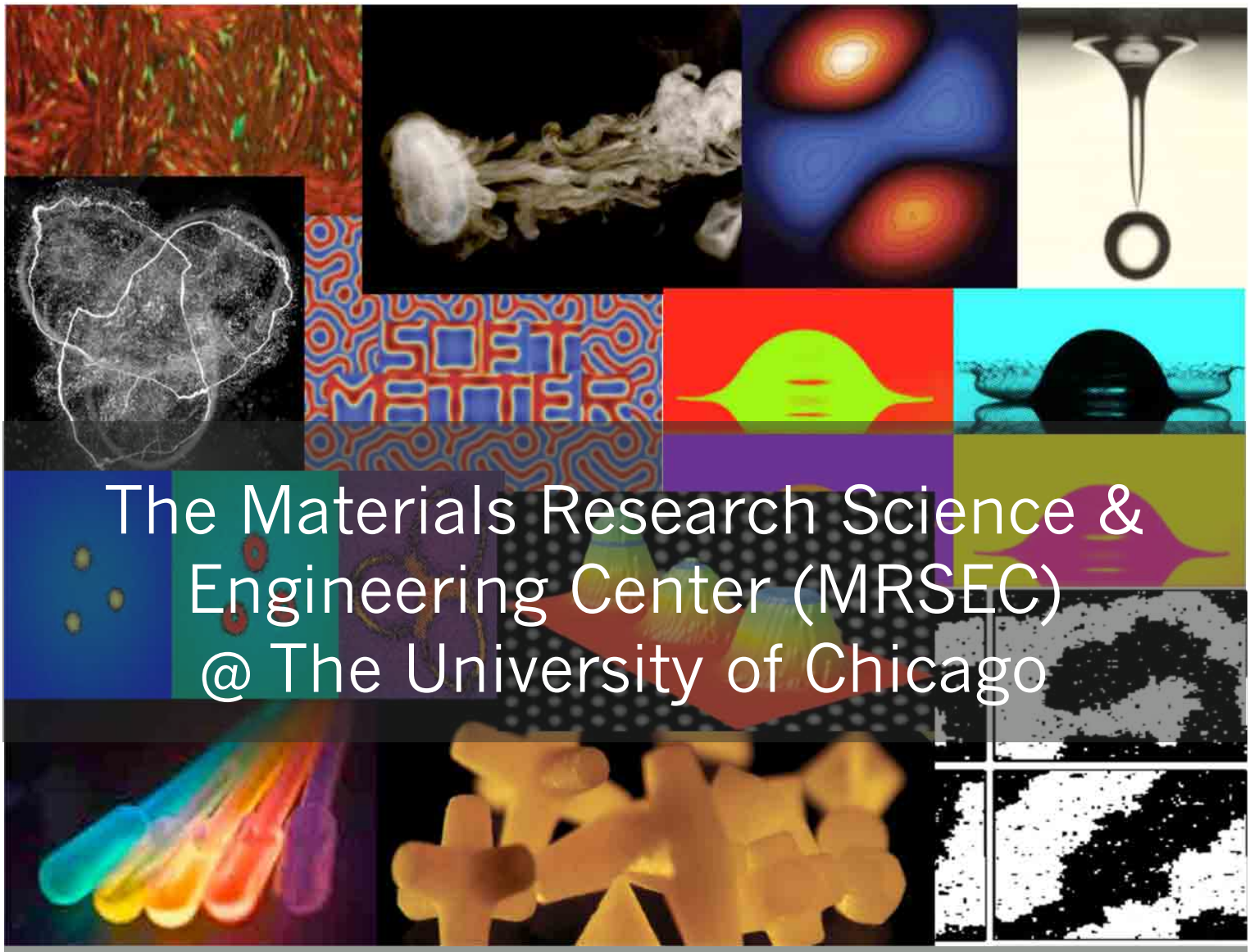


The Materials Research Science & Engineering Center (MRSEC) @ The University of Chicago

The University of Chicago MRSEC is characterized by:

(i) Outstanding materials research of scope & complexity beyond a single investigator

(ii) Programs to stimulate interdisciplinary education and the development of human resources (e.g. we have a REU program, financial support for graduate students & postdocs and outreach activities at schools & for the general public)

(iii) Active cooperation with industry to facilitate knowledge transfer

(iv) Support for shared experimental facilities

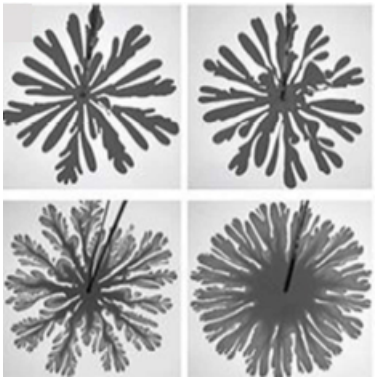
Research Areas:

IRG 1 Dynamics in Soft Interfaces
IRG 2 Control of Active & Shape-Changing Materials
IRG 3 Engineering Quantum Interactions & Materials

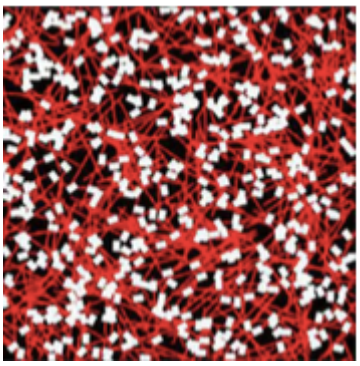
and special projects to seed new research collaborations

NSF

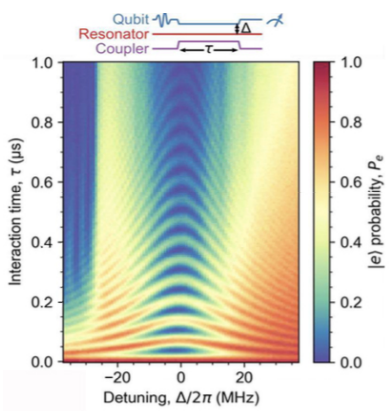
http://mrsec.uchicago.edu



IRG 1 on ***Dynamics at Soft Interfaces*** focuses on both scientific challenges and technological opportunities that arise from controlling and manipulating how fast and to what extent a soft interface forms or deforms, with systems ranging from nanoscale colloids to suspensions of micron-scale particles to truly macroscopic granular materials. By examining how stress variations at an interface can alter properties in the bulk and, conversely, how tailoring bulk parameters can guide interfacial dynamics, the research endeavors to establish the link between processes occurring at the interface and the properties of the material as a whole. Establishing such a link opens up opportunities for designing specific material responses and provides a pathway towards innovative applications.



IRG 2 on ***Control of Active and Shape-Changing Materials*** aims to understand and exploit the myriad ways that biology has evolved to construct materials that spontaneously change shape or generate force. A key feature of such biological materials is that they contain distributed molecular elements that convert chemical energy into mechanical work, and a central question this IRG seeks to address is how such activity relates to specific materials properties. This IRG aspires to achieve control of active materials and ultimately to create novel molecular assemblies for robust tunable shape change. Success of the IRG would result in the identification of minimal combinations of elements capable of programmable amorphous shape changes, autonomous movement and collective behavior, and materials that could be tailored to environments and situations beyond the reach of biological systems.



IRG 3 on ***Engineering Quantum Materials and Interactions*** seeks to elucidate the critical issues of control and coherence in both individual and in collective-mode quantum systems, with the goal of manipulating and exploiting quantum coherence in materials over a large range of length scales, from individual quantum centers to macroscopically entangled materials. This research is expected to directly advance applications in quantum sensing, fabricate materials for quantum information as well as create the next generation of characterization tools for traditional materials.

Center-wide Activities: The University of Chicago MRSEC also supports *Seed Projects* that explore innovative directions with the potential for opening up new research avenues for the Center. We operate a suite of *Shared Facilities* that provide vital support for our research, and participate in the Materials Research Facilities Network (https://mrfn.org). Our educational programs target the research community with specialized workshops and exceptional training, and our local neighborhood through science enrichment opportunities. We run research experiences program for undergraduates and high school students. Our knoweldge transfer activities engage industry, national laboratories in collaborative research.