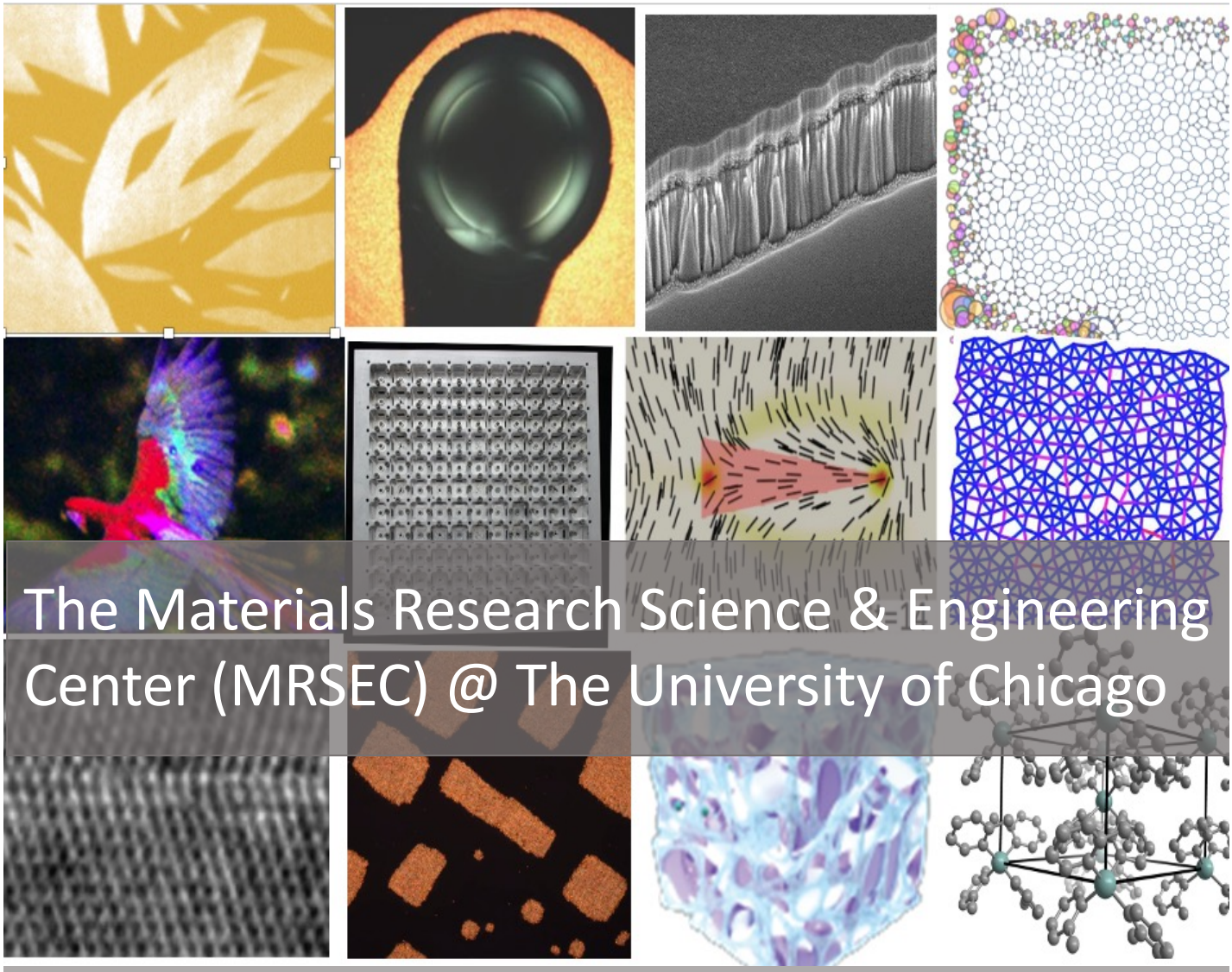

The Materials Research Science & Engineering Center (MRSEC) @ The University of Chicago

The University of Chicago MRSEC is characterized by:

(i) Leading-edge interdisciplinary materials research of scope & complexity beyond a single investigator

(ii) Innovative programs to stimulate interdisciplinary science education and to enhance the development of a diversified workforce and a scientifically aware public (REU programs, financial support for graduate students/postdocs, outreach activities for K-12 inner city schools & the general public).

(iii) Active cooperation with industry to facilitate knowledge transfer

(iv) Support for shared experimental facilities

Research Areas:

IRG 1: Trainable Soft Materials
IRG 2: Activated Architectured Materials
Superseed: Electrical-optical Quantum Transduction

and special projects to seed new research collaborations…

http://mrsec.uchicago.edu

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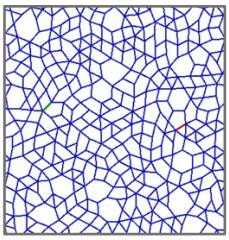
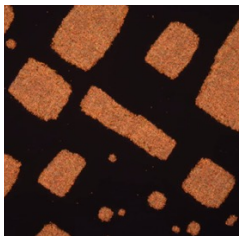
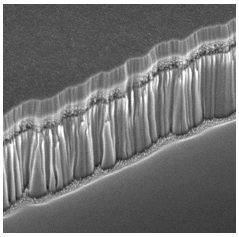
Research Areas



IRG 1: Trainable Soft Materials
Can we train a material to exhibit desired properties, and then retrain it to exhibit different behavior? Biology generates functionality by allowing materials design parameters to evolve and adapt as the system is affected by the environment. This research effort mimics the adaptation that occurs in biological systems in physical materials with a goal of creating novel functionality through the process of training. Since the adaptation during training is carried out by the material itself, it can be achieved without precise (re-)design of the local structure. We plan to derive an understanding of which features of that intricate dance between a biological structure and its environment that are useful to the material world.



IRG 2: Activated Architectured Materials
The vision for this research area is to design and build shape-morphing hybrid materials with transport properties that are programmable and spatiotemporally self-regulating. Such materials are ubiquitous in biology, where they impart autonomy to living systems. Inspired by nature, we design and build hybrid inorganic-biological materials that sense and interact with the environment. The platform on which such technologies will be developed will consist of “activated” materials. By this term we designate materials that operate inherently out of equilibrium because they are comprised of (i) chemically active components, e.g., molecular motors, (ii) building blocks driven by suitably tailored external fields, or (iii) both, acting in tandem.



Superseed: Electrical-optical quantum transduction
The goal of this superseed is to develop materials that can coherently transfer quantum information between electrical circuits and optical photons. To enable coherent electrical-optical coupling, we identify and study suitable materials systems that can coherently support both types of excitation.

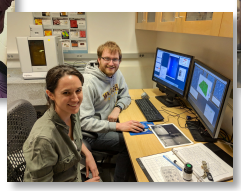
Center-wide Activities

Our vision is grounded in a strong commitment to education and outreach, especially to our inner-city neighborhood and the general public. Central to our mission is improving the diversity and successful training of students in our research labs at all levels (from high school to postdoctoral fellows) and nurturing the next generation of materials-science researchers. These efforts also include our collaborations with Industry and National Laboratories, International collaborations in Latin America, and the operation of Shared Facilities that enable state-of-the-art materials preparation and measurement requiring resources beyond the scale of an individual laboratory. Coupling these complementary aspects strengthens the entire enterprise, providing a vibrant resource to UChicago, the broader materials science community, our neighborhood and the general public.

Physics with a Bang!

Latin American students

science club



SEM

Exploratorium exhibit