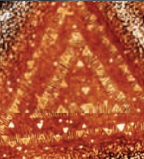
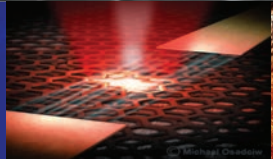
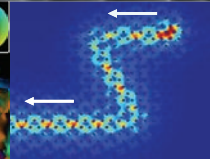
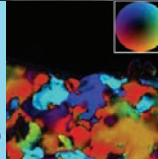
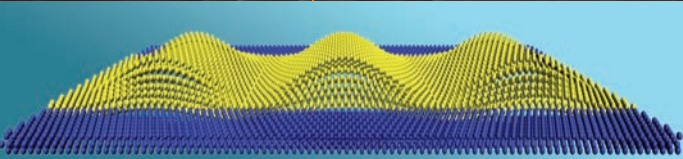
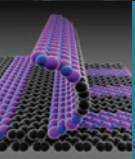


# CCMR Exploring and Advancing the Design, Control and Fundamental Understanding of Materials Through Collaborative Experimental and Theoretical Studies



Cornell University  
CCMR

The central mission of the Cornell Center for Materials Research (CCMR) is to explore and advance the design, control, and fundamental understanding of materials through collaborative experimental and theoretical studies.

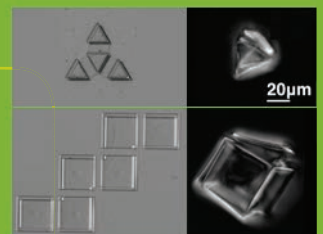
The **Mechanisms, Materials, and Devices for Spin Manipulation** group will work to discover, understand, and apply new mechanisms for controlling spins in magnetic devices. This group aims to provide the scientific foundations for energy-efficient nonvolatile memories with revolutionary capabilities and also frequency-agile nanoscale microwave oscillators extendable to THz frequencies. The **Structured Materials for Strong Light-Matter Interactions** group designs, grows, and patterns photonic materials with the goal of creating the strongest possible light-matter interactions to enable classical and quantum information processing with light. The **Atomic Membranes for 3D systems** group explores the fundamental challenges associated with transducing small local

signals into global observable changes at nanoscale dimensions in a targeted design structure. Combining recent advances in 2D atomic membranes growth with the scale-invariant properties of the centuries-old art forms of origami (“ori” = fold) and kirigami (“kiri” = cut), the group’s aim is to take miniaturization to its ultimate limit, creating atomically thin “paper” materials that self-fold into incredibly responsive structures at the micron to nanometer scales.

Three other activities complete the CCMR’s mission: educational outreach to K-12 teachers, students, and undergraduates; industrial outreach and knowledge transfer; and the operation of Shared Facilities to support on- and off-campus research.

## HIGHLIGHTS ...

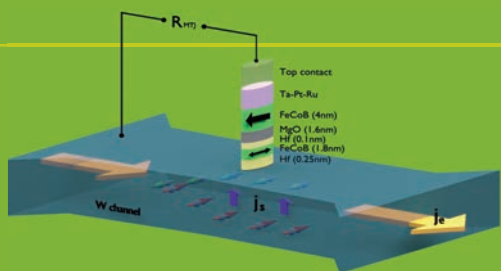
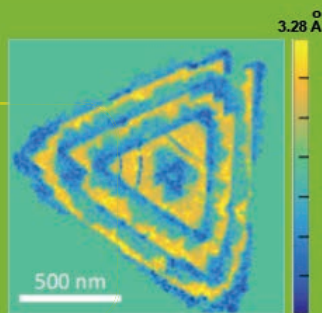
Constructed graphene-glass bimorphs that self-fold into 3D geometries (pictured: tetrahedron and box) in response to chemical stimuli.



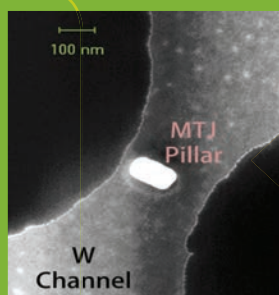
DIRECTOR: Frank Wise  
www.ccmr.cornell.edu

MORE HIGHLIGHTS ...

Mapped lattice constants of  $WS_2/WSe_2$  lateral heterojunctions, with picometer precision, using an electron microscope pixel array detector (EMPAD).



Magnetic-memory pillar devices in which magnetic states are efficiently controlled by the giant spin Hall effect in a tungsten (W) channel.



The CCMR explores fundamental challenges in materials research that will impact technological progress and that have a scope and complexity that require the convergence of researchers from multiple disciplines.

Frank Wise,  
Director, CCMR



THE CCMR OFFERS DIVERSE EDUCATION AND PARTNERSHIPS...

- The CCMR operates a web-based lending library of inquiry-based experiments that can be borrowed by any educator in the nation, free of charge.
- The CCMR offers professional development workshops for K-12 teachers, which include hands-on labs addressing the Next Generation Science Standards.
- The New York State-funded CCMR Industrial Partnerships Program promotes technology transfer and economic development by offering industry partners cost-effective, timely and flexible access to technical expertise in advanced materials, enabling product development as well as expansion to wider markets.
- The CCMR Shared Facilities are an important regional and national resource, attracting more than 700 users per year — including more than 100 external users from both academia and industry.

OUTREACH

More information about the workshops, internships, partnerships, educational opportunities, and research facilities are available at [www.ccmr.cornell.edu](http://www.ccmr.cornell.edu)

