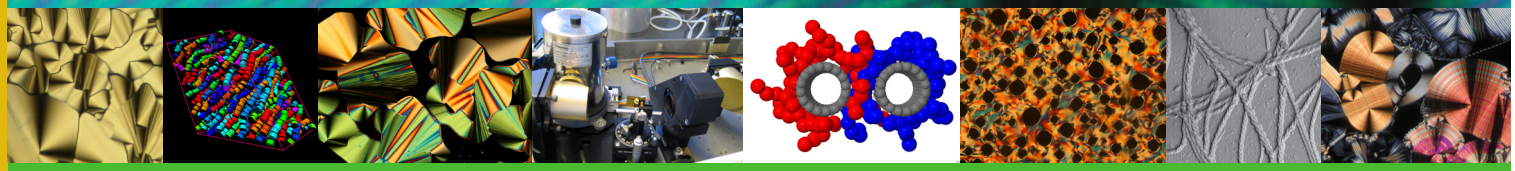
Pursuing the Directed Design and Synthesis of New Materials and the Discovery and Exploration of Novel Organizational Themes and Uses of Liquid Crystal Ordering



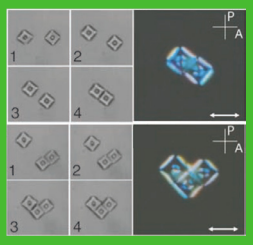
University of Colorado

LCMRC

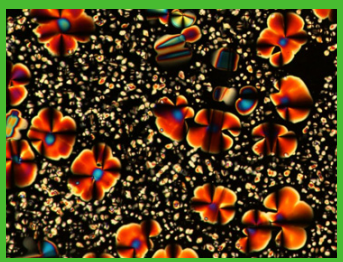
LCMRC research spans the range from cutting-edge, basic liquid crystal and soft materials science to the development of enhanced capabilities for photonic, chemical, and biotech applications of soft materials.

A major theme of materials science as we enter the 21st century is understanding and manipulating the collective behavior and self-organization of complex molecules in soft materials and the expression of this organization at macroscopic scales. It is precisely here that the study of liquid crystals, with their delicate interplay between molecular architecture and macroscopic consequences, has its greatest impact. Within this context, LCMRC research has driven active and stimulating new science, a vitality exemplified by the LCMRC's unique role in evolving the understanding of spontaneous polarization, chirality, and phase behavior of systems of bent-core molecules, and by its recent discovery of liquid crystal phases of nanoscale DNA, leading to the proposal that liquid crystal autocatalytic templating was responsible for establishing the linear polymer structure of RNA in early life.

HIGHLIGHTS ...



Colloidal particles immersed in a liquid crystal interact through the director field, leading to adhesion and alignment.

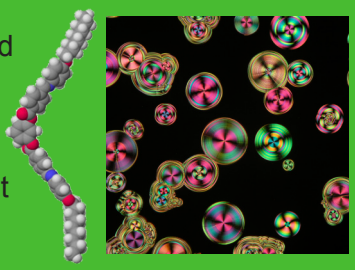


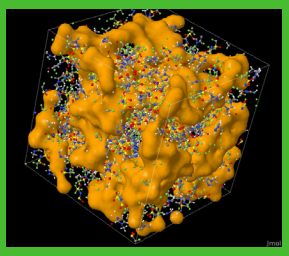
Complementary nanoDNA stacks end-to-end in water to form rod-shaped aggregates that in turn make liquid crystal phases.

DIRECTOR: Noel Clark
http://lcmrc.colorado.edu

RESEARCH FUNDAMENTALS ...

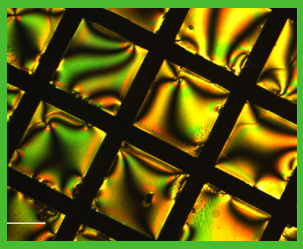
Liquid crystals are partially ordered fluid phases of organic molecules, macromolecules, or colloidal particles, that form spontaneously by self-assembly of the constituent building blocks.





Hierarchically-structured soft condensed phases can be created by nanophase segregation, leading to novel functional materials.

Soft interfaces can be engineered to be responsive to external stimuli, such as light, fields, or chemical composition.



"We continue to be amazed and delighted with the new basic science and applications flowing from the LCMRC research program in liquid crystals."

Noel Clark, Director
LCMRC

EDUCATION AND OUTREACH ...

LCSAT – Graduate Training Program in Liquid Crystal Science and Technology: advancing the industrial competitiveness of the U.S. liquid crystal industry by training more liquid crystal scientists and engineers.

GoldShirt Program: provides expanded opportunities and a performance-enhancing year for motivated high school graduates while increasing enrollment and retention of students historically underrepresented in STEM.

REU – Research Experience for Undergraduates: immersing students in an interdisciplinary research culture, pursuing liquid crystal science and technology at the cutting edge.

Boulder School for Condensed Matter and Materials Physics: an intensive summer training for graduate students and post-docs by internationally leading condensed matter scientists.

Wizard Show: *Light, Polarization and Liquid Crystals*, a family science show in the *CU Wizards* series.

Partnerships with Urban and Local High Schools: attracting and supporting student interest in STEM education and STEM careers through laboratory internships, tutoring and classroom support.

MSFCU – Materials Science From CU: statewide K-12 outreach activity featuring physical sciences classroom presentations tuned to the Colorado curriculum that is extraordinarily successful in reaching K-12 students all over Colorado.

More information about workshops, internships, partnerships, and educational opportunities may be found at http://lcmrc.colorado.edu/outreach.html

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