# AMLCI MATERIALS DAY 2022

## *BIOLOGICAL AND BIOMIMETIC MATERIALS*

# Program

**The 2022 AMLCI Materials Day will be a Hybrid Event!**

Hosted by

KENT STATE UNIVERSITY | Advanced Materials and Liquid Crystal Institute

Co-hosted by

KENT STATE UNIVERSITY | Brain Health Research Institute

ADVANCED MATERIALS AND LIQUID CRYSTAL INSTITUTE at Kent State University

# Theme

The theme of the **2022 AMLCI Materials Day** "**Biological and Biomimetic Materials**" recognizes the societal need for materials, methods, and devices that use nature as a renewable source as well as an endless source of inspiration. April 22nd — day one of our symposium — is Earth Day 2022, and thus an opportune moment to continue learn more and continue explore how to reformulate materials by responsibly using nature as a renewable source that challenges conventional materials engineering. Biological and biomimetic materials serve already as sophisticated alternatives for cell scaffolds as well as for device and biomaterials engineering. Silk, as one such example, highlighted by our keynote speaker, Dr. David Kaplan, is considered the "original liquid crystal polymer" (Lydon, *Liq. Cryst. Today* 2004, **13**, 1-13), and an extraordinary powerful example of how biology can merge with materials science.

**Materials Day 2022** is co-hosted by the AMLCI and the Brain Health Research Institute (BHRI) at KSU and will focus particularly on select classes of advanced biological and biomimetic materials that are designed to have a direct and beneficial impact on our health, our continued quest for reducing ur carbon footprint, and our general understanding of nature's design concepts. In addition to these more applied aspects, **Materials Day 2022** will also feature fundamental research on how certain types of biological and biomimetic materials interact with or affect their environment in new and unusual ways; interact with or template other biological entities, or respond to external stimuli etc., which will form the basis for future bio- and device engineering applications.

**Venue for Materials Day 2022: Lower Level; Integrated Science Building**

## Keynote Speaker

# *DAVID L. KAPLAN*

***Stern Family Endowed Professor of Engineering***
***Tufts University***

David Kaplan
(Tufts University)

David Kaplan is the Stern Family Endowed Professor of Engineering at Tufts University, a Distinguished University Professor, and Professor and Chair of the Department of Biomedical Engineering. His research focus is on biopolymer engineering, tissue engineering, regenerative medicine and cellular agriculture. He has published over 1,000 peer reviewed papers, is editor-in-chief of ACS Biomaterials Science and Engineering and he serves on many editorial boards and programs for journals and universities. He has received awards for his research and teaching and is an elected Fellow of the American Institute of Medical and Biological Engineering and the National Academy of Engineering.

| Time | |
|---|---|
| 5:45 - 6:00 p.m. | **Opening Remarks** and **Introduction of Keynote Speaker** by **Torsten Hegmann** (Director, AMLCI, KSU) |
| 6:00 - 7:00 p.m. | **Keynote Lecture - David L. Kaplan** (Tufts University) (Virtual Lecture) |

# Keynote Lecture (David L. KAPLAN)

## "Silk Material Systems – Versatile Natural Proteins"

### Friday, April 22nd, 6:00 p.m. (EST)

Silk proteins are unique polymer systems with polymorphic behavior. This property is driven by the peptide repeats, amphiphilicity and organization, and self-assembly in aqueous, ambient conditions into hierarchical structures. In nature, this process leads to mechanically robust fibers with remarkable features, while in the laboratory new material outcomes are achieved to optimize structure-function, thus, expanding on the template initially provided from nature. Experimental paths toward new silk-based materials include modulating processing conditions related to assembly, incorporating crosslinks, exploiting bioengineering strategies, and the inclusion of additives. The results are new functional silk materials, where modeling and experiment coexist to achieve insights and new material systems.

A depiction of silkworm cocoons (top) and freestanding optical components made of silk (bottom); credit: Tufts University.

# AMLCI Fellowships - Award Ceremony

**Friday, April 22nd, 7:05 p.m.**

**Glenn H. Brown Fellowship:** For outstanding graduate students who are engaged in research on biological or biology related topics of liquid crystals.

**Alfred Saupe Fellowship:** For outstanding graduate students working on physics or material sciences of liquid crystals

**James Fergason Fellowship:** For outstanding graduate students working on applied research using liquid crystals.

| Time | **Speaker** *"Title"*<br>*Session Chair: Torsten Hegmann (Director, AMLCI)* |
|---|---|
| 7:05 - 7:15 p.m. | **Kelum PERERA** (Winner - Glenn Brown Fellowship; *presented with a special note and a letter from the children of Glenn Brown, Larry, Nancy, Don, and Barb*)<br>TED Talk: "*Liquid Crystal-based Detection of Antigens with ELISA Sensitivity*" |
| 7:20 - 7:30 p.m. | **Olena IADLOVSKA** (Winner - Alfred Saupe Fellowship; *presented by Antal Jákli*)<br>TED Talk: "*Electro-Optics of Oblique Helicoidal Cholesteric*" |
| 7:35 - 7:45 p.m. | **Mojtaba RAJABI** (Winner - Glenn Brown Fellowship; *presented with a special note and a letter from the children of Glenn Brown, Larry, Nancy, Don, and Barb*)<br>TED Talk: "*Liquid Crystal Enables Propulsion of Bacterial Droplets*" |
| 7:50 - 8:00 p.m. | **Amit BHOWMICK** (Winner - James Fergason Fellowship; *presented by T. Hegmann*)<br>TED Talk: "*Large-Area Liquid Crystal Lens for Tunable Focus Application*" |
| 8:00 p.m. | **Closing Day 1** |

# VIP Dinner

**Friday, April 22nd, ~ 8:20 p.m.**

| Time | VIP Dinner |
|---|---|
| ~ 8:20 p.m. | **Laziza** (for Internal and External Advisory Board Members, Invited Speakers, AMLCI Fellowship Recipients, and Members of the Organizing Committee) |

# Program

## Saturday, April 23rd, 9:00 a.m. - noon

| Time | Speaker (Affiliation) *"Title"* |
|---|---|
| | *Session Chair: Hend BAZA* |
| 9:00 - 9:20 a.m. | **Abraham JOY** (University off Akron, School of Polymer Science & Polymer Engineering)<br>"*Designing 3D Printed Biodegradable Polyester Scaffolds as a Substitute for Bioengineered Skin*" |
| 9:20 - 9:40 a.m. | **Hanbin MAO** (Kent State University, Department of Chemistry & Biochemistry, AMLCI)<br>"*DNA Quadruplexes and Optical Tweezers*" |
| 9:40 - 10:00 a.m. | **Nicholas L. ABBOTT** (Cornell University, Smith School of Chemical & Biomolecular Engineering)<br>"*Liquid Crystals as Cellular Exoskeletons*" |
| 10:00 - 10:20 a.m. | **Coffee Break** |
| | *Session Chair: Şenay ÜSTÜNEL* |
| 10:20 - 10:40 a.m. | **Edgar KOOIJMAN** (Kent State University, Biological Science, AMLCI)<br>"*Greasing RNA Therapeutics, the Critical Role of Membrane Lipids in RNA Drug Delivery*" |
| 10:40 - 11:00 a.m. | **Nita SAHAI** (University of Akron, School of Polymer Science & Polymer Engineering)<br>"*Nonenzymatic Nucleotide Polymerization by Cocatalysis of Minerals, Amino Acids and Divalent Metals in the Emergence of Life*" |
| 11:00 - 11:20 a.m. | **Elda HEGMANN** (Kent State University, Biological Sciences, AMLCI)<br>"*Liquid Crystal Elastomers as 3D Biomaterials*" |
| 11:20 - 11:40 a.m. | **Carlos CASTRO** (The Ohio State University, Mechanical & Aerospace Engineering)<br>"*DNA-Based Nanorobotic Devices and Materials*" |
| 11:40 - 12-noon | **Thorsten L. SCHMIDT** (Kent State University, Department of Physics, AMLCI)<br>"*DNA-Lipid Nanodiscs*" |

## Saturday, April 23rd, Noon - 1:30 p.m. (Lunch Break and ISB-AMLCI Tours)

| | *Location* |
|---|---|
| Participants | **ISB Lobby** |
| AMLCI Advisory Boards | **Working Lunch - ISB Conference Room** |

ADVANCED MATERIALS AND LIQUID CRYSTAL INSTITUTE
at Kent State University

## Saturday, April 23rd, 1:30 p.m. - 5:00 p.m.

| Time | Speaker (Affiliation) *"Title"* |
|---|---|
| | *Session Chair: Andrea OPRANDI* |
| 01:30 - 01:50 p.m. | **Oleg D. LAVRENTOVICH** (Kent State University, Department of Physics, AMLCI)<br>"*Living Liquid Crystals*" |
| 01:50 - 02:10 p.m. | **Samuel SENYO** (Case Western Reserve University, Department of Physiology & Biophysics)<br>"*Designing Extracellular Programming for Cardiac Tissue Engineering*" (Virtual Lecture) |
| 02:10 - 02:30 p.m. | **Ali DHINOJWALA** (University of Akron, School of Polymer Science & Polymer Engineering)<br>"*Role of Melanin in Structural Colors and Heat Management*" (Virtual Lecture) |
| 02:30 - 02:50 p.m. | **Kyle LAMPE** (University of Virginia, Chemical Engineering)<br>"*Designing Biomaterials to Engineer Neural Tissue*" (Virtual Lecture) |
| 02:50 - 03:20 p.m. | **Coffee Break** |
| | **Young Investigator Session** *Session Chair: Soumya CHANDRASEKHAR* |
| 03:20 - 03:35 p.m. | **Chao LIU** (Case Western Reserve University, Department of Biomedical Engineering)<br>"*In Vitro Investigation of Mesenchymal Stem Cell Immunosuppression in Heart Using Novel Co-Culture Microfluidic Chip*" |
| 03:35 - 03:50 p.m. | **Praneetha Sundar PRAKASH** (Kent State University, Biomedical Sciences)<br>"*Barcoded Immunostaining*" |
| 03:50 - 04:05 p.m. | **Xinhao LIU** (University of Akron, School of Polymer Science & Polymer Engineering)<br>"*Structural Insight into Self-Assembly of Coacervate-Forming Polyester Amides*" |
| 04:05 - 04:20 p.m. | **Şenay ÜSTÜNEL** (Kent State University, Materials Science Graduate Program, AMLCI)<br>"*Co-Culturing Brain Cells on 3-D LCE Scaffold Towards a Brain Tissue Model*" |
| 04:20 - 04:35 p.m. | **K Zin HTUT** (University of Akron, School of Polymer Science & Polymer Engineering)<br>"*Using a Sustainable Source to Extract Allomelanin for Biomimicry Applications*" |
| 04:35 - 04:50 p.m. | **Sajad SHEIKH** (Kent State University, Department of Physics)<br>"*FRET-PAINT for the Study of Telomeric Sequences and their Interaction with Shelterin Proteins*" |
| 04:50 - 05:00 p.m. | **End of Sessions / Closing / Break before Poster Session starting at 5:00 p.m.** |

## Saturday, April 23rd, 5:00 p.m. - 6:30 p.m. (Poster Session)

| # | **Presenter** (Affiliation) *"Title"* |
|---|---|
| 1 | **Shankar PANDEY** (Kent State University)<br>"*Chirality Transmission in Macromolecular Domains*" |
| 2 | **Deepak KARNA** (Kent State University)<br>"*Modulating Cell Motions Using pH Responsive DNA Origami*" |
| 3 | **Rabindra DUBADI** (Kent State University)<br>"*Mechanochemical Synthesis of Gamma Alumina with Metal Oxide Species*" |
| 4 | **Wolfgang PFEIFER** (The Ohio State University)<br>"*Free-form DNA Origami Design and Higher Order DNA Origami Communication Systems*" |
| 5 | **Sineth KODIKARA** (Kent State University)<br>"*Liquid Crystalline Phases of GDNA*" |
| 6 | **Parikshit GURAGAIN** (Kent State University)<br>"*Influence of Extent and Position of Fluorination on the Mesogenic Behavior of Tetramethoxytriphenylene Derivatives*" |
| 7 | **Nathaniel ORNDORF** (University of Akron)<br>"*Polar Bear Paw Pad Roughness and Friction on Snow*" |
| 8 | **Apoorva VISHWAKARMA** (University of Akron)<br>"*tbd*" |
| 9 | **Valinteshley PIERRE** (Kent State University)<br>"*tbd*" |
| 10 | **Yen-Ming TSENG** (Kent State University)<br>"*tbd*" |
| 11 | **Mohaned ENAMUL** (Kent State University)<br>"*tbd*" |
| 12 | **Philip DUDONES** (Kent State University)<br>"*tbd*" |
| 13 | **Draven HOUSER** (Kent State University)<br>"*tbd*" |

# Organizing Committee

Torsten HEGMANN, Director AMLCI; Member BHRI; Department of Chemistry and Biochemistry (Chair)
Mary Ann KOPCAK, AMLCI (Secretary, Treasurer)
Jack DAUPHARS (IT Specialist)

Min-Ho KIM, AMLCI; Department of Biological Sciences (Scientific Board)
Jennifer MCDONOUGH, AMLCI; Department of Biological Sciences (Scientific Board)
Elda HEGMANN, AMLCI; Department of Biological Sciences (Scientific Board)
Jo DOWELL, AMLCI, College of Nursing (Scientific Board)
Şenay ÜSTÜNEL, Materials Science Graduate Program (Scientific Board - Graduate Student Member)
Soumya CHANDRASEKHAR, Materials Science Graduate Program (Scientific Board - Graduate Student Member)
Hend BAZA, Materials Science Graduate Program (Scientific Board - Graduate Student Member)

# Sponsors

**Cheng CHEN**

KENT STATE UNIVERSITY | Advanced Materials and Liquid Crystal Institute

EMD PERFORMANCE MATERIALS

KENT DISPLAYS

**Stay Tuned for Next Year's AMLCI Materials Day (April 2023)**

# AMLCI MATERIALS DAY 2023

## *CHIRALITY AND OPTICAL ACTIVITY*

Hosted by

KENT STATE UNIVERSITY | Advanced Materials and Liquid Crystal Institute

Co-hosted by

ADVANCED MATERIALS AND LIQUID CRYSTAL INSTITUTE at Kent State University