



Universität
Münster

CRC 1459 Fall Colloquium 2026

November 19th, 2026
Münster, Germany



Booklet of Abstracts

Program

3:00 pm

Karen Alim

Chair:

Technical University of Munich, Germany
Learning without a Brain

4:00 pm

Danqing Liu

Chair:

Eindhoven University of Technology,
The Netherlands
*Designing Interactive Liquid Crystal
Polymers for Haptics and Soft Robotics*

5:00 pm

**Networking with
Beer & Pretzels**

Please see our website www.uni-muenster.de/SFB1459/events for updates
or contact crc1459@uni-muenster.de if you have any questions!

Speakers

Prof. Dr. Karen Alim



TUM School of Natural Sciences
Technical University of Munich
Germany

Karen Alim studied physics at the University of Karlsruhe, at the Ludwig Maximilian University of Munich and at the University of Manchester. For her doctorate she performed research at the Kavli Institute for Theoretical Physics of the University of California in Santa Barbara and at the Ludwig Maximilian University of Munich, where she received her doctorate in 2010. From 2010-2015 she worked at Harvard University as a postdoctoral researcher and lecturer before joining the Max Planck Institute for Dynamics and Self-Organization in Göttingen in 2015 as a Max Planck Research Group Leader. In 2019 Prof. Alim was appointed to the Physics Department of the TUM.

She investigates non-neuronal information processing. The aim of her research is to identify the physical principles of how information is propagated, stored and processed in life without neurons.

Learning without a Brain

Prof. Dr. Karen Alim, Technical University of Munich, Germany

Propagating, storing and processing information is key to take smart decisions – for organisms as well as for autonomous devices. In search for the minimal units that allow for complex behaviour, the slime mould *Physarum polycephalum* stands out by solving complex optimization problems despite its simple make-up. *Physarum*'s body is an interlaced network of fluid-filled tubes lacking any nervous system, in fact being a single gigantic cell. Yet, *Physarum* finds the shortest path through a maze. We unravel that *Physarum*'s complex behaviour emerges from the physics of active flows shuffling through its tubular networks. Flows transport information, information that is stored in the architecture and mechanical state of the network. Thus, tubular adaptation drives processing of information into complex behaviour. Taking inspiration from the mechanisms in *Physarum* we outline how to embed complex behaviour in active microfluidic devices and how to program human vasculature

Speakers

Prof. Dr. Danqing Liu



**Department of Chemical Engineering and Chemistry &
Institute for Complex Molecular Systems**

Eindhoven University of Technology

The Netherlands

Danqing Liu received her master degree in Electrical Engineering in 2009 at the Delft University in The Netherlands. She joined the Department of Mechanical Engineering at Eindhoven University of Technology, The Netherlands for her PhD research. She developed polymer responsive surfaces based on hydrogels and liquid crystal polymers. She received her PhD degree in 2013. In the same year she joined the Department of Chemical Engineering and Chemistry at the same university working as postdoctoral student on new mechanisms of surface activation. In 2015 she was Research Fellow at the Institute of Complex Molecular Systems in Eindhoven, The Netherlands. In 2019 she is appointed as Assistant professor (Tenured), in 2023 she is appointed as Associate professor at the Department of Chemical Engineering and Chemistry, Eindhoven University of Technology. In 2020 she has received Michi Nakata Prize for Early Career Achievements from International Liquid Crystal Society. In 2021, she is appointed as Visiting professor at South China Normal University, P. R. China. Since 2015, she has received funding >7 million euros to support her research, including NWO Veni, OTP, Startup, Marie Curie ITN.

With her broad background in various disciplines (electric, mechanical and chemical engineering), Danqing Liu is a materials scientist. She develops 'human interactive materials' where the materials sense, feel and communicate with human or machines. The approach is fill the field between molecular sciences, such as synthetic organic chemistry, and the dimensions of the more macroscopic materials including morphology and shape control. Special in the approach is the transfer or even amplification of the responsive (dielectric-, ferroelectric-, piezoelectric-, and/ or photo-chemical) effects of a single molecule to the macroscopic level of a device. This is realized by incorporating the functional molecules into suitable and cooperative host materials, such as liquid crystals.

Interactive Liquid Crystal Polymers for Haptics and Soft Robotics

Prof. Dr. Danqing Liu, Eindhoven University of Technology, The Netherlands

We propose the integration of a haptic liquid crystal polymer network (LCN) coating into optical displays, creating a next-generation touchscreen with dynamic haptic feedback (1). This innovative approach bridges optics and haptics, enabling displays to provide real-time tactile sensations through programmable surface deformations. The LCN coating responds to external stimuli such as temperature, light, and electric fields (2), allowing for localized texture changes, friction modulation, and pressure-sensitive feedback. This seamless integration transforms smooth glass surfaces into interactive, touch-responsive interfaces, enhancing user experience in consumer electronics, augmented reality, and assistive technologies. The ability to create programmable tactile patterns makes it ideal for visually impaired users, immersive gaming, virtual training environments, and advanced medical interfaces. By merging haptics with optics, this technology redefines human-machine interaction, paving the way for smarter, more intuitive touch interfaces in the digital age.

Acknowledgements

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References

- [1] Samuël AM Weima, Reza Norouzikudiani, Jaeryang Baek, Jacques A Peixoto, Thierry K Slot, Dirk J Broer, Antonio DeSimone, Danqing Liu, Science Advances, 10, 36, 2024.
- [2] Danqing Liu, Nicholas B Tito, Dirk J Broer, Nature communications, 8:1526.

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Karen Alim and Danqing Liu