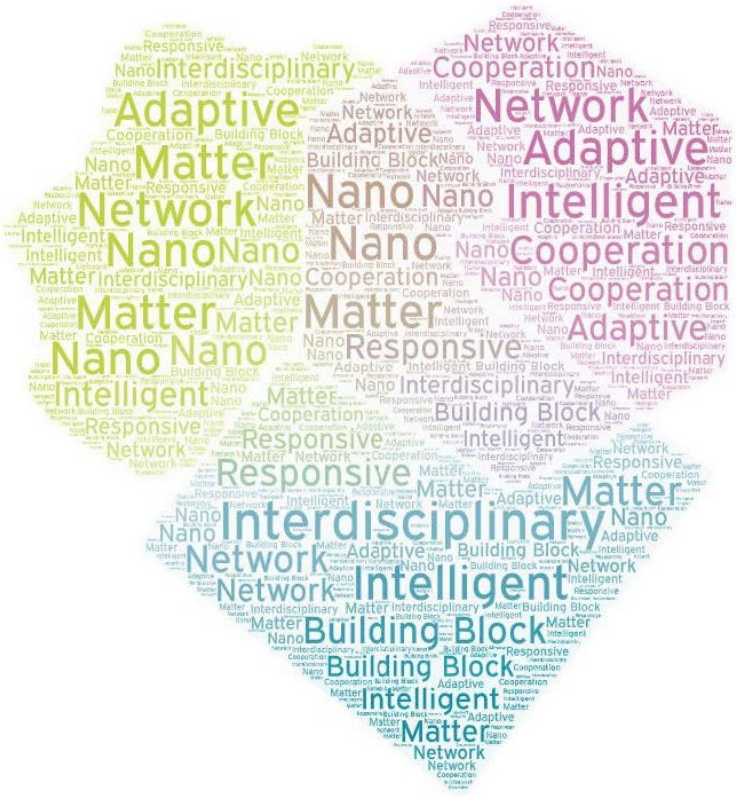
Westfälische Wilhelms-Universität Münster

Center for Soft Nanoscience

CRC 1459 INTELLIGENT MATTER

CRC 1459
Fall Colloquium 2022

December 1st 2022 | 3:00pm
Münster, Germany



Booklet of Abstracts

Program

3:00 pm

Juliane Simmchen

Chair: Raphael Wittkowski

TU Dresden, Germany

How Smart Does a Material Have to Be to Mimic Biological Behaviours?

4:15 pm

Michael Giese

Chair: Bart Jan Ravoo

University of Duisburg-Essen, Germany

Employing the Dynamics of Chemical Bonds for Functional Materials

5:30 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

Dr. Juliane Simmchen

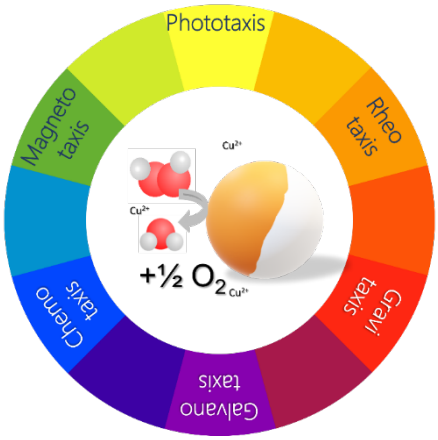
Freigeist Physical Chemistry
Technical University Dresden
Dresden, Germany
University of Strathclyde
Glasgow, Scotland

Juliane studied chemistry at the Technical University of Dresden. After graduating in Analytical Chemistry in 2010, she received her PhD in Materials Science in 2014 from the Catalan Institute of Nanoscience and Nanotechnology (ICN2) of the Autonomous University of Barcelona in Spain. After research appointments at the MPI for Intelligent Systems, Stuttgart, and at the Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro, Brazil, she returned to the Technical University of Dresden in 2016 as a research assistant in the field of materials science. Since November 2016 she has been a Freigeist Fellow focussing on 'Light driven microswimmers' in physical chemistry. Together with her research group, she investigates colloidal materials and strategies for activating them. They design so-called micromotors: small-scale structures made of synthetic and biological building blocks that can move autonomously. In addition, they investigate how different environments, such as interfaces or applied stimuli, affect this movement.

How Smart Does a Material Have to Be to Mimic Biological Behaviours?

Juliane Simmchen, TU Dresden, Germany, U Strathclyde, Scotland

While the behavior of biological microswimmers is undoubtedly influenced by physics, it is frequently guided and manipulated by active sensing processes. Understanding the respective influences of the surrounding environment can help to engineering the desired response also in artificial swimmers. More often than not, the achievement of biomimicking behavior requires the understanding of both biological and artificial microswimmers swimming mechanisms and the parameters inducing mechanosensory responses. Using different examples of tactic behaviours, I will show empirical examples how active matter can be tuned to mimic bacteria or other microorganisms.



References:

[1] Colloidal Active Matter Mimics the Behavior of Biological Microorganisms—An Overview, A Nsamela, AI Garcia Zintzun, TD Montenegro-Johnson, J Simmchen, Small 2022, 2202685.

[2] A Platform for Stop-Flow Gradient Generation to Investigate Chemotaxis, Z Xiao, A Nsamela, B Garlan, J Simmchen, Angewandte Chemie International Edition 2022, 61 (21), e202117768.

[3] Upstream rheotaxis of catalytic Janus spheres, P Sharan, Z Xiao, V Mancuso, WE Uspal, J Simmchen, ACS nano 2022, 16 (3), 4599-4608.

[4] Apparent phototaxis enabled by Brownian motion, L Niese, L Wang, S Das, J Simmchen, Soft Matter 2020, 16 (47), 10585-10590.

Prof. Dr. Michael Giese

Heisenberg-Professor for Supramolecular Materials
Faculty of Chemistry
University of Duisburg-Essen
Germany

Michael completed his studies in chemistry at RWTH Aachen University, where he received his doctoral degree (summa cum laude) in 2011. Subsequently, he conducted research at the University of British Columbia in Vancouver, Canada, as a fellow of the German Academic Exchange Service (DAAD). Under the direction of Prof. Mark MacLachlan, he discovered his passion for supramolecular materials. From 2014 until 2019 he was leading his own independent research group on Supramolecular Functional Materials as an endowed junior professor of the Professor-Werdelmann Foundation at the University Duisburg-Essen. After appointments as interim chair of Organic Chemistry II in 2019 and vice chair of Organic Chemistry II from 2019 until 2021, he was appointed Heisenberg Professor of Supramolecular Materials at the University of Duisburg-Essen in October 2021. His research group focuses on the synthesis and analysis of supramolecular functional aggregates, especially those with liquid crystalline properties. There, a major goal is to utilize and control the molecular self-assembly of discotic aggregates and understand the underlying principles in detail in order to develop novel supramolecular liquid crystals for potential applications in optical and electronic devices such as organic solar cells or light-emitting diodes (OLEDs). In 2021, he furthermore became head of the GUIDE^{PLUS}- Co-Creation Lab “Product Innovations”, a first point of contact for students and interested members of the university who need professional support in the implementation of their entrepreneurial ideas for products or intelligent materials as well as the creation of prototypes.

Employing the Dynamics of Chemical Bonds
for Functional Materials

Michael Giese, University of Duisburg – Essen, Germany

The principles of Supramolecular Chemistry and the concept of the dynamic covalent bond allows a sustainable design for new functional materials. Herein, we present the efforts of our group to employ hydrogen-bonded liquid crystals for functional materials with application potential in photonic sensing or data storage. Learning from this highly responsive and dynamic systems we moved towards more robust functional systems with adaptive properties by making use of dynamic covalent bonds in imine-based liquid crystals. Exchange and metathesis reactions allowed us to tune the liquid crystalline properties and the fluorescence behavior in-situ – a first step towards adaptive materials.