

# Colloquium

## Self-Organization of Building Blocks into Functional Materials

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### Abstract

There have been rapid advances in the synthesis of macromolecules, nanoparticles and colloids. But while biology self-organizes such building blocks into structures and materials with great ease, reproducing similar complex self-organization processes in the lab requires further developments. The focus of our research lies at the interface of experimental realizations of self-organizing systems and their theoretical understanding. For this purpose, we develop new models and apply advanced computer simulations. In this talk, I will discuss recent advances achieved in diverse systems such as colloids [1], nanoparticles [2], and granular robots [3]. I will demonstrate that only the close interplay of simulation and experiment allows a thorough understanding of these systems, which is crucial for the optimization of their function and their practical applications.

### Literature

- [1] J. Wang et al., "[Magic Number Colloidal Clusters as Minimum Free Energy Structures](#)", Nature Comm. 9, 5259 (2018)
- [2] M.A. Boles et al. "[Self-Assembly of Colloidal Nanocrystals: From Intricate Structures to Functional Materials](#)", Chem. Rev. 116, 11220-11289 (2016)
- [3] C. Scholz et al., "[Rotating Robots Move Collectively and Self-Organize](#)", Nature Comm. 9, 931 (2018)

### Brief Bio

Michael Engel received his doctorate in physics from the University of Stuttgart in 2008. He then worked at the University of Michigan in Ann Arbor, USA as a research scientist on problems involving self-assembling shapes, packing, and aperiodic order. Since 2016 he has been Junior Professor in the Institute for Multiscale Simulation, Department of Chemical and Biological Engineering at Friedrich-Alexander-University Erlangen-Nuremberg. His research lies at the intersection of chemical physics, engineering, and materials science. His favorite scientific tools are statistical mechanics, high-performance computing, and crystallography.

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FIT, Georges-Köhler-Allee 105, 79110 Freiburg

Seminar room, ground level