

Carnegie Mellon University

Materials Science & Engineering

presents

Computational Crystallography Bridging Hard and Soft Matter

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ABSTRACT

Natural and biological systems achieve emergent behavior by self-assembling elementary building blocks. Research in soft and hard condensed matter exploits this behavior with the goal of targeting and optimizing desired materials properties. Of particular help for understanding the appearance of ordered structures of macromolecules, nanoparticles, colloids, and other mesoscale building blocks are computer simulations that are inspired by or an inspiration for experiments.

In this talk, I will discuss the role of building block shape for the growth of ordered superlattices. Replacing shape by variations of the particle interaction, we observe a diverse variety of known and unknown crystalline and quasicrystalline lattices. As an example of a non-equilibrium system we investigated the formation of artificial colloidal cells, which convert energy input into control of function and form. Our discoveries rival behavior and complexity traditionally found only on the atomic scale and provide insight into the relationship of local geometry and crystallographic symmetry.

BIOGRAPHY

Michael Engel is an Assistant Research Scientist in the Department of Chemical Engineering at the University of Michigan in Ann Arbor. He is currently part of the Center for Assembly Science and Engineering, where he works with several PhD students and in collaboration with experimental groups. Dr. Engel has more than 30 refereed publications and has presented over 50 keynote, invited talks, and seminars around the world. Prior to his current appointment he obtained a PhD in Physics at the University of Stuttgart, Germany in 2008 and held postdoctoral fellowships by the Japan Society for the Promotion of Science and the German Research Foundation. His current research is funded by the National Science Foundation and focuses on modeling and computation on the molecular, nanoscale, and colloidal level. He is broadly interested in combining scientific knowledge and engineering principles to investigate self-assembly and dynamics. Frequently topics are shape, packing, and (a)periodic order with the goal of discovering and designing next generation materials.

Doherty Hall 2210, 11:30AM
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