



# From bioinspired structure formation to particle-based metamaterials

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151 Wellington Road, Clayton, 3168

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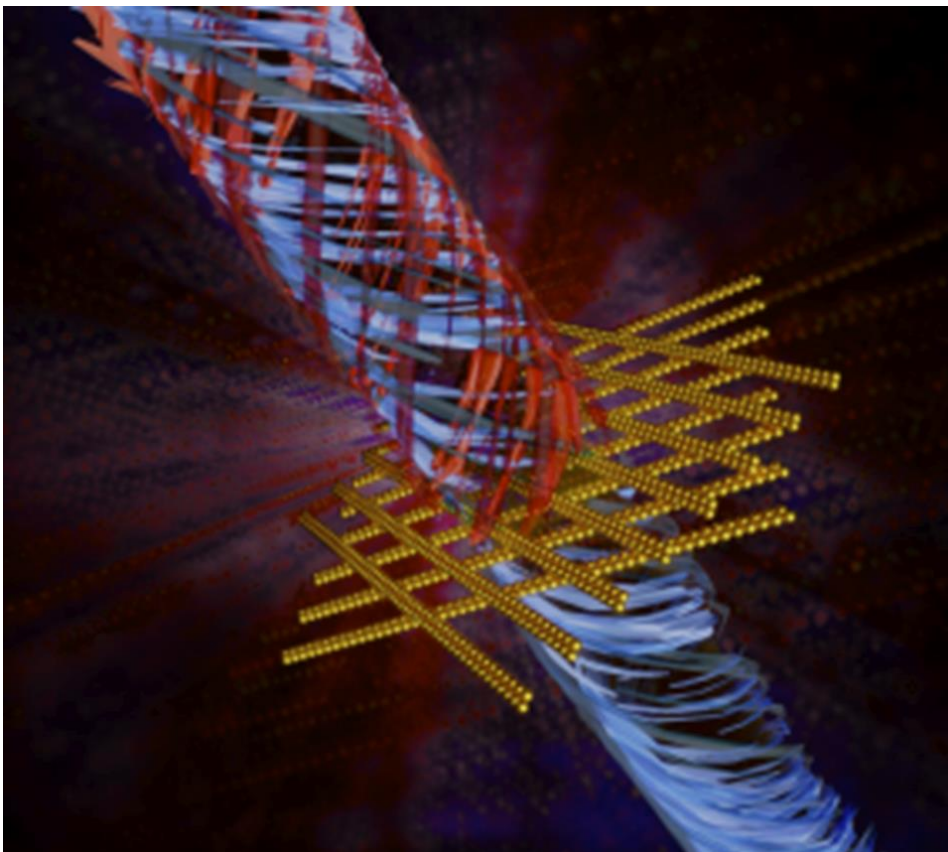


## Abstract:

Metallic nanoparticles offer a range of interesting optical and electronic effects. A prominent example is the localized surface plasmon resonance (LSPR) due to resonant excitations of vibrations of the particles' free-electron cloud by light. Due to the LSPR, plasmonic nanoparticles provide excellent means for controlling electromagnetic near-fields at optical frequencies, which has led to a broad range of applications in various field such as surface enhanced spectroscopy, light harvesting or photonics.

While much research has been dedicated to understanding nanoparticle synthesis and tailoring their LSPR on the single particle level [1-3], ordering particles on different length scales opens another powerful avenue towards optical and electronic functionality, as novel collective plasmonic excitations are occurring due to plasmonic coupling effects.

We focus on achieving such ordered particle arrays via assembly approaches. Colloidal self-assembly indeed succeeds in achieving well-defined colloidal clusters [4] and surface assemblies [5] in which coupling effects can be controlled. Especially when combined with biomimetic surface structuring, large area assemblies are feasible. We discuss the underlying physico-chemical principles of the assembly process and the arising plasmonic coupling effects [6,7]. Finally, we highlight perspectives for taking this assembly principle to meta-surfaces with high field enhancement and/or ultra-high circular dichroism [6, 8].



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**Prof Andreas Fery** is head of the institute for Physical Chemistry/Polymer Physics at the Leibniz Institut für Polymerforschung Dresden since 2015. He studied Physics at Konstanz University, where he received his Diplom in 1996. He did his PhD at the Max-Planck Institute for Colloids and Interfaces (MPIKG)/Potsdam University in 2000. After a post-doc at Institute Curie Paris in 2001, he became group leader at MPIKG and received his habilitation in 2006. In 2007 he joined Bayreuth University as associate professor and was promoted to full professor in 2008. He received the Richard Zsigmondy award of the German colloid society and an ERC starting grant. He has published more than 250 papers in peer-reviewed journals in the area of Polymer science and Colloid and interface science which have been cited more than 10000 times resulting in an h-index of 62. His research interests are in development of novel approaches for Responsive/Bio-interactive Coatings and Nanophotonic/Plasmonic Surface Assemblies. Both research directions benefit from expertise in Characterizing Mechanics and Interactions of Colloidal Particles on the single particle level, using Atomic force microscopy techniques. He is deputy spokesperson of the German Colloid society and treasurer of the European Colloid and Interface Society.