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## How much information is in my scattering data? Some recent approaches to the structure of microgels, polymers and nanoparticles.

*Wednesday, December 9, 2020 11:15 AM (45 minutes)*

Recent progress with soft nanostructures will be reviewed. Traditionally, data analysis follows two approaches, roughly depending on your geographic position with respect to the Rhine river. While “inversion” predominates in the east, “modeling” is more western. In short, “inversion” minimizes the use of a-priori knowledge, while modeling starts with an idea of what the structure might be, which may be wrong ... and fit perfectly. Of course many implementations ignoring geography have been developed, and we advocate a mixed approach based on known ingredients: e.g., assembling nanoparticles in nanocomposites, or monomers within microgels.

In polymer nanocomposites, we will show that SANS can be used to analyze the polymer interfacial region within a nm to NPs –which impacts dynamics as measured by BDS and NSE. On micron scales, thousands of NP are embedded in the polymer, and their dispersion affects both  $I(q)$  and the mechanics of the material. A statistical method based on RMC of this many-parameter problem will be presented, showing that key features like percolation can be described. Finally, the structure of core-shell microgels has been studied by SANS using deuteration. A model describing the polymer density profiles has been developed, and the surprising result is that the shell may not necessarily be where the intuition of the synthetic chemist located it. This leads to new nanostructures of striking mechanical properties, the study of which is an on-going endeavor.

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