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**Nanoparticles with DNA-mediated interactions: from Mess to Order and Complexity**

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By decorating colloids and nanoparticles with various biomolecules, one can introduce highly selective key-lock interactions between them. This leads to a new class of systems and problems in soft condensed matter physics. In my talk, I will review a number of theoretical possibilities and recent experimental achievements in this new field. First, I will discuss DNA-mediated self-assembly of nanostructures and nanoclusters. The specificity and tunability of the interactions result in a remarkable morphological diversity of in such systems. In some of the proposed schemes, DNA can be used to essentially “program” the self-assembly of a desired structure. The colloids with type-dependent interactions can also be used for experimental realization of one of the simplest self-replicating system. Its study may shed some light onto such important problems as prebiotic evolution and origin of life.