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An introduction to self-assembly, theory and implementations

Self-assembly is the process by which unorganized atomic components coalesce into complex shapes and structures. Its study started at the end of the 90s, from the point of view of computer scientists. Since then, it has yielded both an accurate theory of how things form at the nanoscale, and an impressive number of practical implementations at the nanoscale, in particular using DNA: fractal structures, regular arrays, programmed nanoparticle placement, arbitrary 2D (connected) shapes$\cdots$

This is one of the fields of science in which theory and experiments are this close, as they are often done by the same persons. This proximity opens amazing horizons, from molecular programming inside living organisms, to testing new hypotheses on evolution and the origins of life.

In this talk, I will introduce the essential notions of the field at both levels, and present our next challenges.

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