# 3D self-assembly using DNA as programmable molecules

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Our goal is to build artificial molecular systems and machines sufficiently sophisticated to recapitulate and decipher fundamental aspects of biology and to help solve problems of medical interest. We use a DNA self-assembly method called DNA origami, which represents a landmark as the first practical method to self assemble megadalton scale nanostructures with arbitrarily-defined morphology and programmable actuation. I will first present an overview of the field of DNA origami nanotechnology and next present several applications of this method [1-3]. At the end, I will report the ability to engineer DNA nanostructures up to 1 gigadalton by using a new method called DNA Lego [4]. This recent work introduces the practical one-pot construction of fully addressable nanostructures containing 1.7 million nucleotides, comparable to the size of an entire genome of some bacteria. Collectively, these methods may offer a `bottom-up' route to scale programmable morphology and create opportunities for *de novo* fabrication of high-performing functional molecular systems previously inaccessible.

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[3] Ke Y, Regulation at a distance of biomolecular interactions using a DNA origami nanoactuator. Nature Comm. 2016, doi: 10.1038/ncomms10935.
[4] Ont LL, Programmable self-assembly of three-dimensional nanostructures from 10,000 unique components. Nature. 2017, doi: 10.1038/nature24648.