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The Design of Self-Assembled 3D DNA Crystals. Nadrian C. Seeman[‡], Pamela E. Constantinou[‡], Baoquan Ding[‡], Tong Wang[‡], Jens Kopatsch[‡], Ruojie Sha[‡], Jens J. Birktoft[‡], Furong Liu[‡], Robert Sweet[#] & Chengde Mao[§], [‡]Dept. of Chemistry, New York Univ., New York, NY 10003, [§]Dept. of Chemistry, Purdue Univ., West Lafayette, IN 47907, [#]Dept. of Biology, Brookhaven National Laboratory, Upton, NY 11973.

Structural DNA nanotechnology uses unusual DNA motifs to build target shapes and arrangements. These motifs are based on branched systems, often with many strands and multiple helical domains. The motifs can be combined by sticky ended cohesion. A variety of individual DNA species have been developed, including a polyhedra, single-stranded knots, Borromean rings and nanomechanical devices. Many of the key goals of structural DNA nanotechnology entail the use of periodic or aperiodic arrays. Crystalline 2D DNA arrays have been produced with tunable patterns visible in the atomic force microscope. A central goal is the extension of this system from 2D to 3D for biological, nanoelectronic and nanorobotic goals. We have several 3D motifs that form three independent 2D crystalline motifs when one direction is inactivated. X-ray diffraction patterns support the designed cell dimensions and symmetries of 3D crystals.

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