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FLASH HALL, Seminar Room (28c)

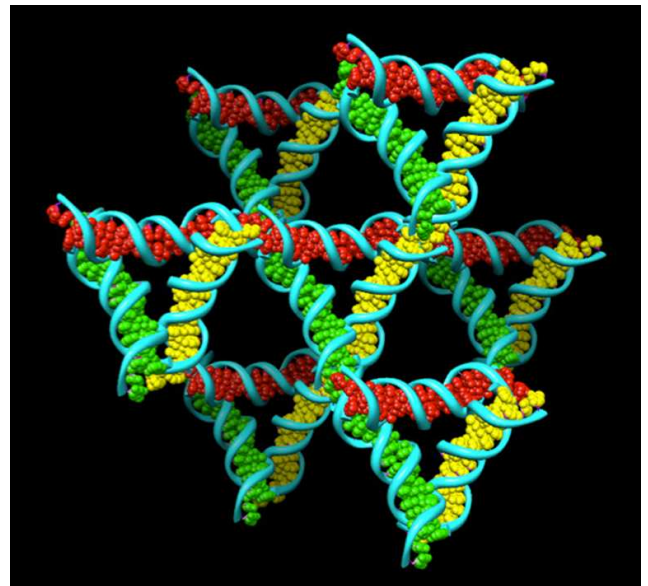
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DNA: Not merely the secret of life

We build branched DNA species that can be joined using sticky ends to produce N-connected objects and lattices. We have used ligation to construct DNA stick-polyhedra and topological targets, such as Borromean rings or a Solomon's Knot. Branched junctions with up to 12 arms have been produced.

Nanorobotics is a key area of application. We have made robust 2-state and 3-state sequence-dependent devices that change states by varied hybridization topology. Bipedal walkers, both clocked and autonomous have been built. We have constructed a molecular assembly line by combining a DNA origami layer with three 2-state devices, so that there are eight different states represented by their arrangements. We have demonstrated that all eight products can be built from this system.



A central goal of DNA nanotechnology is the self-assembly of periodic matter. We have constructed 2-dimensional DNA arrays with designed patterns from many different motifs. We have used pairs of 2-state devices to capture a variety of different targets. Multi-tile DNA arrays have been used to organize gold nanoparticles in specific arrangements.

We have self-assembled a 3D crystalline array and have solved its crystal structure to 4 Å resolution, using unbiased crystallographic methods. More than ten other crystals have been designed following the same principles of sticky-ended cohesion. We can use crystals with two molecules in the crystallographic repeat to control the color of the crystals. Thus, structural DNA nanotechnology has fulfilled its initial goal of controlling the structure of matter in three dimensions. A new era in nanoscale control awaits us.

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