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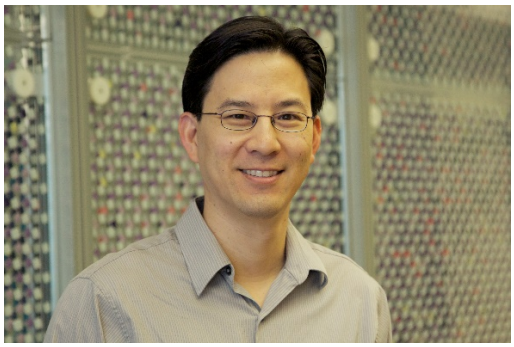
Materials Science and Engineering



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Tuesday, February 13, 2018
4:00pm Tech L211

DNA-origami barrels

DNA origami, in which a long scaffold strand is assembled with a large number of short staple strands into parallel arrays of double helices, has proven a powerful method for custom nanofabrication. Although diverse shapes in 2D are possible, the single-layer rectangle has proven the most popular, as it features fast and robust folding and modular design of staple strands for simple abstraction to a regular pixel surface. Here we introduce a barrel architecture, built as stacked rings of double helices, that retains these appealing features, while extending construction into 3D. We demonstrate hierarchical assembly of a 100 megadalton barrel that is ~90 nm in diameter and ~270 nm in height, and that provides a rhombic-lattice canvas of a thousand pixels each, with a pitch of 9 nm, on its inner and outer surfaces. Complex patterns rendered on these surfaces were resolved using up to twelve rounds of exchange PAINT super-resolution fluorescence microscopy. We envision these structures as versatile nanoscale pegboards for applications requiring complex 3D arrangements of matter.

William Shih is a Professor in the Department of Biological Chemistry and Molecular Pharmacology at Harvard Medical School and the Department of Cancer Biology at the Dana-Farber Cancer Institute and a Core Faculty member at the Wyss Institute for Biologically Inspired Engineering at Harvard. William studied Biochemical Sciences at Harvard for his A.B. (1990–1994) and Biochemistry at Stanford for his Ph.D. (1994–2000) He did a postdoctoral fellowship at The Scripps Research Institute (2001–2004) and has since been back at Harvard as a faculty member. William was a 2013 Blavatnik National Award Finalist in the Physical Sciences and the 2017 Foresight Prize Awardee in Experimental Nanotechnology.