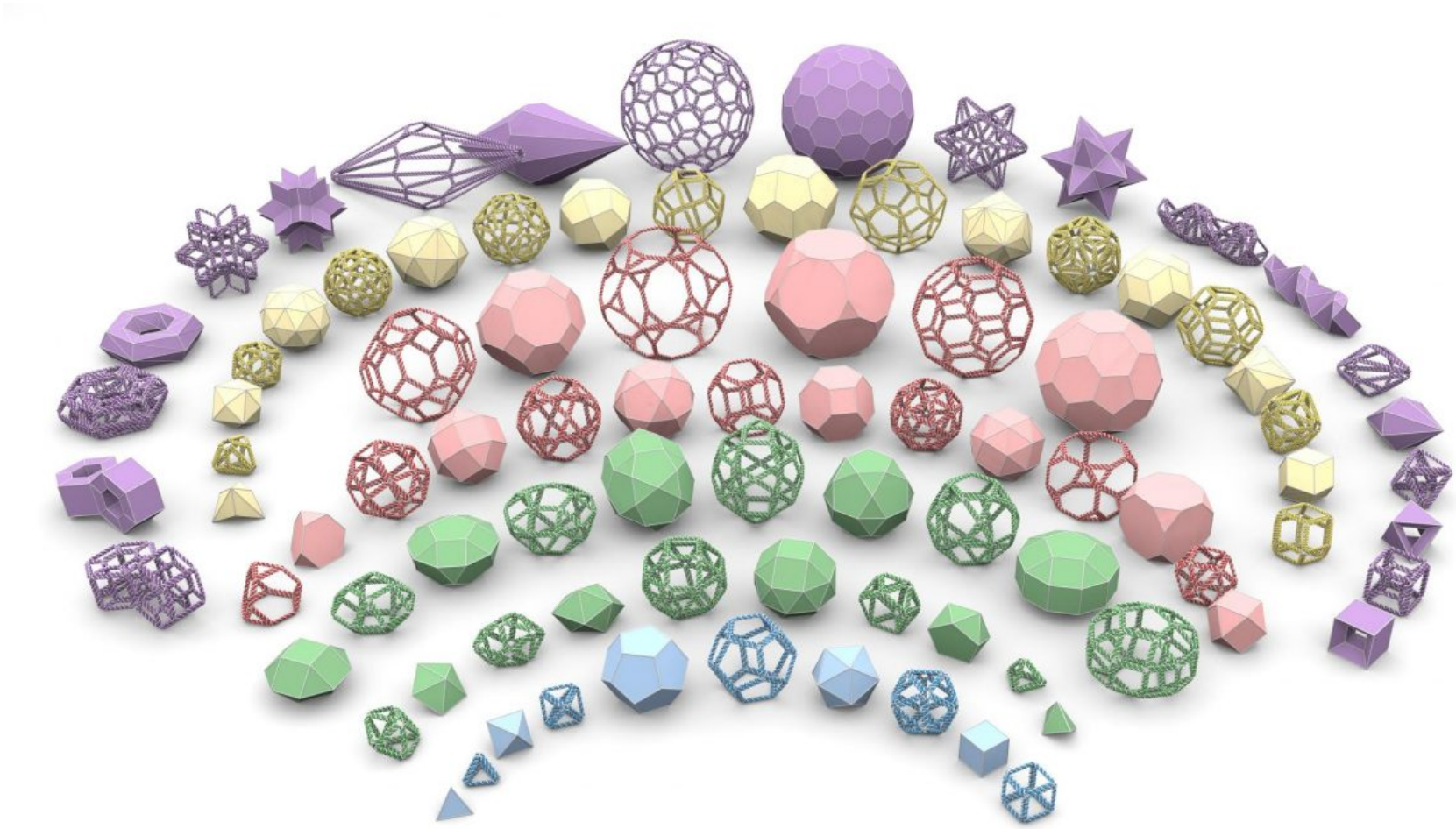
Dedicated softwares for DNA origami designs

DAEDALUS (http://daedalus-dna-origami.org/)
→ independent to M13 ssDNA
→ generates dedicated DNA scaffolds (450-3,400 bases)



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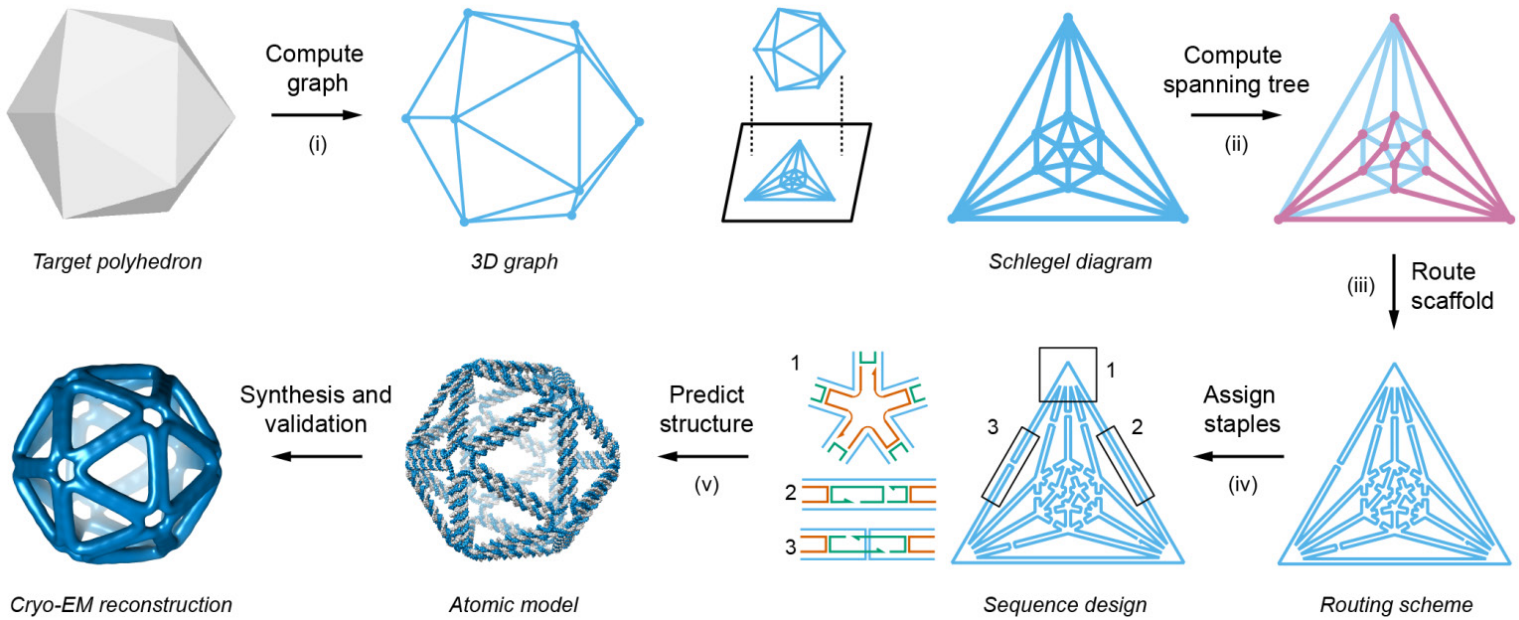
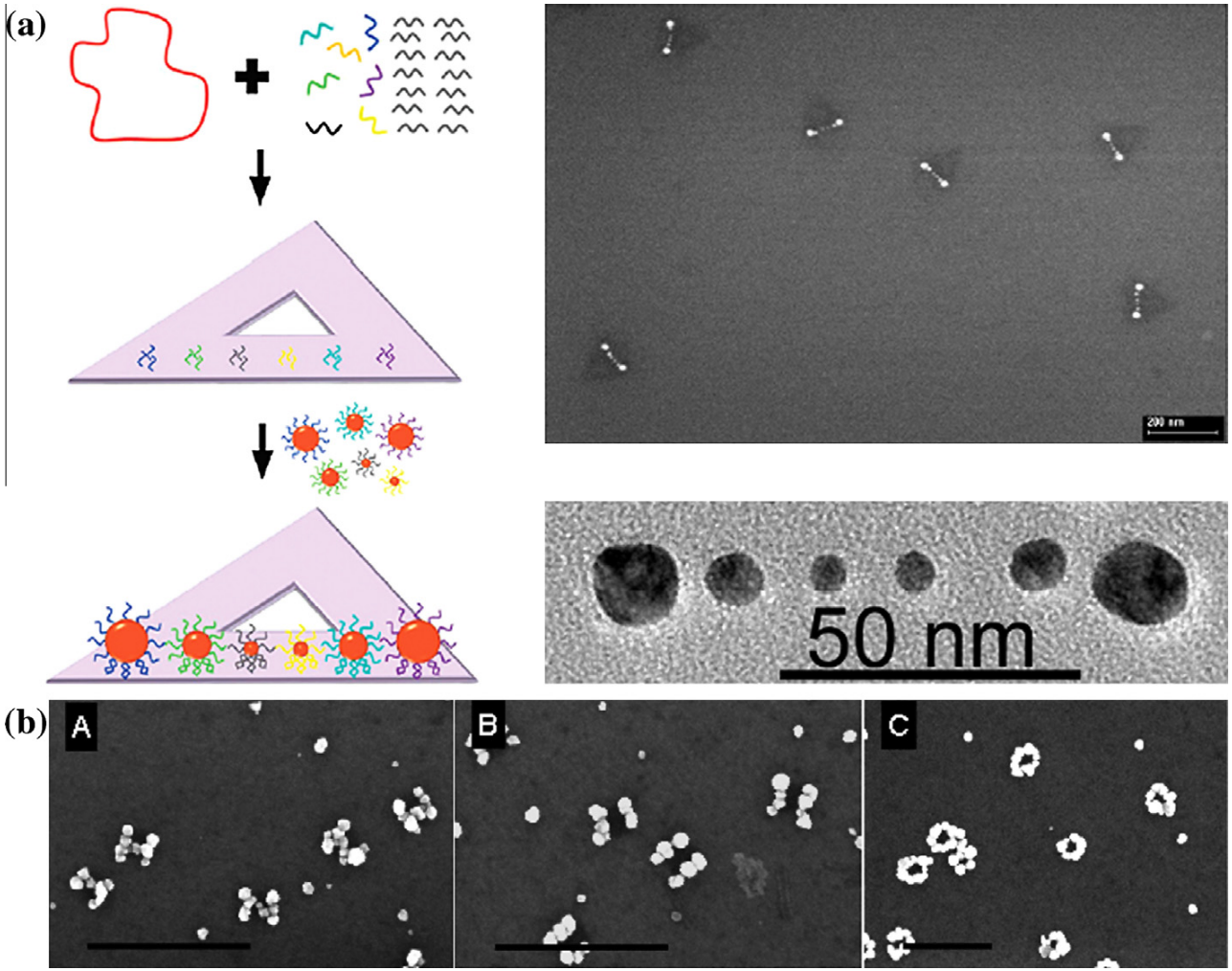


Cite as: R. Veneziano *et al.*, *Science* 10.1126/science.aaf4388 (2016).

DNA origami decorated with nanoparticles

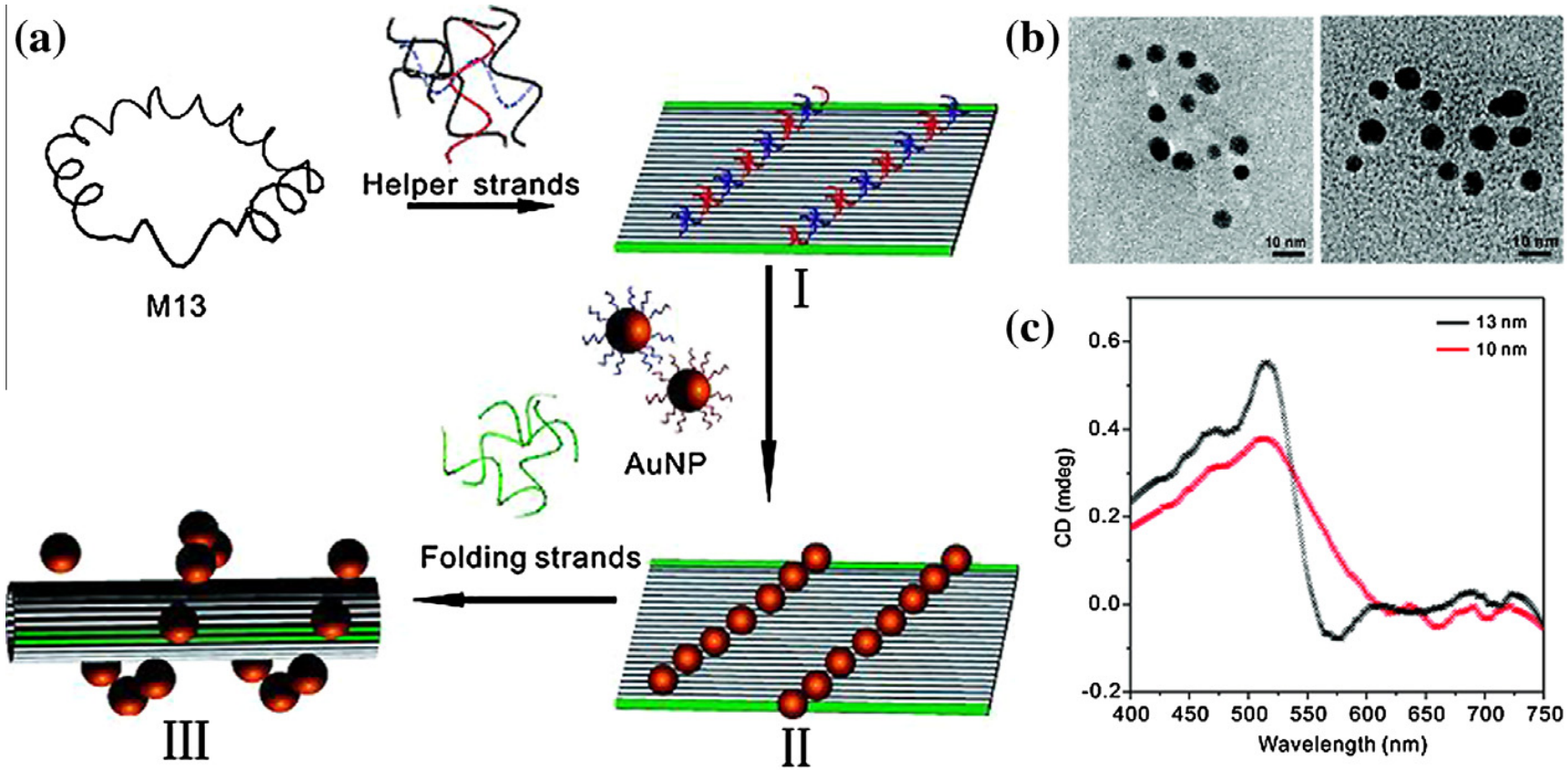
2D nanostructures



Q. Liu et al., Methods (2013), http://dx.doi.org/10.1016/j.ymeth.2013.10.006

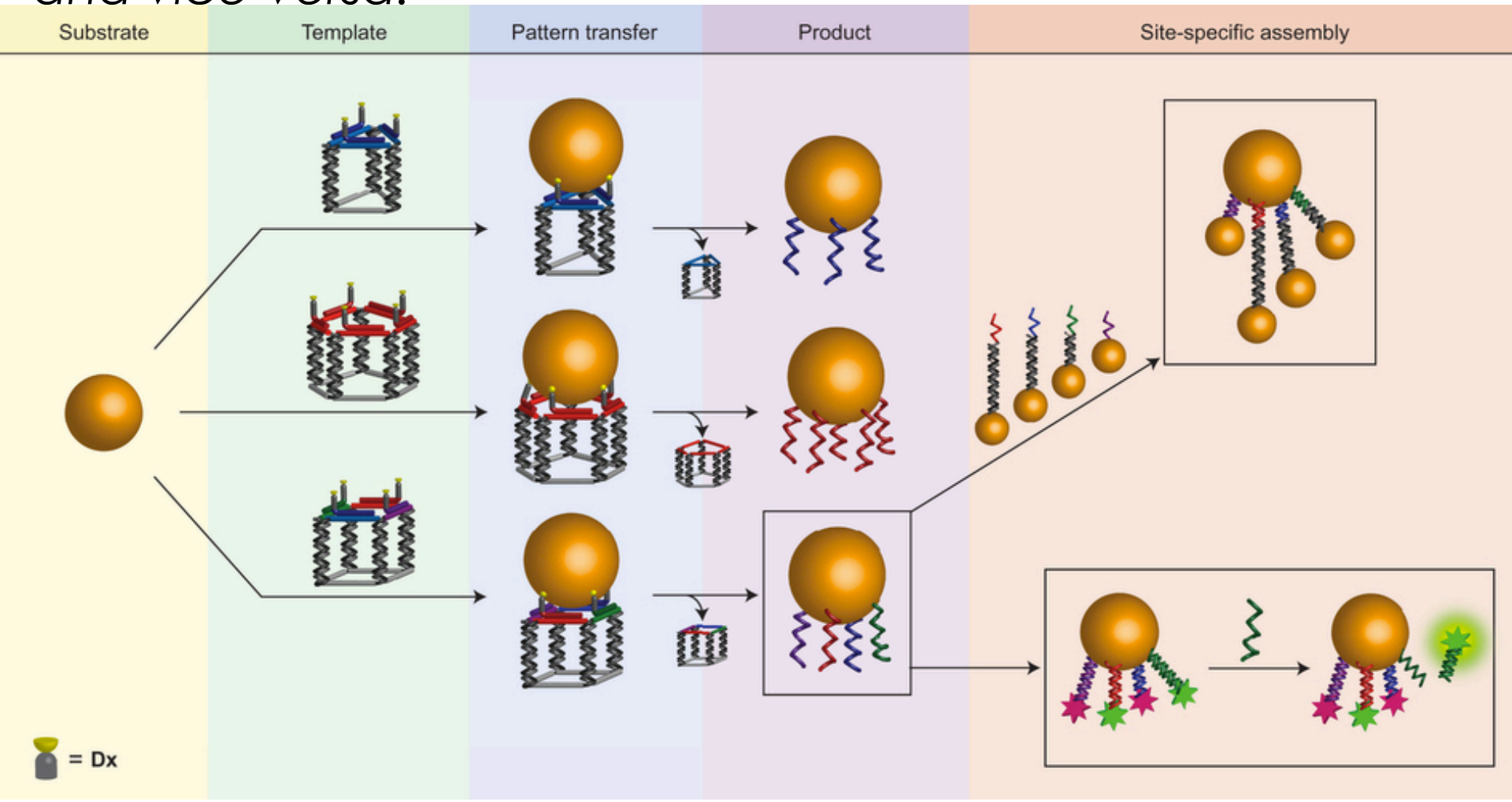
DNA origami decorated with nanoparticles

3D nanostructures



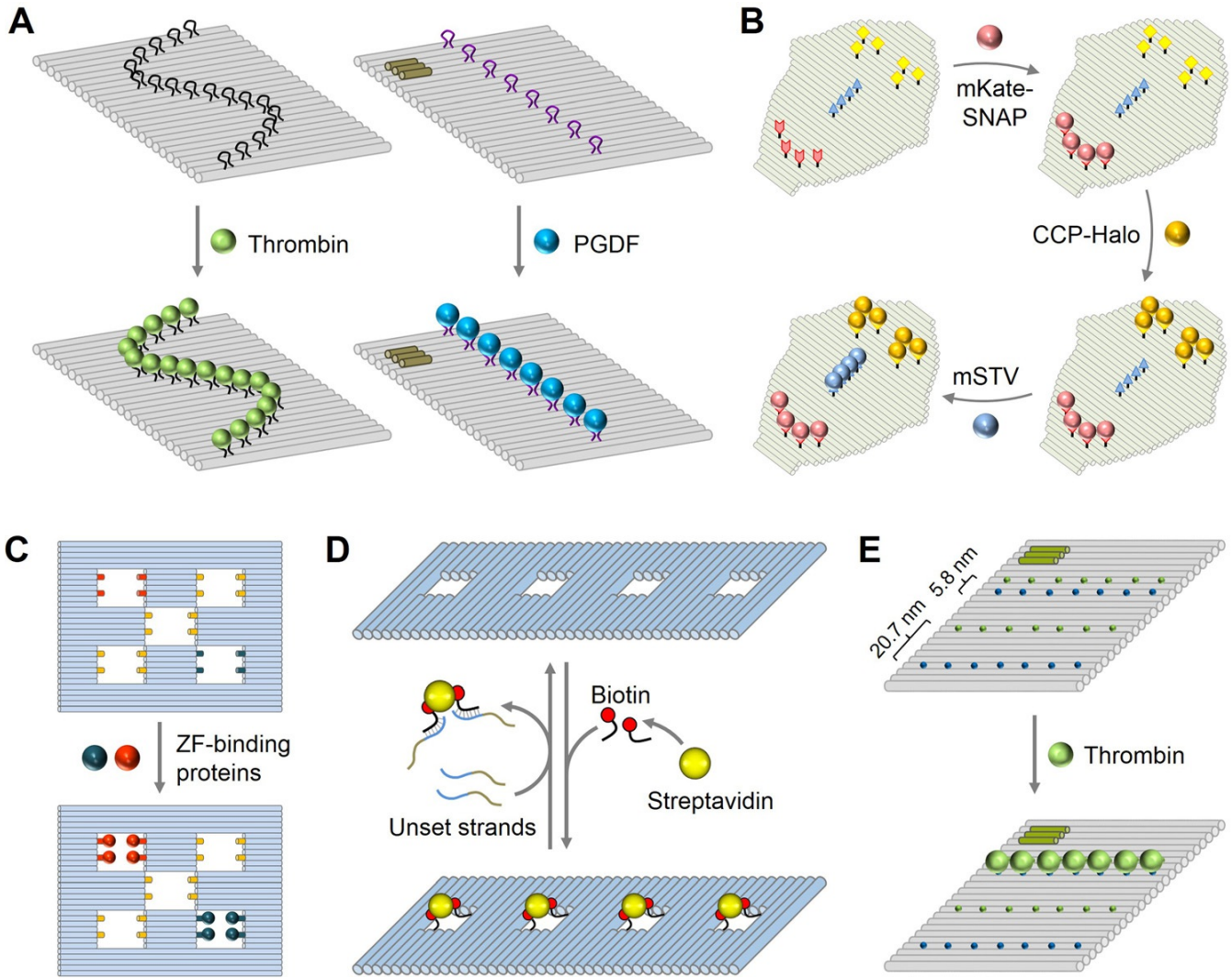
Q. Liu et al., Methods (2013), http://dx.doi.org/10.1016/j.ymeth.2013.10.006

DNA nanostructures decorated with nanoparticles and vice-versa!



Nature Chemistry 8, 162–170 (2016)
doi:10.1038/nchem.2420

DNA origami decorated with proteins



ChemBioChem 2016, 17, 1081 – 1089

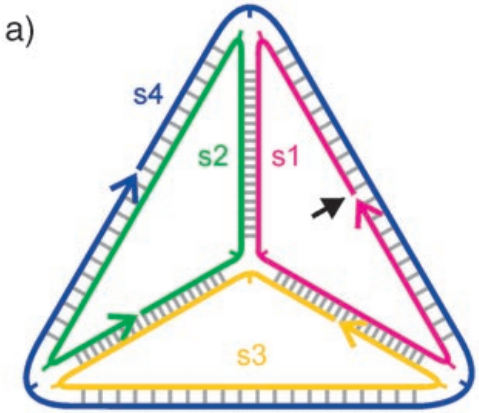
DNA nanocage decorated with proteins

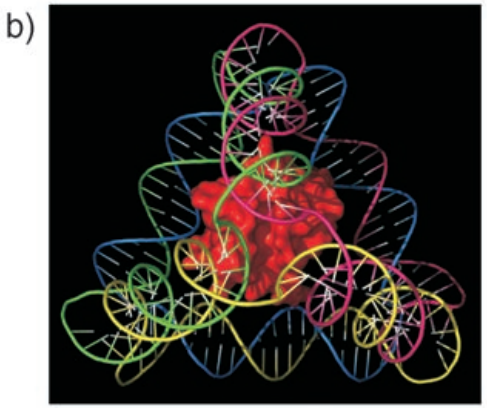
DOI: 10.1002/anie.200603392

Single-Molecule Protein Encapsulation in a Rigid DNA Cage**

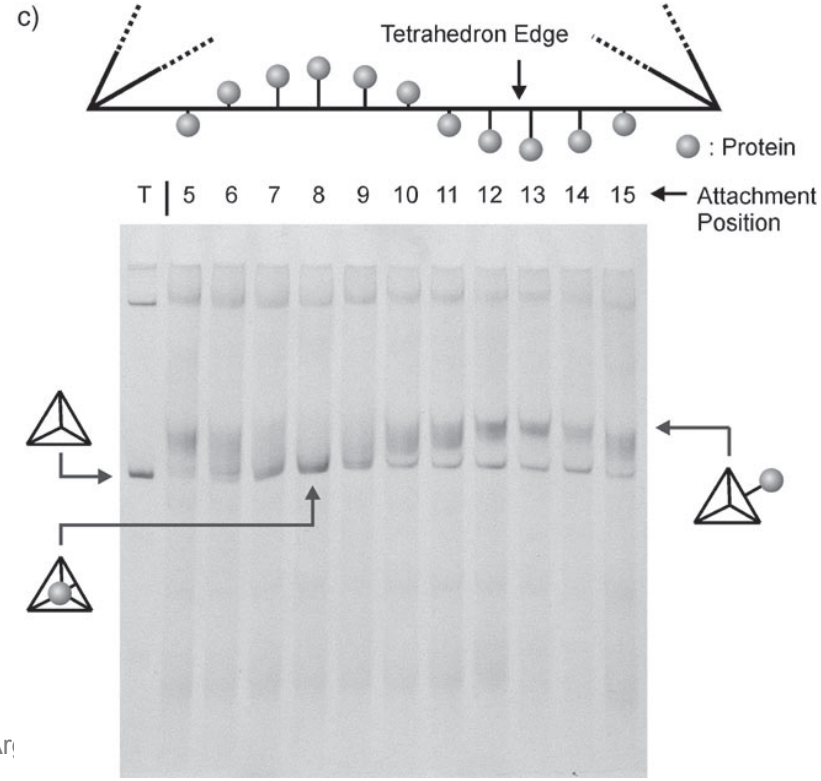
*Christoph M. Erben, Russell P. Goodman, and Andrew J. Turberfield**

Central cavity of the tetrahedron could accommodate a sphere of radius of approximately 2.6nm,corresponding to a globular protein with a molecular weight of 60 kDa.



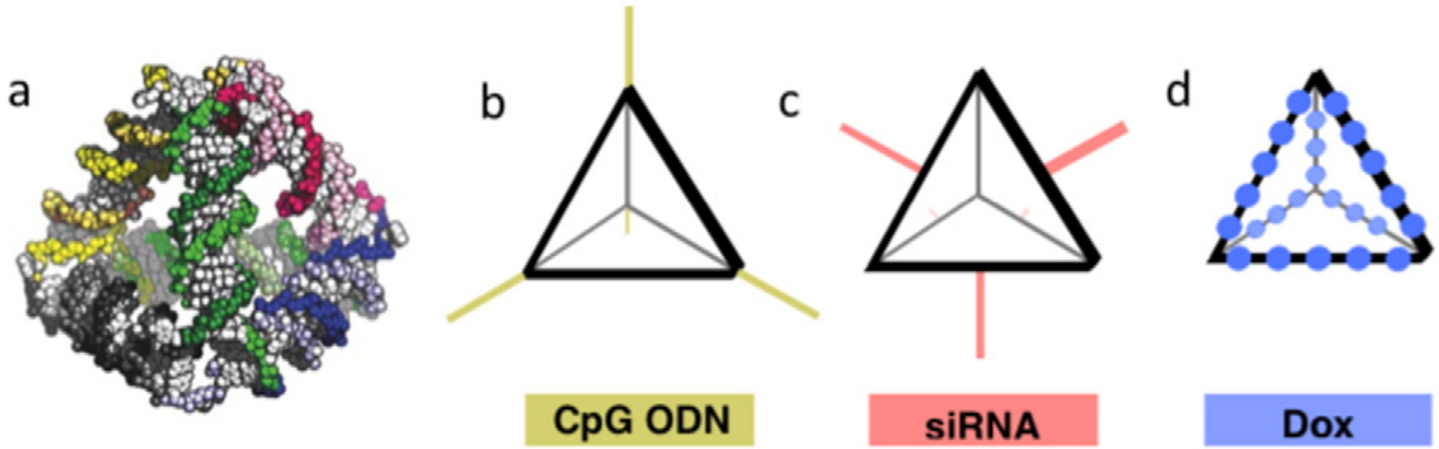


cytochrome c (12.4 kDa)



DNA-based drug delivery

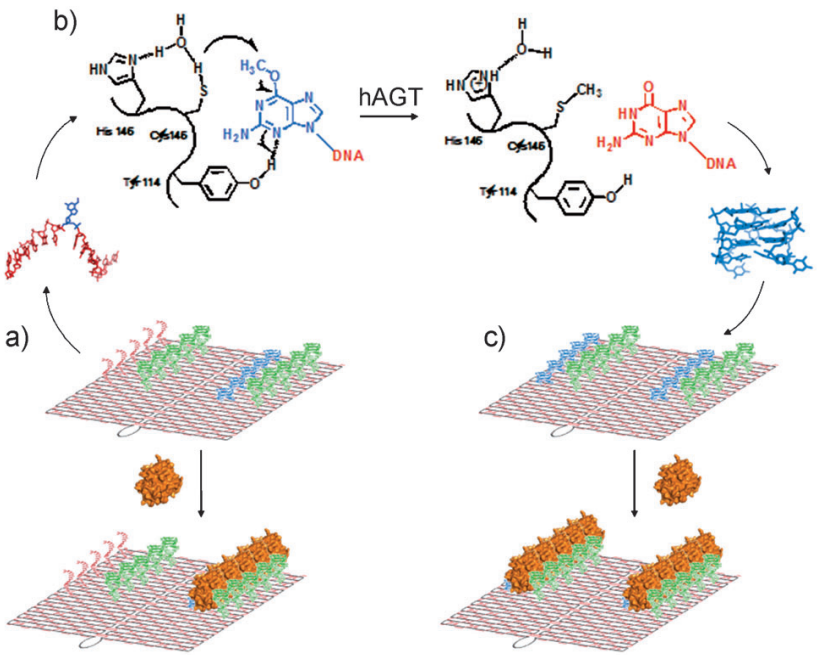
« Particles below 25 nm are subject to filtration in the kidney or uptake in the liver, and particles above 150 nm experience increased filtration in the spleen and phagocytosis by macrophages » => DNA nanocages are the perfect « nanovehicles »

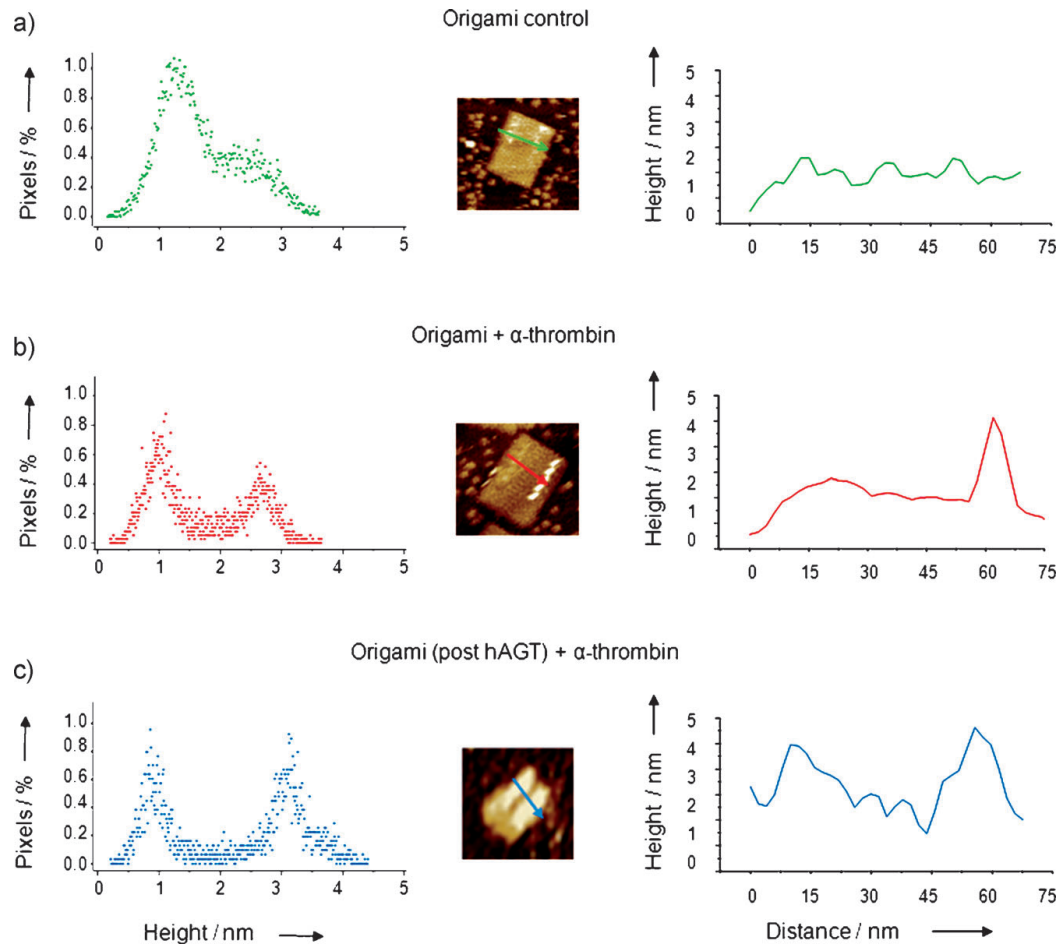


a) The DNA tetrahedron is assembled by annealing of 4 ODNs. It consists of three 20 bp sides and three 30 bp sides making it approximately 7.5 nm or 10.5 nm high
b) CpG ODNs attached to the vertices of the tetrahedron
c) siRNA attached to the sides of the tetrahedron
d) Doxorubicin interchelates dsDNA of the tetrahedron

A.H. Okholm, J. Kjems / Advanced Drug Delivery Reviews 106 (2016) 183–191

DNA origami for biosensing





spatial addressability of DNA origami in combination with the change of conformation of a DNA G-quadruplex to visually detect by AFM the change in its binding affinity to a-thrombin.

Angew. Chem. Int. Ed. **2013**, *52*, 1 – 5