



Nano-origami

Description

Using techniques I alluded to (briefly) in my previous post, genetic engineers fabricate, isolate and deploy a class of short DNA strands (20 or so DNA base-pairs) known as *staples* (oligonucleotides). There are techniques for inserting these staples into long DNA strands at specific locations to cause the strand structures to *fold*. So the double helix of a strand of DNA is effectively a tube able to be bent and folded by the judicious placing of these staples to make shapes. That's DNA origami. It's ex-vivo synthetic, controlled lab work, and is independent of operational DNA in living cells.

A helpful article by Swarup Dey and colleagues identifies the range of applications of DNA origami, e.g. its use in providing masks or templates for printing patterns for nano-scale electronic circuitry. They also mention light-harvesting antennas and photonic wires with long-range directional energy transfer[•] (12). Folded DNA strands have a negative charge, a feature that can be exploited to induce rotation.

A major goal for DNA nanotechnology is to create molecular machinery and motors that do not just switch between states upon sensing some external change but also are progressively fuelled through a closed state path and generate change externally[•] (14).

One popular application is delivering drugs to specific sites in the human body. Dey's article includes an image of a cube-shaped box with a hinged lid.

DNA origami structures can also serve as containers with docking sites in their interior or within dedicated cavities, protecting the payloads from the environment and the environment from the payloads[•] (15).

This is architecture of a sort: designed, constrained, responsive to environment, functional, consequential, socially influential, speculative and risky – but invisible.

Bibliography

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- Dey, Swarup, Chunhai Fan, Kurt V. Gothelf, Jiang Li, Chenxiang Lin, Longfei Liu, Na Liu, Minke A. D. Nijenhuis, Barbara SaccÃ , Friedrich C. Simmel, Hao Yan, and Pengfei Zhan. 2021. DNA origami. *Nature Reviews*, (1) 13, 1-24.

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