

2023-03-03 DNA origami

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https://biocenterat-my.sharepoint.com/:v/g/person/chlara_cerioti_vbc_ac_at/EcDUZrLLdPpLu1kWrUGzKRO_BbOUh7-o4naQ051WRMxzE7w?e=U5UItu

Abstract:

DNA origami is a technique that aims to create nanostructures made of DNA, with a high degree of programmability, flexibility, and reliability¹. Importantly, such structures can be precisely modified with various moieties (oligonucleotides, also fluorophore-modified, proteins², lipids³), creating platforms that have been used for a wide range of applications, such as piconewton force sensing⁴, membrane potential measurements⁵, study of protein behaviour^{6,7}, drug delivery⁸, standards for fluorescence microscopy⁹, or more abstract applications^{10,11}. I hope you found the titles of some of these papers useful or interesting: I will try to give an overview of the technique, of its applications, and provide pointers for anyone who might want to approach the technique and apply it to their research.

1. Rothemund, P. W. K. Folding DNA to create nanoscale shapes and patterns. *Nature* [2006].
2. Hellmeier, J. et al. Strategies for the Site-Specific Decoration of DNA Origami Nanostructures with Functionally Intact Proteins. *ACS Nano* [2021].
3. Singh, J. K. D. et al. Binding of DNA origami to lipids: maximising yield and switching via strand-displacement. *bioRxiv* [2021].
4. Nickels, P. C. et al. Molecular force spectroscopy with a DNA origami-based nanoscopic force clamp. *Science* [2016].
5. Ochmann, S. E. et al. DNA Origami Voltage Sensors for Transmembrane Potentials with Single-Molecule Sensitivity. *bioRxiv* [2021].
6. Ketterer, P. et al. DNA origami scaffold for studying intrinsically disordered proteins of the nuclear pore complex. *Nat. Commun.* [2018].
7. Brown, J. W. P. et al. Rapid Exchange of Stably Bound Protein and DNA Cargo on a DNA Origami Receptor. *ACS Nano* [2022].
8. Douglas, S. M., Bachelet, I. & Church, G. M. A Logic-Gated Nanorobot for Targeted Transport of Molecular Payloads. *Science* [2012].
9. Schmied, J. J. et al. DNA origami-based standards for quantitative fluorescence microscopy. *Nat. Protoc.* [2014].
10. Pumm, A.-K. et al. A DNA origami rotary ratchet motor. *Nature* [2022].
11. Zhou, F., Sha, R., Ni, H., Seeman, N. & Chaikin, P. Mutations in artificial self-replicating tiles: A step toward Darwinian evolution. *Proc. Natl. Acad. Sci.* [2021].