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Membrane Spanning DNA Origami Nanopores for Protein Translocation

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Abstract : Single-molecule sensing via protein nanopores has achieved a step-change in portable and label-free DNA sequencing. However, protein pores of both natural or engineered origin are not able to produce the tunable diameters needed for effective protein sensing. Here, we describe a generic strategy to build synthetic DNA nanopores that are wide enough to accommodate folded protein. The pores are composed of interlinked DNA duplexes and carry lipid anchors to achieve the required membrane insertion. Our demonstrator pore has a contiguous cross-sectional channel area of 50 nm2 which is 6-times larger than the largest protein pore. Consequently, transport of folded protein across bilayers is possible. The modular design is amenable for different pore dimensions and can be adapted for protein sensing or to create molecular gates in synthetic biology.

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