Engineering Molecular Tools with DNA Nanotechnology

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Yale Day of Instrumentation
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https://medicine.yale.edu/cellbio/people/chenxiang_lin.profile
Cells are self-assembled machineries

Top-down: extract, disturb, probe...

Bottom-up: build, recapitulate

Lehninger Principles of Biochemistry, 5th Edition
Engineering challenge

Control geometry, stoichiometry, and dynamics of molecular assemblies

Quantitative biology

- Imaging standards and probes for quantitative microscopy
- Biomimetic constructs to analyze molecular interactions
Engineer 3D shapes with DNA

### Biomimetic DNA Nanostructures

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<tr>
<th>Clathrin</th>
<th>Dynamin</th>
<th>CHMP2/CHMP3</th>
<th>Coliphage T1</th>
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<td><img src="image1.png" alt="Clathrin Image" /></td>
<td><img src="image2.png" alt="Dynamin Image" /></td>
<td><img src="image3.png" alt="CHMP2/CHMP3 Image" /></td>
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- **DNA Buckyball**
- **DNA Helices**
- **DNA Tubules**
- **DNA Syringes**

DNA-scaffolded membrane curvatures

Size-controlled liposomes

Membrane fusion biophysics


Xu, Nathwani, Lin, …, Shih, Rothman JACS (2016)