Towards DNA-Templated Molecular Electronic Devices

Seham Helmi, Jonathan Bath, Arzhang Ardavan & Andrew J. Turberfield*

Clarendon Laboratory, Department of Physics, University of Oxford, Oxford, UK

* andrew.turberfield@physics.ox.ac.uk

The ultimate miniaturization of active electronic components requires the construction of electronic devices from single molecules [1]. Molecular electronics would provide advantages in device architecture, power consumption and functionality. However, building a single-molecule device is challenging as it requires absolute control over the fabrication process including the integration of heterogeneous components, unrelated to materials currently used in semiconductor fabrication, and their positioning with near-atomic precision.

Here we present a new method for the templated conjugation of marginally water-soluble organic molecules to DNA-adapters, with the aim to provide close control over the position and orientation of the molecule within self-assembled single-molecule electronic devices. This method provides a way to conjugate different DNA sequences to the same molecule without the need to provide orthogonal chemistries on the target molecule. It also allows purification of the intended product and screening for the correctly assembled device. It thus provides a promising new tool for the programmable fabrication of molecular electronics.

[1] Aviram A, Ratner MA 1974. *Chem. Phys. Lett.* **29**, 277