DNA engine observed in real-time traveling along base pair track

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In a complex feat of nanoengineering, a team of scientists at Kyoto University and the University of Oxford have succeeded in creating a programable molecular transport system, the workings of which can be observed in real time. The results, appearing in the latest issue of *Nature Nanotechnology*, open the door to the development of advanced drug delivery methods and molecular manufacturing systems.

Resembling a monorail train, the system relies on the self-assembly properties of DNA origami and consists of a 100 nm track together with a motor and fuel. Using atomic force microscopy (AFM), the research team was able to observe in real time as this motor traveled the full length of the track at a constant average speed of around 0.1 nm/s.

"The track and motor interact to generate forward motion in the motor," explained Dr. Masayuki Endo of Kyoto University's Institute for Integrated Cell-Material Sciences (iCeMS). "By varying the distance between the rail 'ties,' for example, we can adjust the speed of this motion."

The research team, including lead author Dr. Shelley Wickham at Oxford, anticipates that these results will have broad implications for future development of programable molecular assembly lines leading to the creation of synthetic ribosomes.

"DNA origami techniques allow us to build nano- and meso-sized structures with great precision," elaborated iCeMS Prof. Hiroshi

Sugiyama. "We already envision more complex track geometries of greater length and even including junctions. Autonomous, molecular manufacturing robots are a possible outcome."

More information: The article, "Direct observation of stepwise movement of a synthetic molecular transporter" by Shelley F. J. Wickham, Masayuki Endo, Yousuke Katsuda, Kumi Hidaka, Jonathan Bath, Hiroshi Sugiyama, and Andrew J. Turberfield, was published online in the February 6, 2011 issue of *Nature Nanotechnology*.

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