

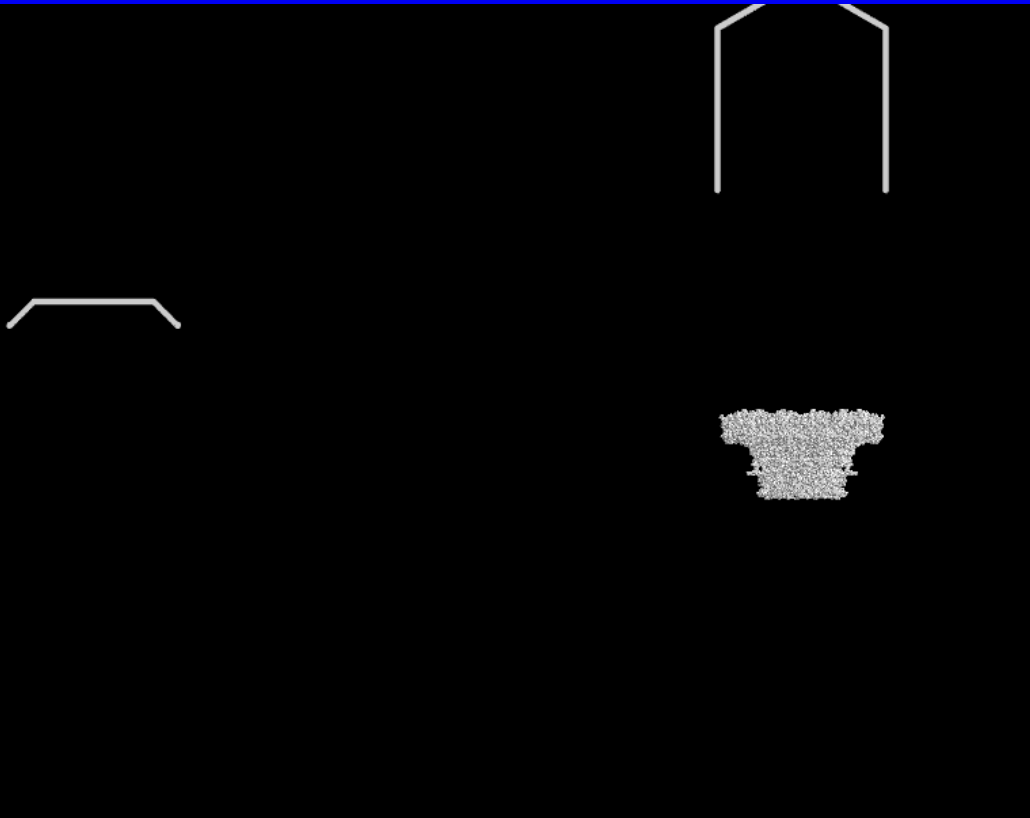


**Title :** Studies and application of Nanomotor for Single Pore Sensing, Single Fluorescence Imaging, and RNA Nanotechnology

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DsDNA translocation motors are essential for DNA replication, repair, homologous recombination, chromosome segregation, bacterial division, viral DNA packaging, and DNA/RNA transport within cells.



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21 February 2003

### Mighty RNA Powers Viral Assembly

**DENVER**--Researchers have found that the most powerful molecular motor is not powered by ATP. Because the motor is made of RNA, the results suggest it could have functioned long before the evolution of DNA. They also offer a new class of controllable motors to propel tiny molecular-scale machines.

3.6 nm (Channel)  
3.2 nm (DNA)  
Hexamer RNA  
Connector

Guo P. et al. *Science*, 1987

Guo P. et al. *PNAS*, 1986

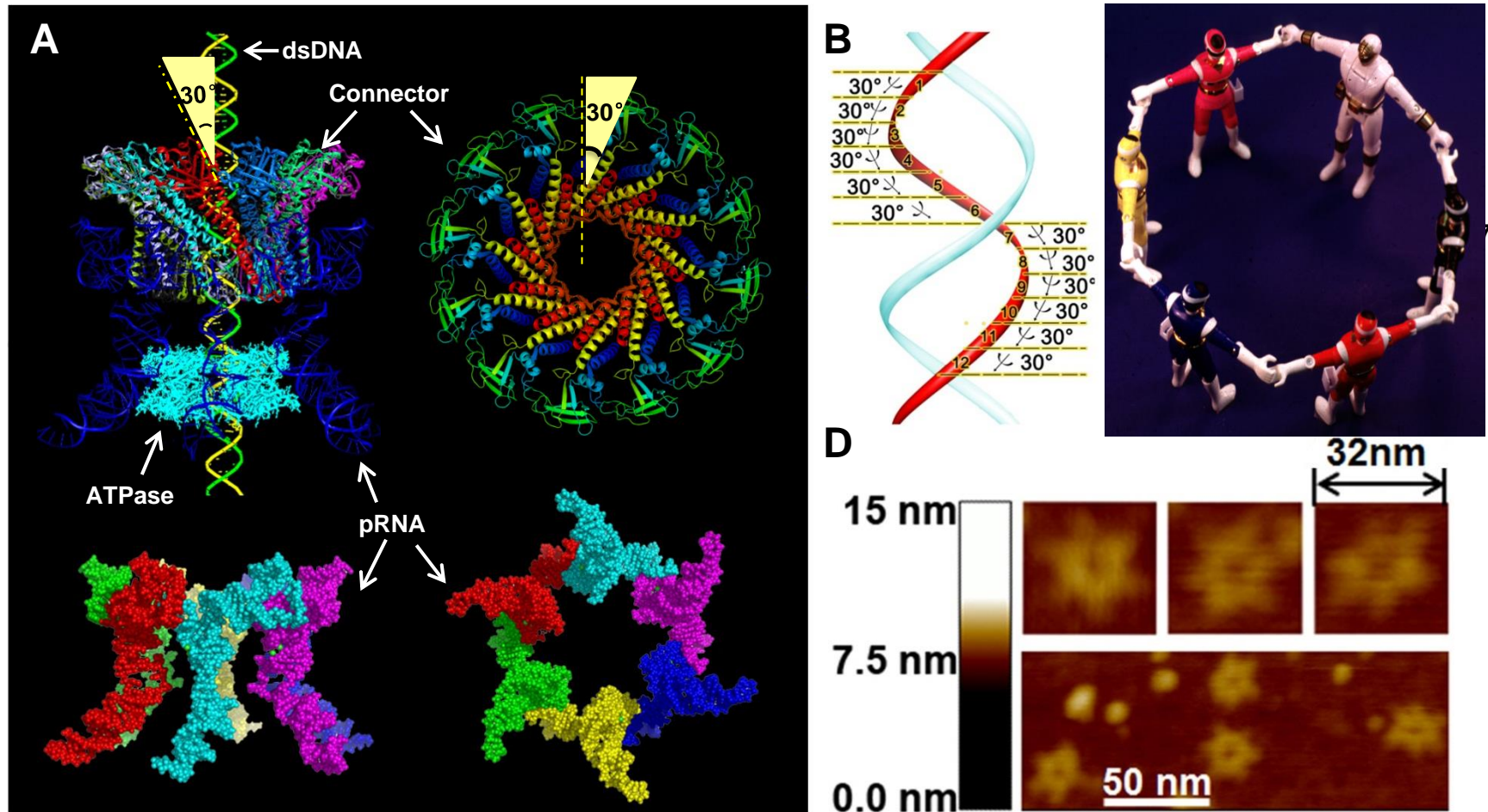
Guo, P. et al. *Mol Cell*, 1998

# Our recent discoveries on the studies of Phi29 DNA Packaging Motor

- ▶ 1. Mechanism of motor action: Revolution without rotation
- ▶ 2. Insertion of the motor channel into membrane for personal medicine and high-throughput dsDNA sequencing.
- ▶ 3. Lead to the emergence of a new field in RNA nanotechnology

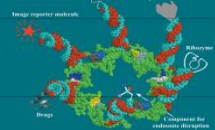
# Phi29 bacteriophage dsDNA packaging motor

The left-handed channel and the right-handed DNA with anti-parallel conformation supports the revolution, but not the rotation mechanism.

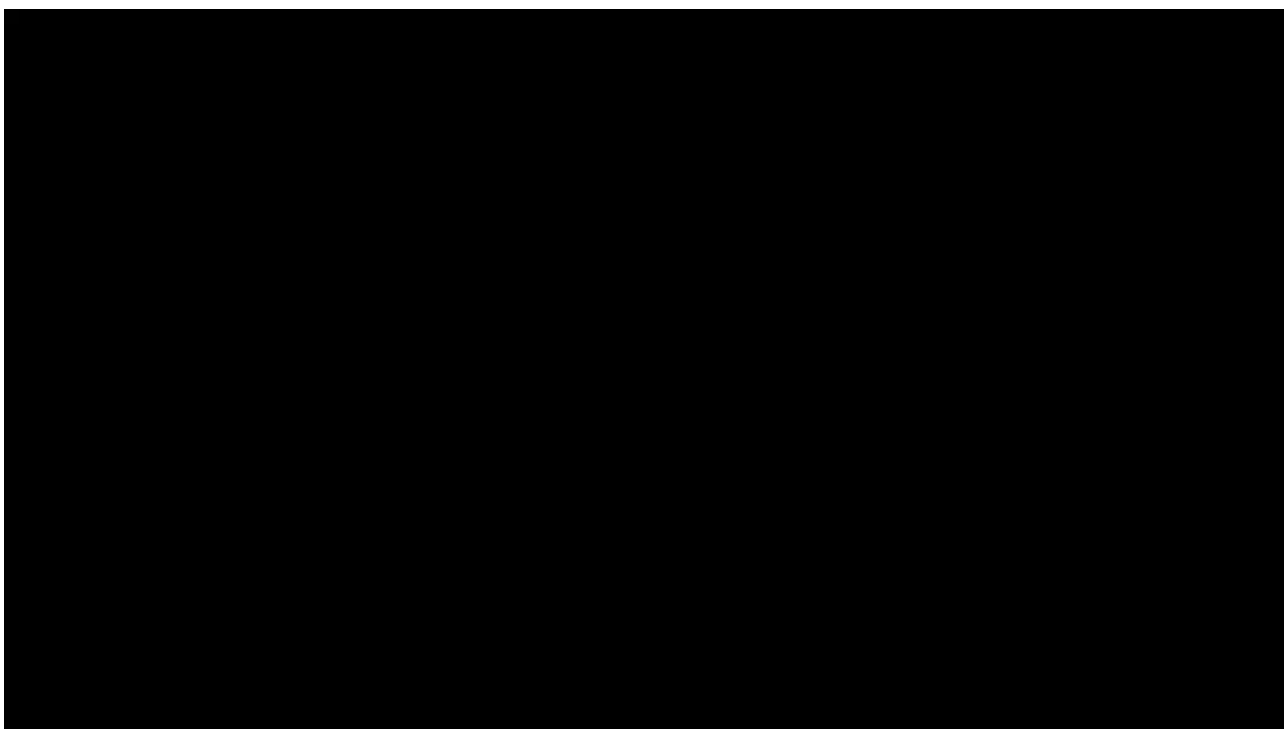


Schwartz C., et al & Guo P. *Virology* 2013;443:28.

Guo P., et al. *Virology* 2013;446:133.

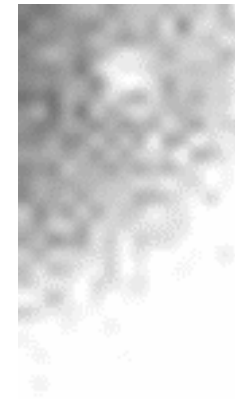
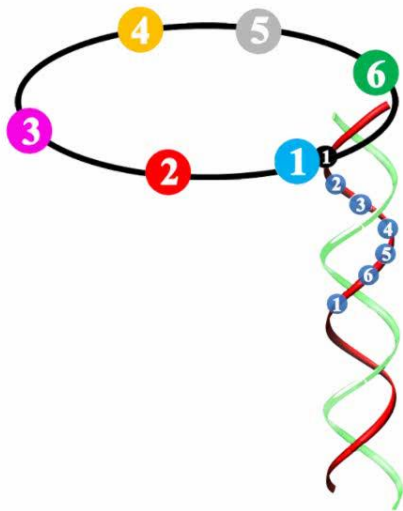


## UK's Guo Discovers New Class of Revolving Biomotor



- Previously, two types of biomotors had been discovered:
  - Linear Motor
  - Rotation Motor

- Recently, we discovered a third type --- revolution motor:



Schwartz C., et al. & Guo P. *Virology* 2013;443:28.  
Schwartz C., et al. & Guo P. *Virology* 2013;443:20.  
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De-Donatis GM et al. & Guo P. *Cell & Bioscience* 2014, 4:30.

Zhao Z., et al & Guo P. *ACS Nano*. 2013;7:4082-92.  
Guo P., et al. *Virology* 2013;446:133-143.  
Guo P., et al. *Biotech Advances*. 2014;32:853-872.  
Guo P. *Biophysical J*. 2014;106:1837-8.