PicoTwist

Stretching and twisting single molecules

- **PicoTwist** is a nanomanipulation apparatus designed to probe real-time protein and DNA interactions at the single molecule level.

- **PicoTwist** uses a magnetic trap to apply a picoNewton scale force on a micron-sized superparamagnetic bead.

- **PicoTwist**’s impressive stability and resolution, combined with an extreme simplicity of use, makes it a very powerful device to investigate biological interactions at the nanometer scale.

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**PicoTwist** bibliography


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**PicoTwist**

**Stretching and twisting single molecules**

**PicoTwist** principles
- Fast moving magnets
- Super-paramagnetic bead
- Single DNA or protein
- Microfluidics flow chamber
- Piezo controlled objective

**PicoTwist** stability

**Stretching ....**

**...and twisting single molecules**

Left: Force-extension curve of a single λ-phage DNA molecule (50 kb).
- Fit using the Freely-jointed chain (FJC) and the Worm-like chain model (WLC).

Right: Extension-rotation curves obtained at different forces on λ-phage DNA. Observation of different structures: plectonemes (0.2 pN), DNA melting (1 pN), P-DNA (8 pN).

With an impressive dynamics of force (0.01 pN to 100 pN, depending on the bead size), **PicoTwist** fits a large variety of biological applications. However, the main feature of **PicoTwist** is its ability to induce a torque into the substrate of interest, and thus to achieve a perfect control of its mechanical state.

**Applications to DNA/protein interactions: example of Topoisomerasers**

Topoisomerasers are ubiquitous enzymes that unwind and disentangle DNA in vivo, by acting as a DNA cissors.
- Generating DNA supercoils on a single DNA molecule with **PicoTwist** allows one to track the real-time activity of a single enzyme. Thus, it lets one to retrieve precious quantitative informations about topoisomeraser kinetic properties, such as burst velocity and

Besides Topoisomerasers, magnetic tweezers apparatus like **PicoTwist** have been shown to be extremely useful to study fundamental classes of enzymes, such as Helicases, Restriction enzymes, and Polymerases at the molecular level. **PicoTwist** is also suitable to the study of biological systems at a larger scale, such as Chromatin or in Cell Biology.

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