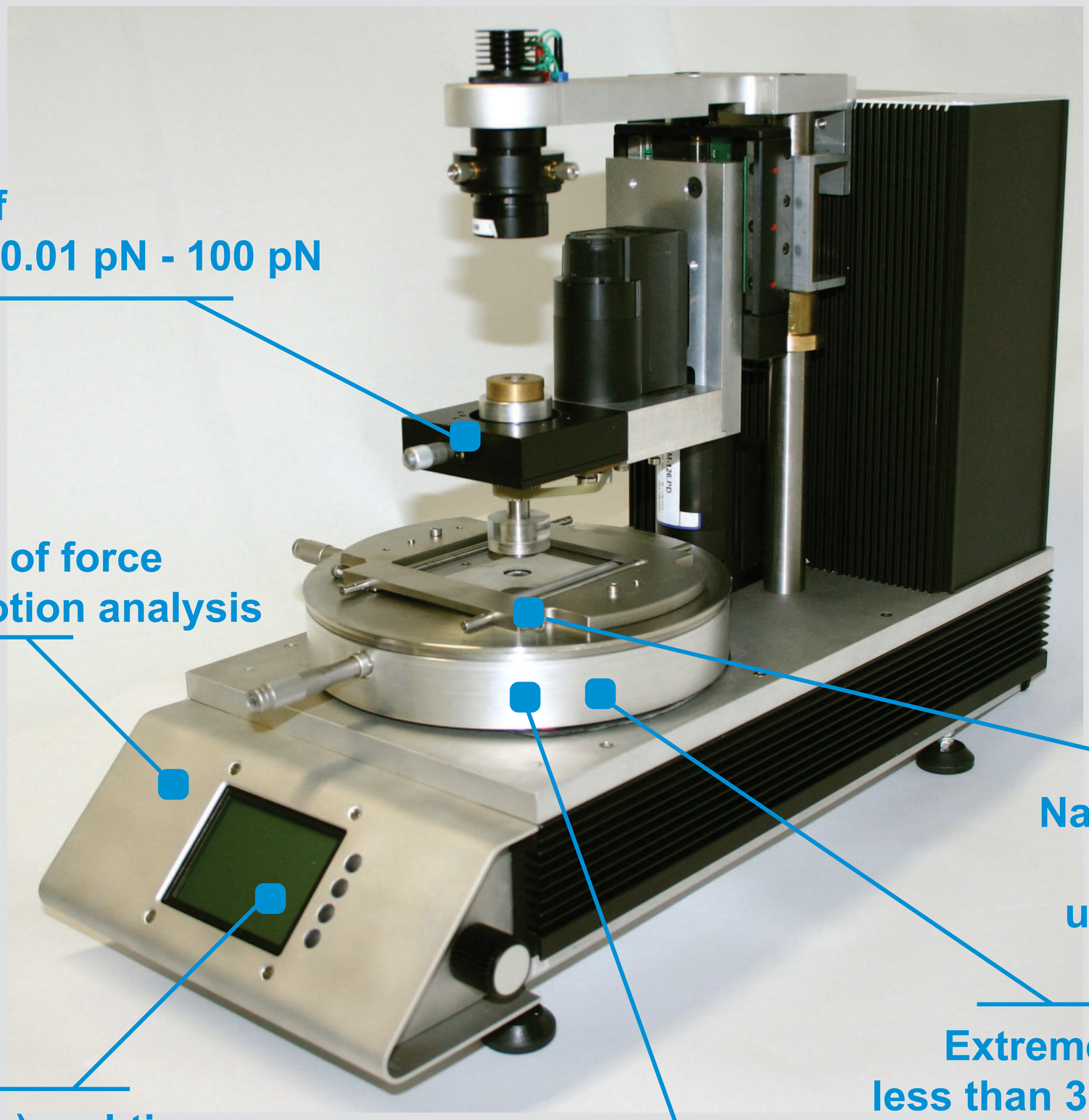
PicoTwist

Stretching and twisting single molecules

- ***PicoTwistT*** 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.



PicoTwist bibliography

Strick TR, Allemand JF, Bensimon D, Bensimon A, Croquette V, Science. 1996 Mar 29;271(5257):1835-7.
Strick TR, Croquette V, Bensimon D, Nature. 2000 Apr 20;404(6780):901-4.
Charvin G, Strick TR, Bensimon D, Croquette V, Annu Rev Biophys Biomol Struct. 2005;34:201-19.
Dessinges MN, Lionnet T, Xi XG, Bensimon D, Croquette V, Proc Natl Acad Sci U S A. 2004 Apr 27;101(17):6439-44.
Saleh OA, Bigot S, Barre FX, Allemand JF, Nat Struct Mol Biol. 2005 May;12(5):436-40.
Koster DA, Croquette V, Dekker C, Shuman S, Dekker NH, Nature. 2005 Mar 31;434(7033):671-4 .

www.picotwist.com

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PicoTwist

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PicoTwist principles

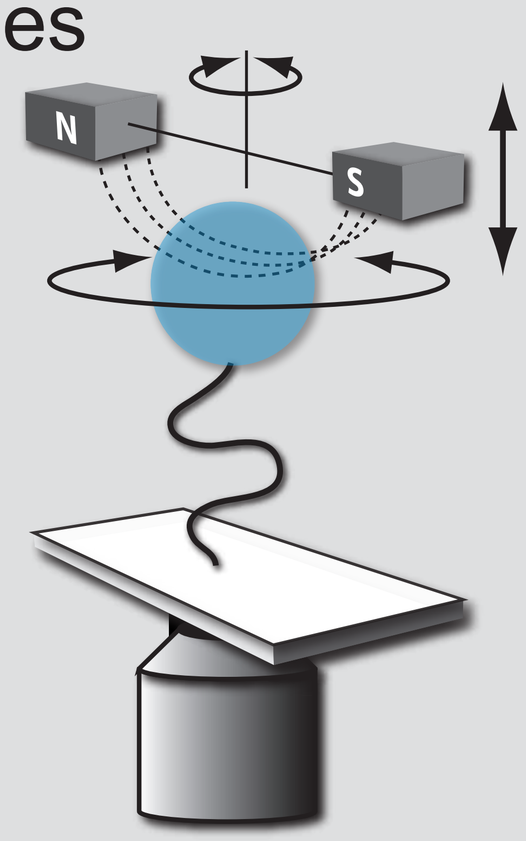
Fast moving magnets

Super-paramagnetic bead

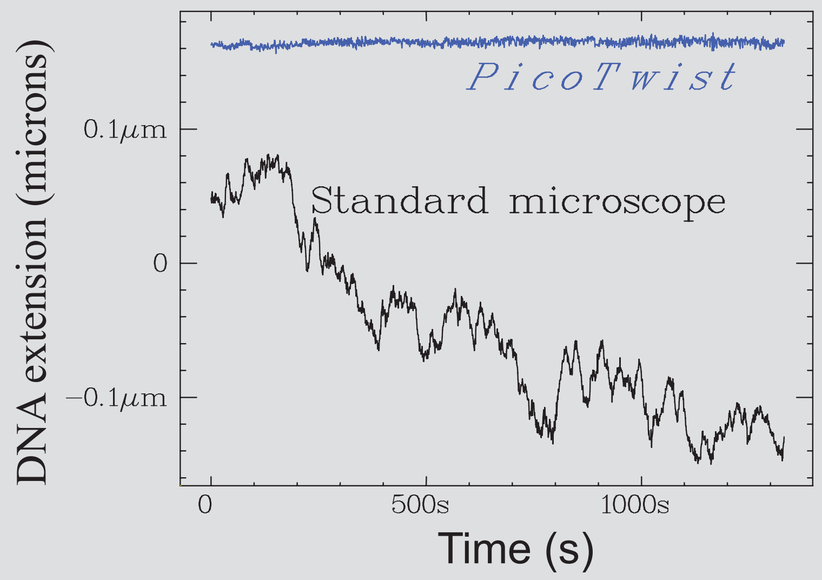
Single DNA or protein

Microfluidics flow chamber

Piezo controlled objective

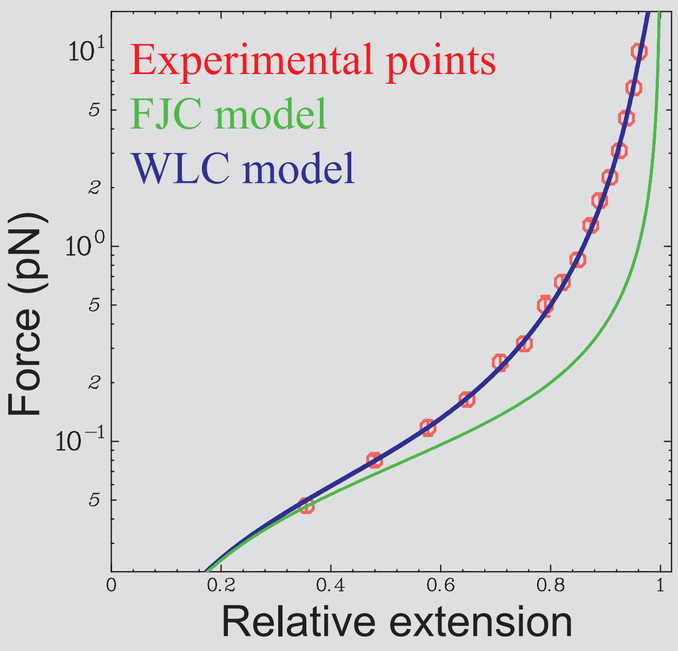


PicoTwist stability



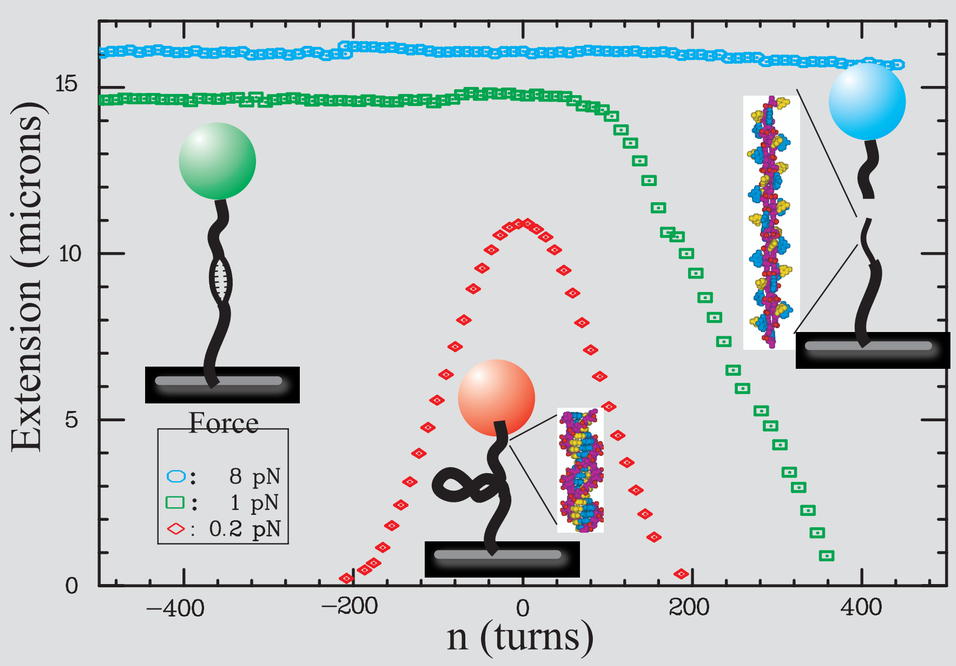
PicoTwist has been designed to ensure an optimal mechanical stability. Low drift is a critical requirement to achieve the detection of protein/DNA interactions at the scale of the nanometer.

Stretching ....



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).

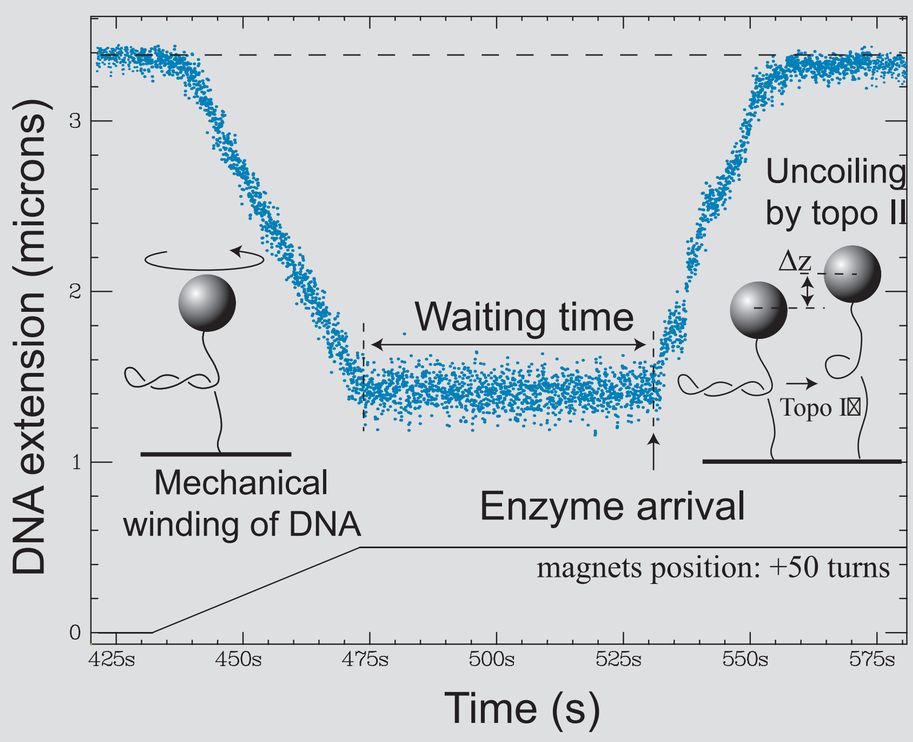
...and twisting single molecules



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 Topoisomerases

Topoisomerase 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 topoisomerase kinetic properties, such as burst velocity and



Besides Topoisomerases, 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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