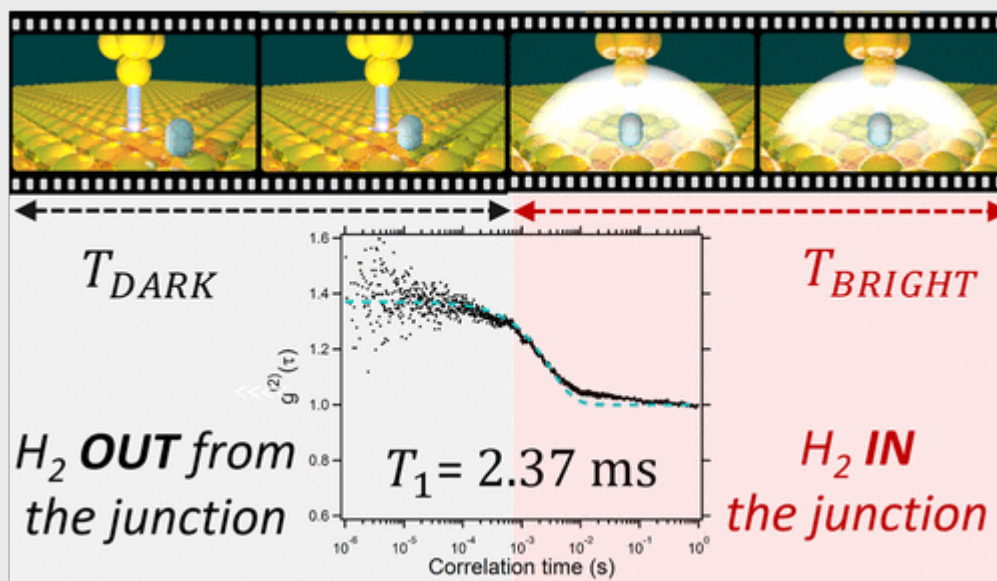


Article: published in [Physical Review Letters](#) by [Rubén Pérez](#), IFIMAC researcher and member of the Department of Theoretical Condensed Matter Physics.

The genomic material needs to be precisely organized and access to its information carefully regulated in order to ensure proper functioning of a cell. These instructions are encoded in the DNA, although not in the form of the well-known three-letter words (or codons) that chemically code for proteins. In this work we found a striking connection between DNA sequence, structure and flexibility: the sequence can specifically modify the flexibility by means of concerted changes in the structure of the double-helix. Our state-of-the-art computer simulations showed that DNA molecules with different sequences substantially differed in their extension. This was a consequence of an internal curvature of the DNA that we denoted crookedness. As we increased the force, sequences that were initially more compressed - or more crooked - were able to elongate by a greater amount than those that were already elongated at low forces. Crookedness works as a reservoir of elastic energy that is directly encoded in the nucleotide sequence. Remarkably, sequences that lacked this reservoir had been previously described to destabilize nucleosomes, the first step of DNA compaction into chromosomes. As a consequence, these DNA regions are known to be highly accessible to the cellular machinery, triggering many key biological processes. [[Full article](#)]

[Research Highlight in Nature Reviews Physics: DNA's crooked path.](#)

A Single Hydrogen Molecule as an Intensity Chopper in an Electrically Driven Plasmonic Nanocavity



Article: published in [Nano Letters](#) by César González Pascual, IFIMAC researcher and member of the Department of Theoretical Condensed Matter Physics.

Photon statistics is a powerful tool for characterizing the emission dynamics of nanoscopic systems and their photophysics. Recent advances that combine correlation spectroscopy with scanning tunneling microscopy induced luminescence (STML) have allowed the measurement of the emission dynamics from individual molecules and defects, demonstrating their nature as single-photon emitters. The application of correlation spectroscopy to the analysis of the dynamics of a well-characterized adsorbate system in an ultrahigh vacuum remained to be demonstrated. Here, we combine single-photon time correlations with STML to measure the dynamics of individual H₂ molecules between a gold tip and an Au(111) surface. An adsorbed H₂ molecule performs recurrent excursions below the tip apex. We use the fact that the presence of the H₂ molecule in the junction modifies plasmon emission to study the adsorbate dynamics. Using the H₂ molecule as a chopper for STM-induced optical emission intensity, we demonstrate bunching in the plasmonic photon train in a single measurement over 6 orders of magnitude in the time domain (from microseconds to seconds) that takes only a few seconds. Our findings illustrate the power of using photon statistics to measure the diffusion dynamics of adsorbates with STML. [[Full article](#)]
