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DNA and RNA unzipping using nanopore force spectroscopy AMIT MELLER, JEROME MATHE, MENI WANUNU, Harvard University, BARAK AKABAYOV, IRIT SAGI, Weizmann Institute for Science — DNA and RNA molecules can be electrophoreticaly threaded through nanoscale pores, such as the ∼1.5 nm alpha-Hemolysin. Information about their translocation dynamics is obtained by probing the ionic current flowing through the pore during their passage. We experimentally study the translocation process of unstructured and structured DNA molecules through a single nanopore. We find that the translocation process depends on DNA properties, such as its sequence and its direction of entry. With intense electrical field structured DNA and RNA can be unzipped in a controlled way, and the unzipping kinetics can be directly quantified. We study the unzipping kinetics of DNA and RNA molecules under a wide range of voltage gradients. We find that the unzipping kinetics is characterized by two limiting regimes: the strong field limit in which the system is unzipped in an irreversible process, and the weak field regime, in which it is in quasi equilibrium. Interestingly the unzipping kinetics of RNA molecules is very different from their DNA analogues. A theoretical model that accounts for our experimental results will be discussed.

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