

MAR05-2004-004694

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Single-molecule analysis of the full transcription cycle

TERENCE STRICK, Institut Jacques Monod, CNRS

By monitoring the extension of a mechanically stretched, supercoiled DNA molecule containing a single bacterial promoter, we have been able to directly observe in real time the change in DNA extension associated with topological unwinding of ~ 1 helical turn of promoter DNA by RNAP during transcription initiation. We find that this stage of transcription initiation is extremely sensitive to the torque acting on the supercoiled DNA. Upon addition of limited sets of nucleotides, changes in the polymerase/promoter interaction which are related to the process of abortive initiation can be studied in detail. Upon addition of the full set of nucleotides, the subsequent stages of transcription – promoter escape, productive elongation and transcription termination – can also be observed in real-time. The changes in DNA topology which occur at each of these stages have been determined, and these results provide for the first global view of the entire transcription cycle at the resolution of single molecules.

Co-authors: Richard H. Ebright, Chen-Yu Liu and Andrey Revyakin, HHMI & Waksman Institute, Rutgers University.