DNA rotational dynamics far from equilibrium

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A stiff cylindrical filament that is rotated at one end undergoes a shape instability at a critical rotational frequency[1], which is the dynamic analogue of the Euler buckling.
For a long DNA molecule a similar critical rotational frequency is predicted, where the dominant hydrodynamic dissipation mode changes from speedometer-cable like axial spinning to loop creation/diffusion[2]. This non-equilibrium transition might be relevant for in-vivo DNA replication and transcription processes and could explain twist localization and histone unlocking.

[1] Non-equilibrium hydrodynamics of a rotating filament,
H. Wada and R. Netz, Europhysics Letters 75, 645 (2006)
[2] Plectoneme creation reduces the rotational friction of a polymer,
H. Wada and R. Netz, EPL, submitted