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**An efficient variational method to study the denaturation of DNA induced by superhelical stress** DANIEL JOST, RALF EVERAERS, Laboratoire de Physique and Centre Blaise Pascal of the Ecole Normale Supérieure de Lyon, Lyon, France — Many fundamental biological processes, like transcription or replication, need the opening of the double-stranded DNA. One common way to control the local denaturation is to impose superhelical stress to the DNA using protein machineries. To describe superhelical effect for circular molecules, Benham introduced a model where the standard thermodynamic description of base-pairing is coupled with torsional stress energetics. Here, we introduce an efficient mean-field approximation of the Benham model. Our self-consistent solution is confident and computationally-fast, compared to the full treatment of the model. In particular, our formulation allows to compute the probability of bubble formation for given length and position along the sequence. Evolution of this probability as a function of the superhelical stress could inform us on the ability for organisms to control the strength of superhelicity acting on their genomes.

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