Title:	Origin of spatial organization of DNA-polymer in bacterial chromosomes
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Abstract:	In vivo DNA organization at large length scales $({\sim}100\ \text{nm})$ is highly debated and polymer models have proved useful to understand the principles of DNA organization. Here, we show that ${<}2{\%}$ cross-links at specific points in a ring polymer can lead to a distinct spatial organization of the polymer. The specific pairs of cross-linked monomers were extracted from contact maps of bacterial DNA. We are able to predict the structure of 2 DNAs (E. coli and Caulobacter crescentus) using Monte Carlo simulations of the bead-spring polymer with cross-links at these special positions. Simulations with cross-links at random positions along the chain show that the organization of the polymer is different in nature from the previous case. We provide some direct and some indirect experimental validation for our predicted organization of DNA-polymers.
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