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How molecular crowding controls the spatial organization of biopolymers in a confined space

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In a crowded space, a long chain molecule can be phase-separated into a condensed state, redistributing the surrounding crowders. Here we discuss how crowding influences the spatial organization of a ring polymer, consisting of two "arms," in a cylindrical space. In a parameter space of biological relevance, the distributions of monomers and crowders follow a simple relationship: the sum of their volume fractions rescaled by their size remains constant. Beyond a physical picture of molecular crowding it offers, this finding explains a few key features of what has been known about chromosome organization in an *E. coli* cell. For instance, it is consistent with the observation that crowding promotes clustering of transcription-active sites into transcription foci. Finally, crowding is essential for distributing the two arms in the way observed with *E. coli* chromosomes.

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