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Screened DNA packs faster

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Despite being negatively charged, DNA can be compacted to almost crystalline densities inside virus capsids. However, how this is achieved has been debated for years. Most theoretical models predict that attractive DNA–DNA interactions — such as those resulting from the screening effect of nearby positively charged molecules — would facilitate DNA packaging by countering the effects of DNA self-repulsion and loss of entropy. Now, optical-tweezer experiments by Nicholas Keller and colleagues demonstrate that the packaging of DNA is accelerated in the presence of low concentrations of the positively charged polyamine spermidine. However, when the concentration of spermidine is sufficiently high to induce attractive interactions in the DNA, the molecular motors tend to slow and stall, drastically lowering the average packaging rate. The authors conclude that the screening of repulsive DNA–DNA interactions speeds up DNA compaction, but that attractive interactions induce the molecular motors to experience highly variable loads that cause the DNA to be packaged in a wider range of conformations, some of which can eventually impede the functioning of the motor.