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Uncovering dynamic genome organization by passive observation and active manipulation

The DNA in a cell's nucleus is intricately structured across 4 orders of magnitude in space. Over the past decade, our understanding of these structures has advanced tremendously, but remains constrained to static snapshots. I will discuss two recent approaches that go beyond the static picture using fluorescence microscopy in live cells. By observing the interaction of two genomic loci on the same chromosome, we were able to study the formation and dissolution of chromatin loops, which are believed to play important structural an regulatory roles. Zooming out to scales of the whole nucleus, magnetic manipulation of a single genomic locus allowed us to study the mechanical properties, specifically the force response, of chromatin in living cells. Both works add to our understanding of the dynamical behavior of chromatin, thus contributing to a full four dimensional understanding of genome organization.

References: https://www.science.org/doi/abs/10.1126/science.abn6583, https://www.biorxiv.org/content/10.1101/2021.04.20.439763v1

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