

# The relationship between transcriptional bursting and DNA structure

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# Mediator and RNA polymerase II clusters associate in transcription-dependent condensates

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Models of gene control have emerged from genetic and biochemical studies, with limited consideration of the spatial organization and dynamics of key components in living cells. Here we used live cell super-resolution and light sheet imaging to study the organization and dynamics of the Mediator coactivator and RNA polymerase II (Pol II) directly. Mediator and Pol II each form small transient and large stable clusters in living embryonic stem cells. Mediator and Pol II are colocalized in the stable clusters, which associate with chromatin, have properties of phase-separated condensates, and are sensitive to transcriptional inhibitors. We suggest that large clusters of Mediator, recruited by transcription factors at large or clustered enhancer elements, interact with large Pol II clusters in transcriptional condensates in vivo.









