The relationship between chromatin structure and transcriptional dynamics

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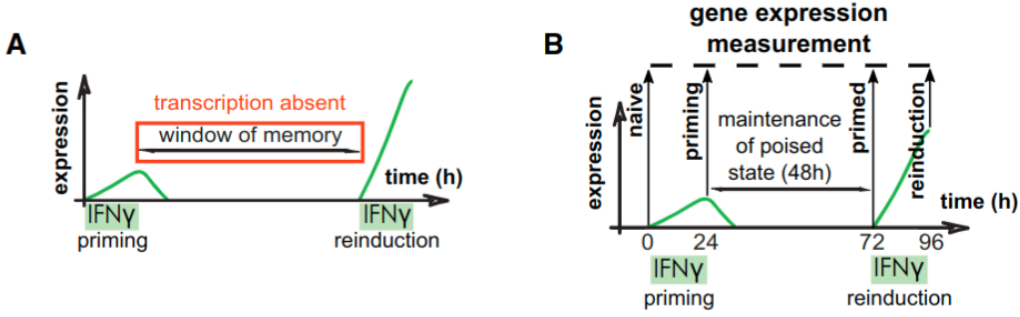
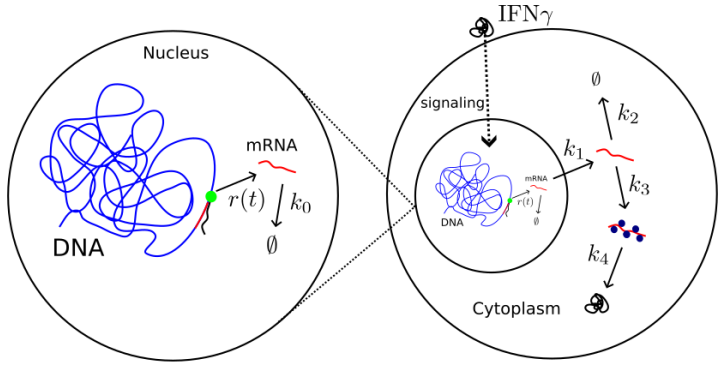
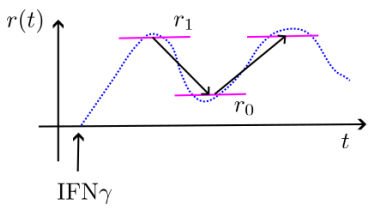
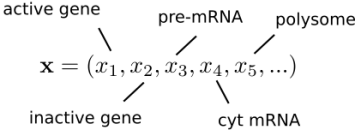
Principle of transcriptional memory



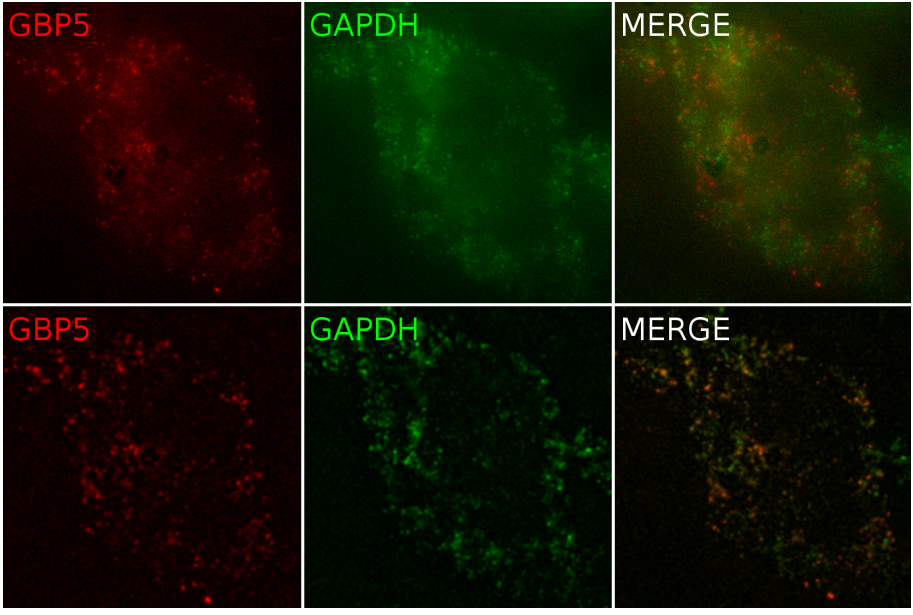
RNA flow model for transcription dynamics and RNA transport



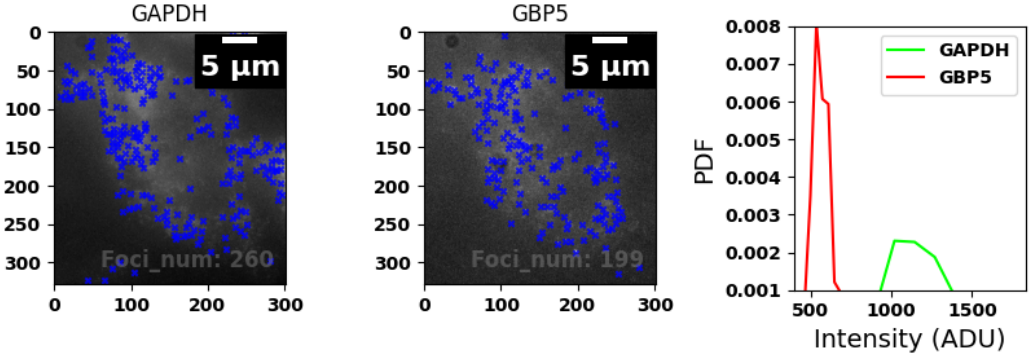




Rare HeLa cell GBP5 expression @ 24h after reinduction with IFN-γ



Intensity histogram for rare GBP5 expression



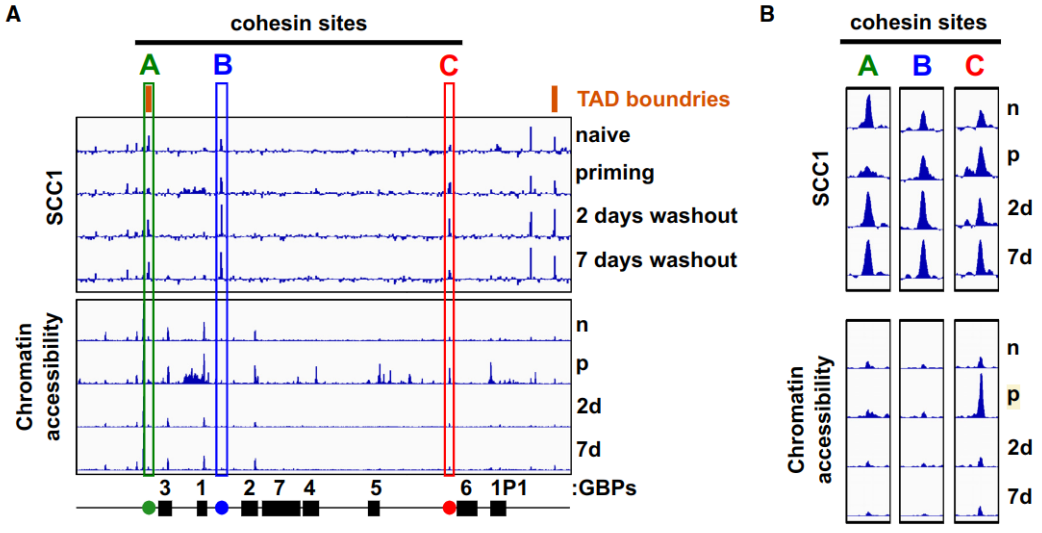
- Very few ($\sim 1\%$) reinduced cells express GBP5, but those that do express at high levels (relative to GAPDH)
- Waiting on the control to determine if this effect is coupled to IFN-γ

Comments on ergodicity of transcription

- If this result is reproducible, transcription is non-ergodic
- RNA flow cannot apply to non-ergodic systems (yet ergodicity is often assumed)
- Previous work suggests that IFN-γ induces epigenetic changes at the GBP5 locus
- If only some cells get the epigenetic modification, the cells are distingushable
- What is the epigenetic change? Is the epigenetic change all or nothing? If it is, then the modified subpopulation form an ergodic subsystem
- Perhaps more importantly, we can study the epigenetic change itself

But it is difficult to study epigenetic changes at a single gene, without additional methods e.g., DNA FISH + STORM microscopy. Let's talk about STORM

Epigenetic changes at GBP genes after IFN-γ treatment



Using STORM to measure epigenetic changes