

# Introduction to epigenomics

Or how genes are regulated...

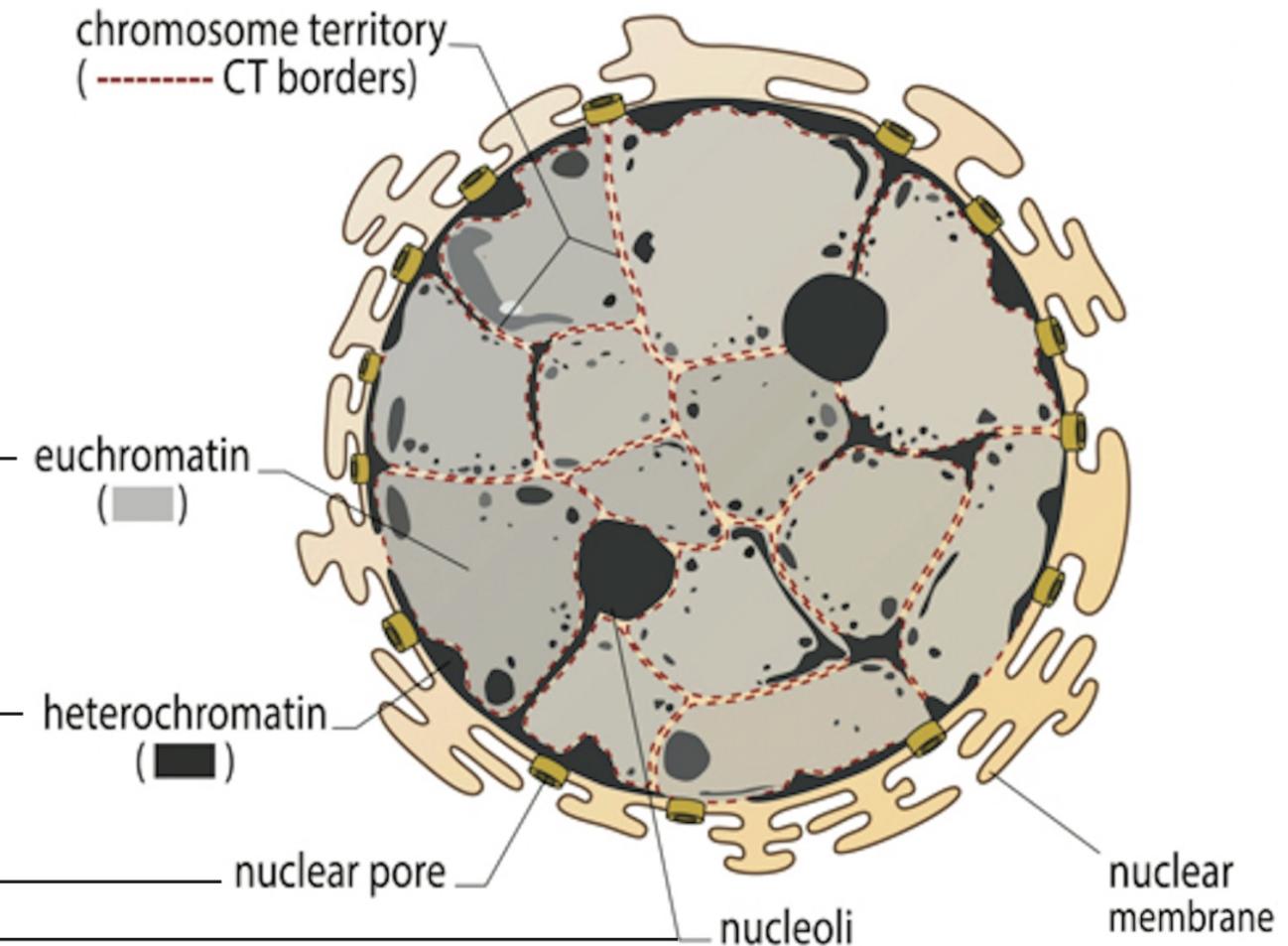
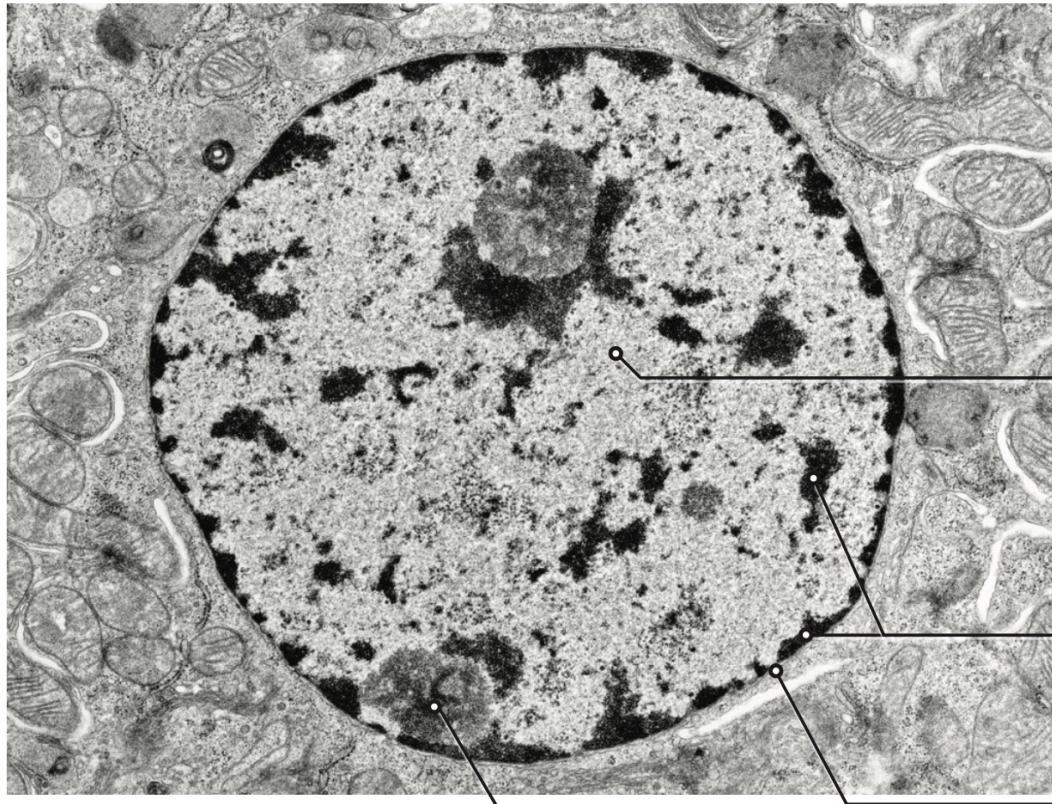
Epigenomics Data Analysis

Jacques Serizay

Physalia 2023



# Chromatin is complex



# Chromatin composition varies along the genome

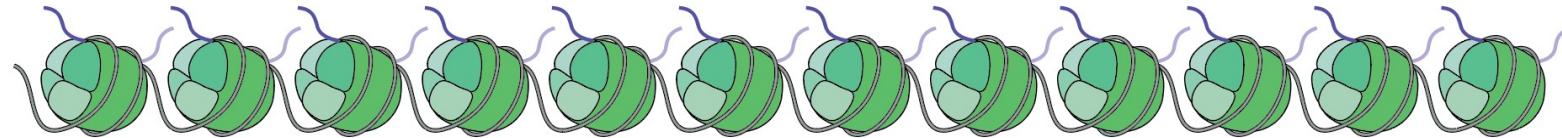
DNA



# Chromatin composition varies along the genome

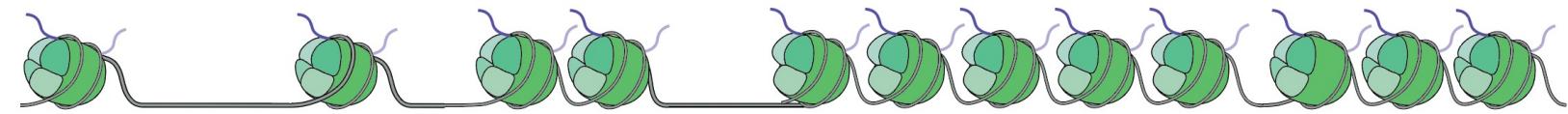
DNA  
+ Histone cores

} Nucleosomes: core chromatin structural unit



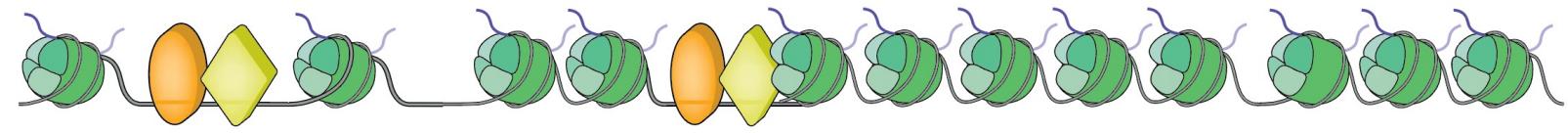
# Chromatin composition varies along the genome

DNA  
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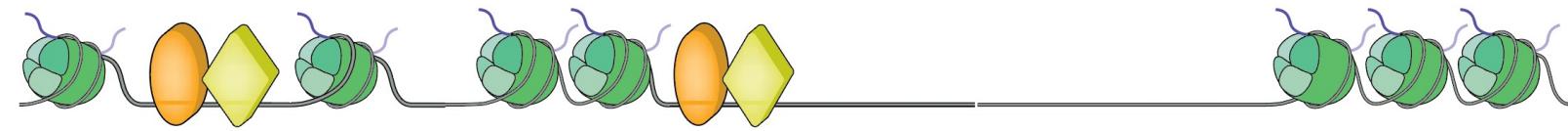
# Chromatin composition varies along the genome

DNA  
+ Histone cores } Nucleosomes: core chromatin structural unit  
+ nucleosome positioning  
+ transcription factors



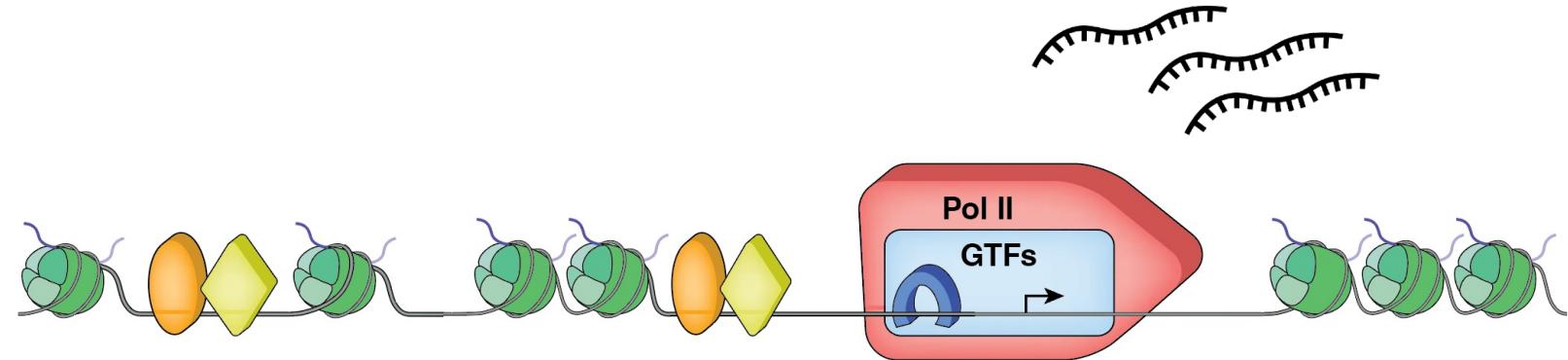
# Chromatin composition varies along the genome

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+ transcription factors  
+ Promoter accessibility



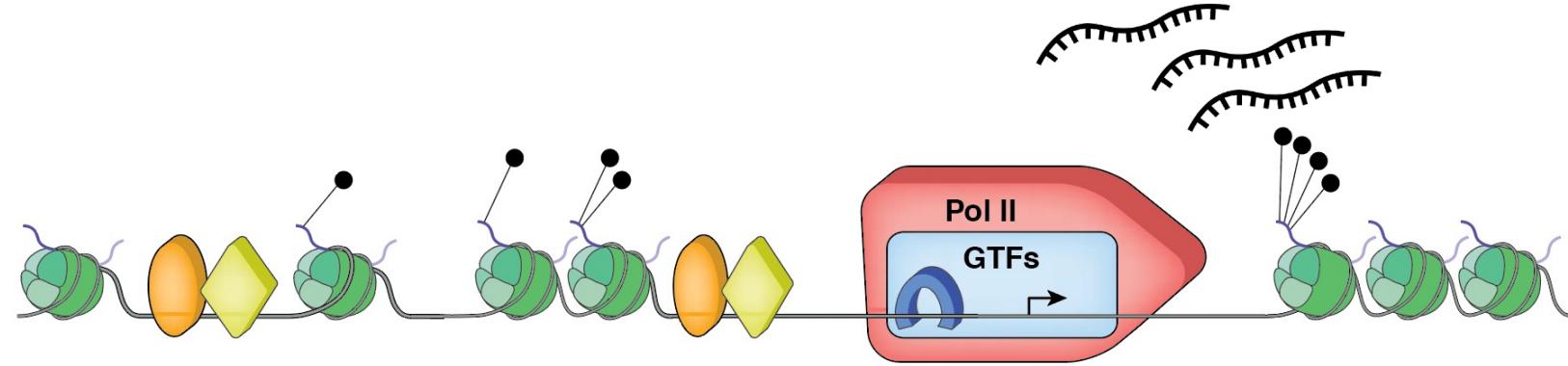
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- DNA } Nucleosomes: core chromatin structural unit  
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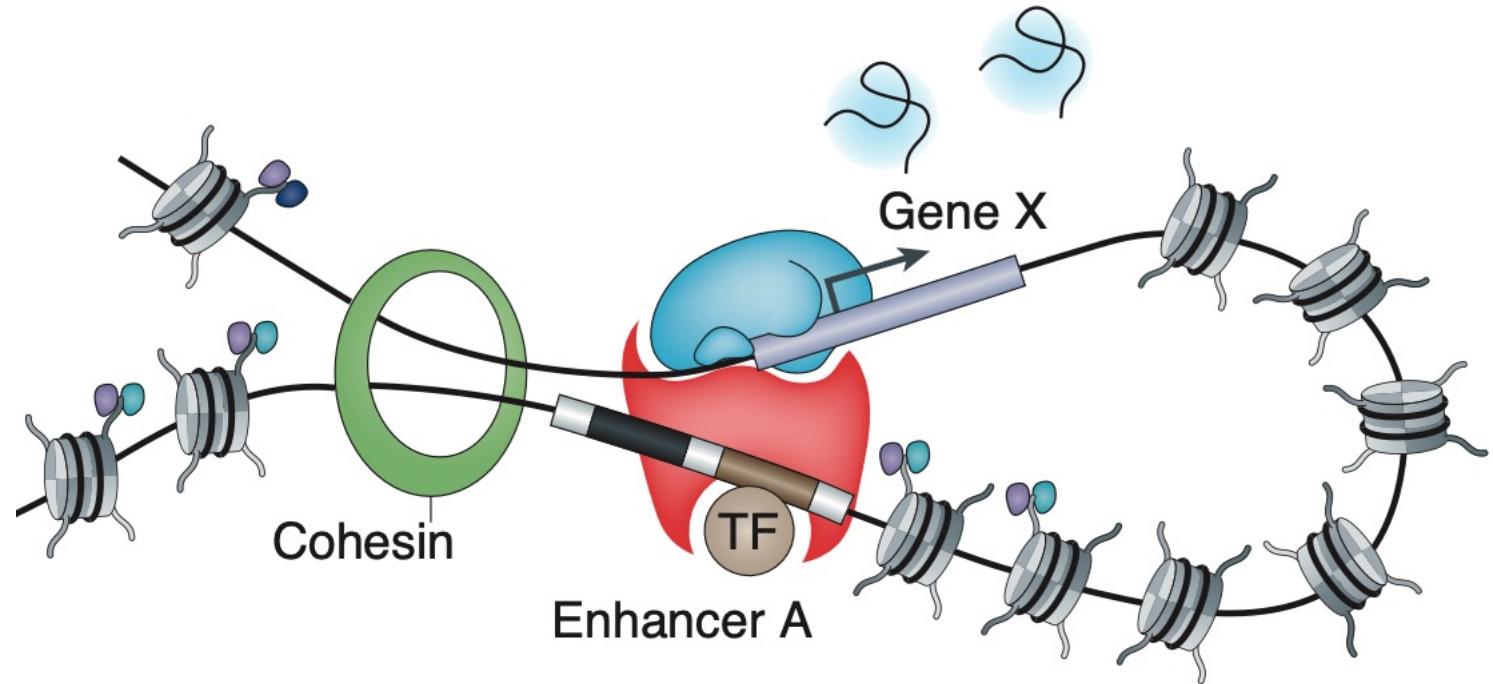
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- DNA
- + Histone cores } Nucleosomes: core chromatin structural unit
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- + Promoter accessibility
- + Polymerase
- + Histone PTMs



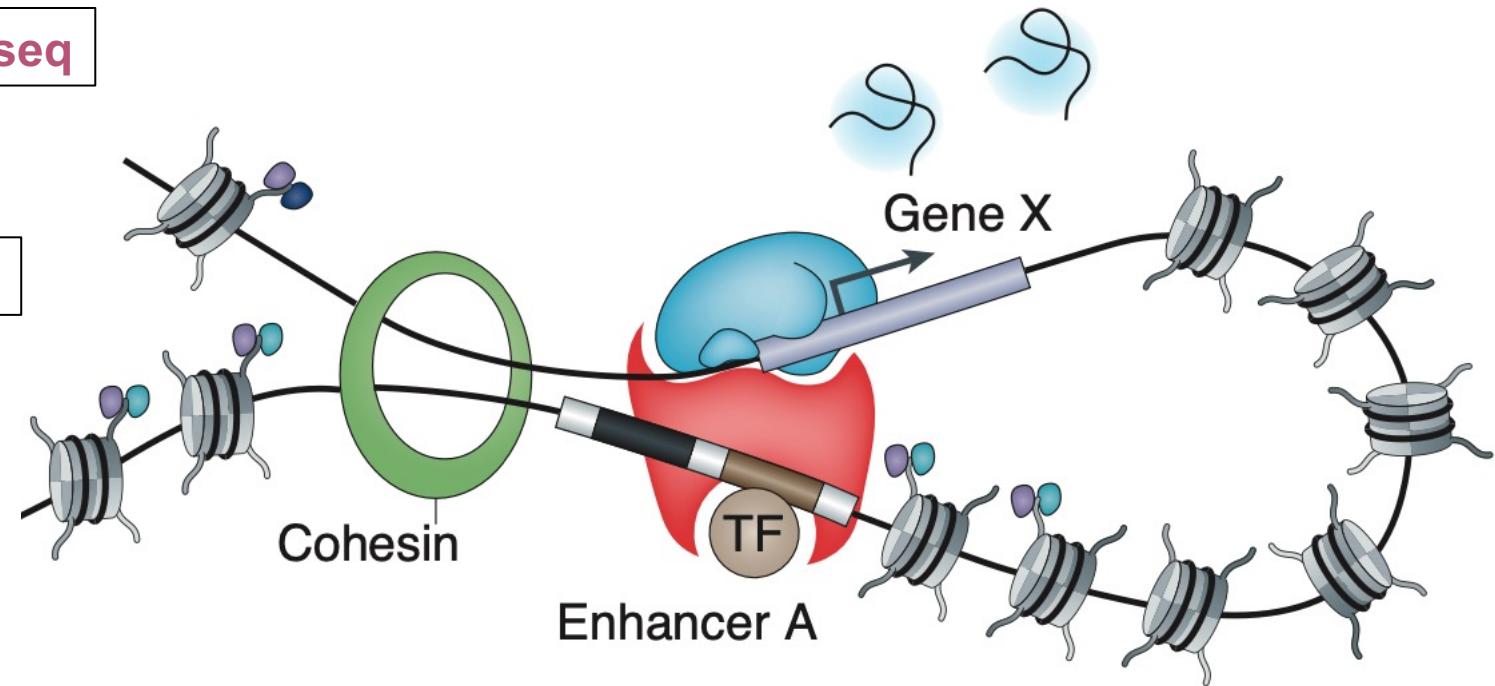
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- DNA } Nucleosomes: core chromatin structural unit  
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+ Histone PTMs  
+ Chromatin folding

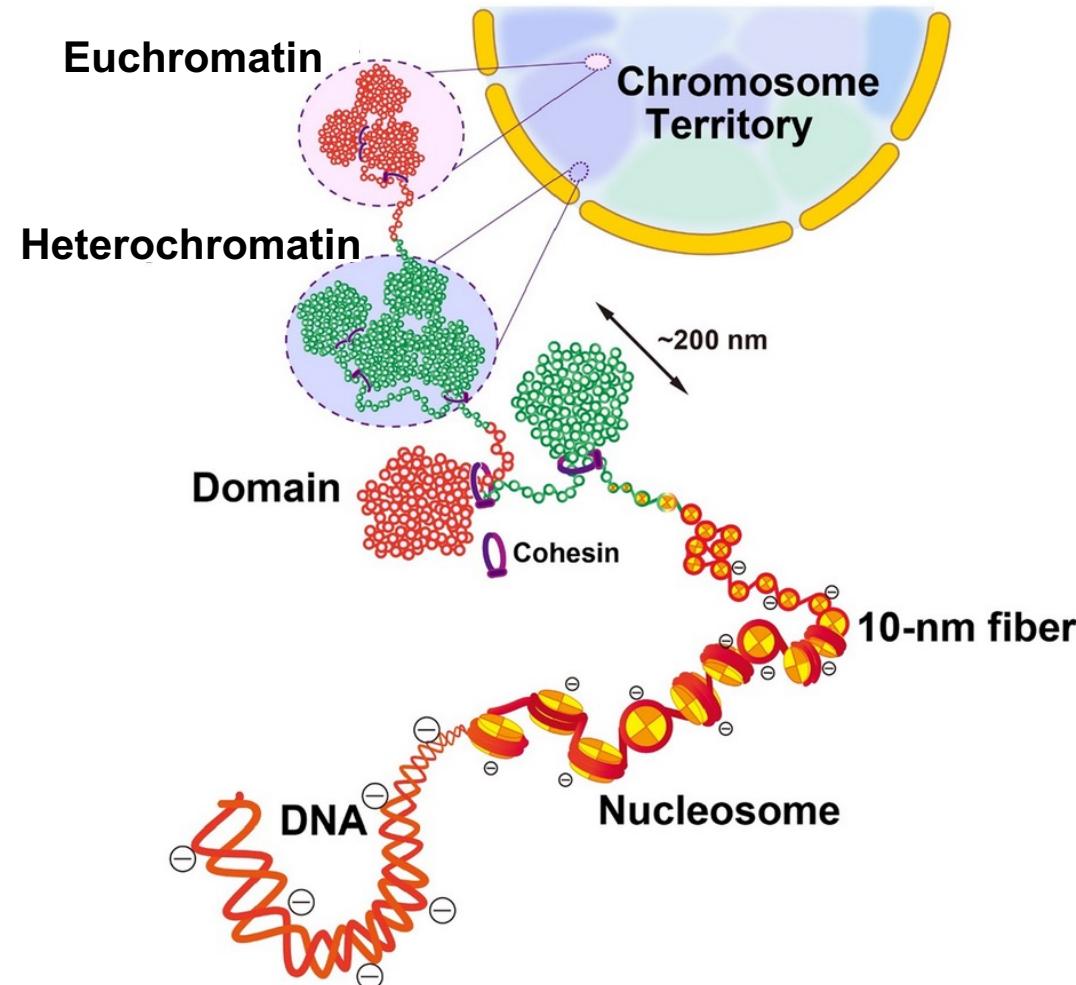


# Chromatin composition varies along the genome

- DNA      **WGS**
- + Histone cores      **ChIP-seq**
- + nucleosome positioning      **MNase-seq**
- + transcription factors      **ChIP-seq**
- + Promoter accessibility      **ATAC-seq**
- + Polymerase      **RNA-seq**
- + Histone PTMs      **ChIP-seq**
- + Chromatin folding      **Hi-C**
- Nucleosomes: core chromatin structural unit



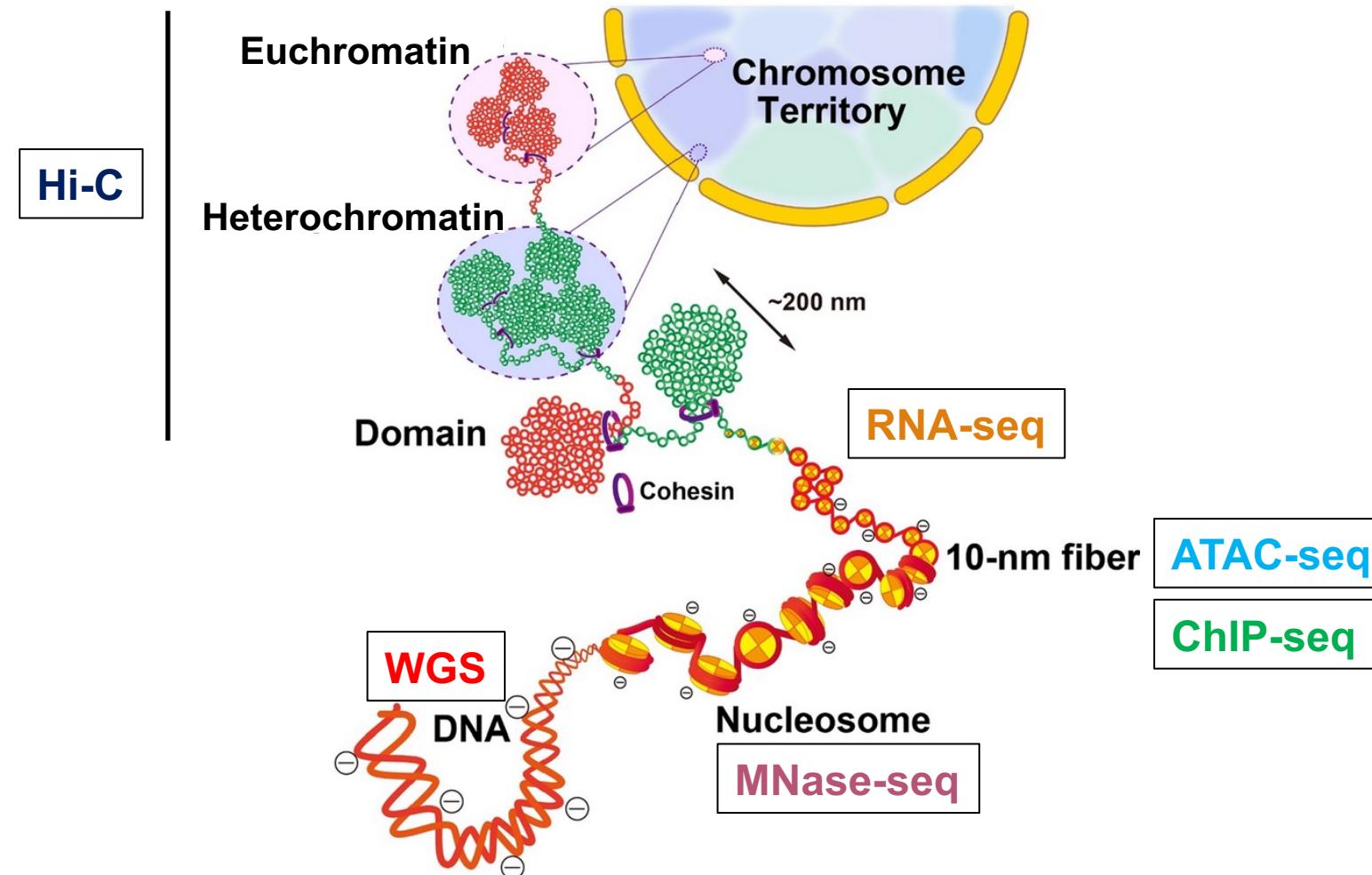
# Chromatin is organized in hierarchical structure to enable transcriptional regulation



Lafontain et al., Current Protocols 2021



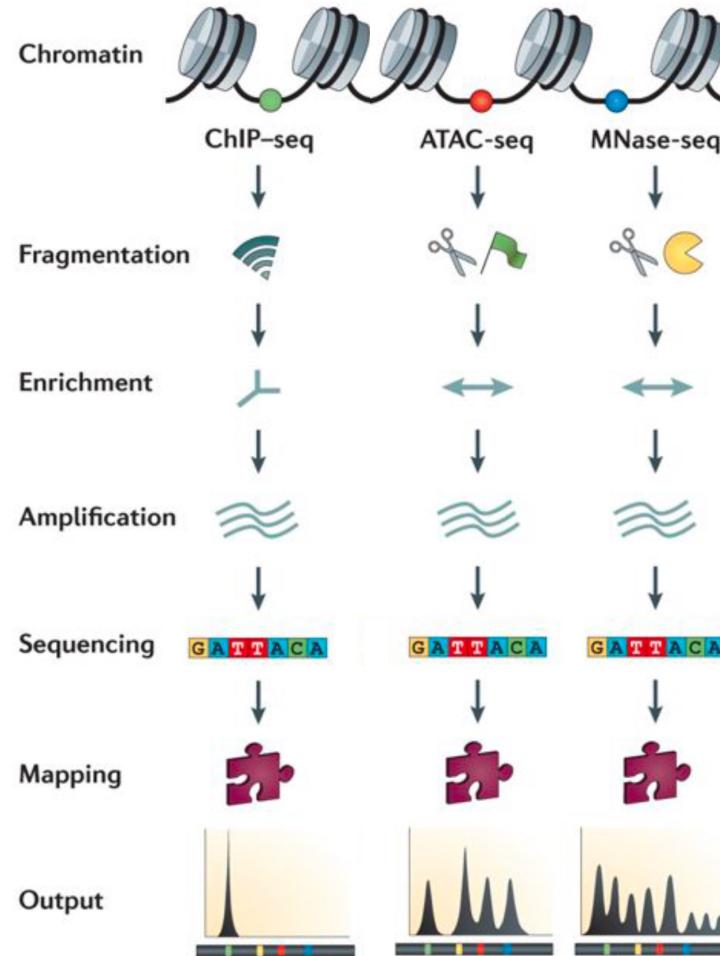
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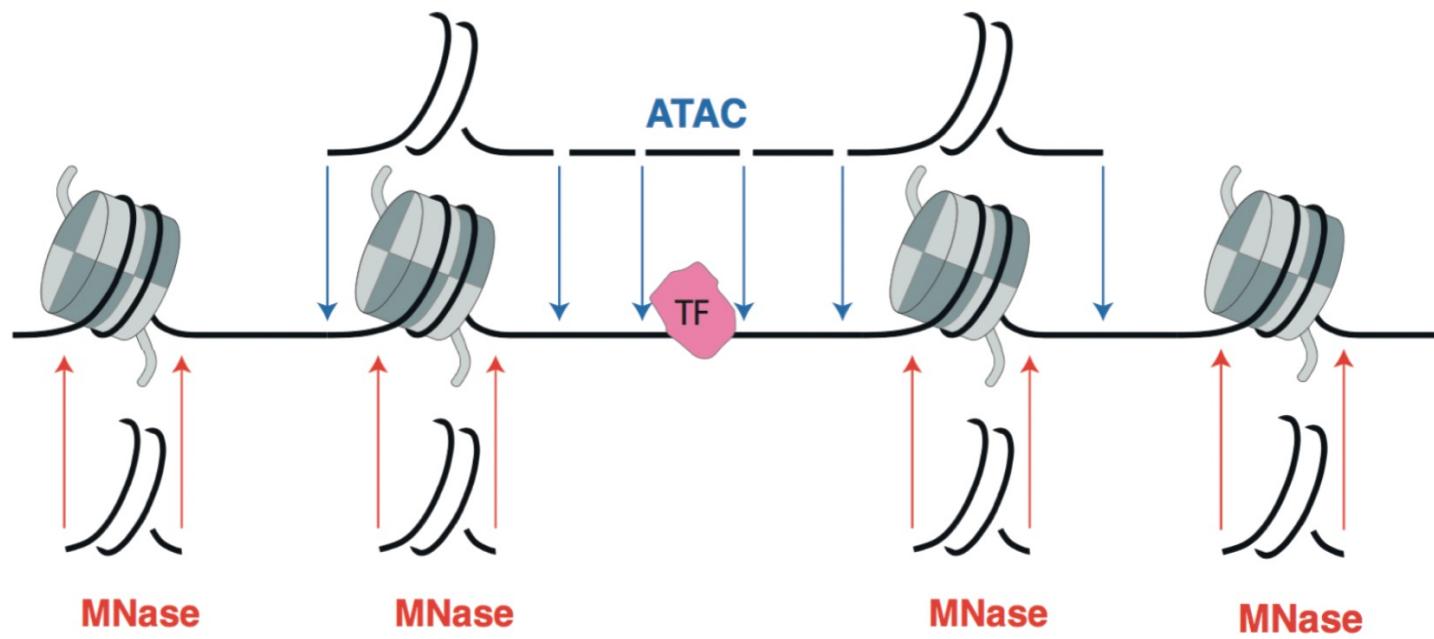
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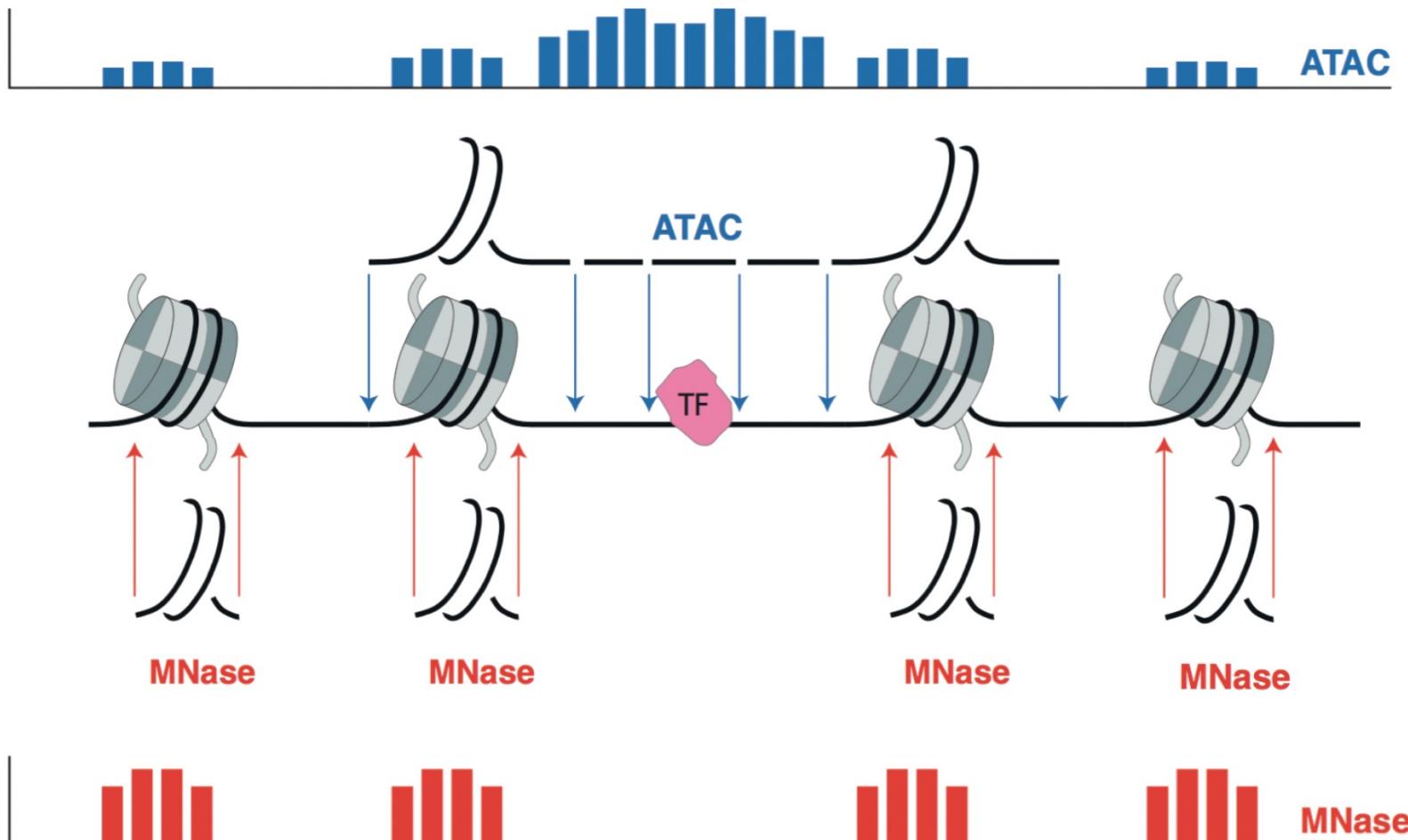
# ChIP-seq vs. ATAC-seq vs MNase-seq



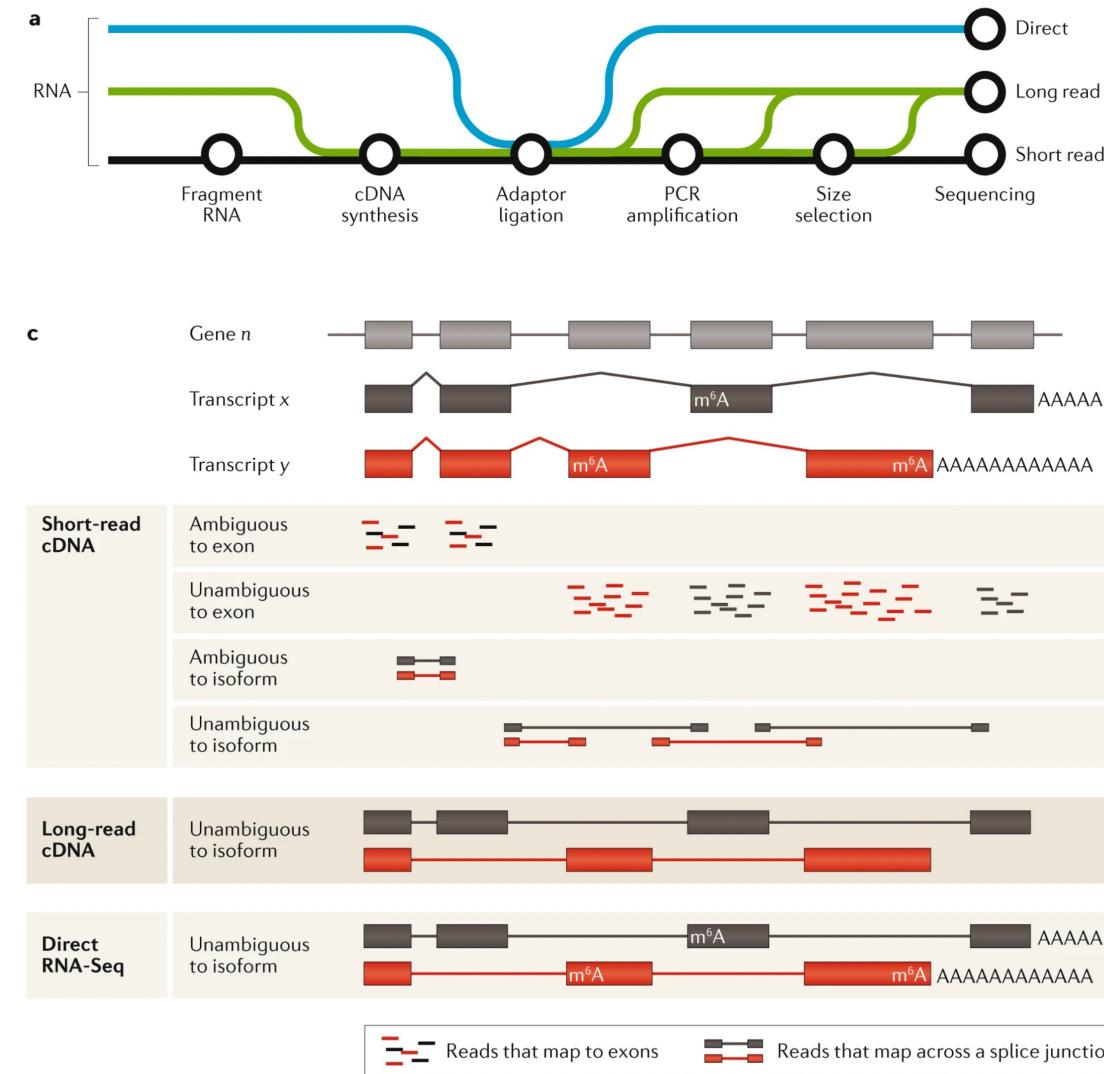
## ATAC-seq vs MNase-seq



## ATAC-seq vs MNase-seq



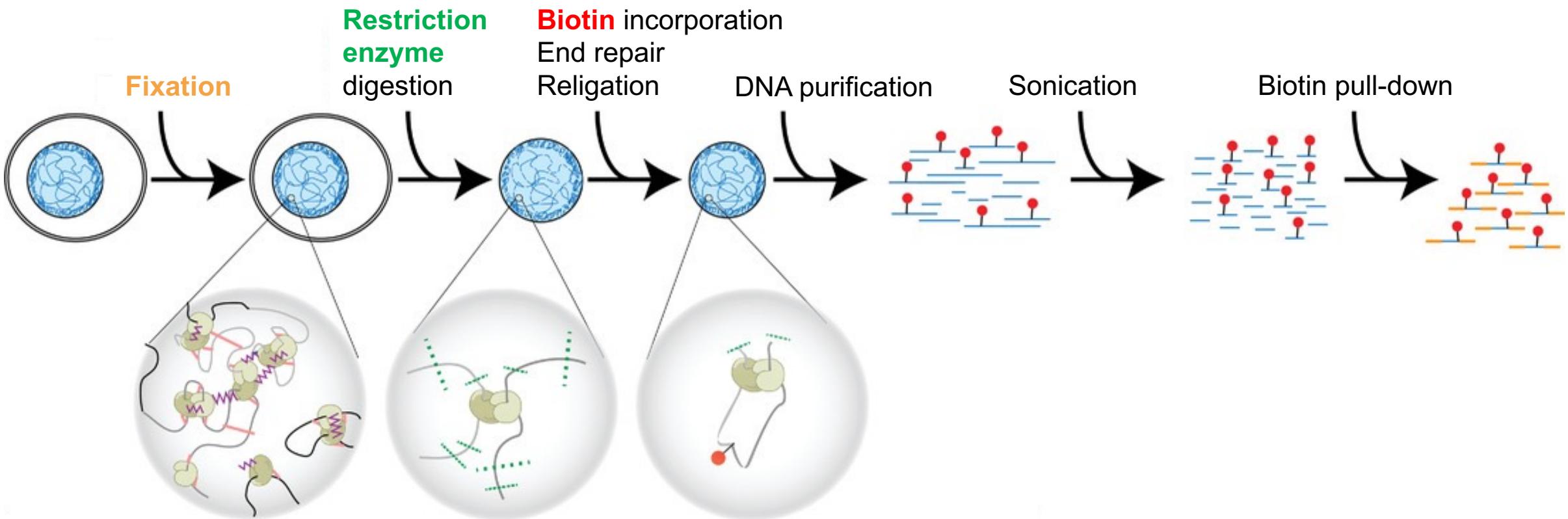
# RNA-seq



Stark, Grzelak & Hadfield 2019



# Hi-C



Lafontain et al., Current Protocols 2021

