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New insights into nucleosome positioning RAZVAN CHEREJI, JOSEFINA OCAMPO, TARA BURKE, DAVID CLARK, Natl Inst of Health - NIH — A human body contains enough DNA to circle the Earth's Equator more than 2.5 million times. Nevertheless, the entire genetic material is packed inside the tiny nuclei of our cells. The basic units of DNA packaging are called nucleosomes. Their locations on the chromosomes play an essential role in gene regulation. We study nucleosome positioning in yeast, fly and mouse, both in vivo and in vitro, and build biophysical models in order to explain the genome-wide nucleosome organization. We show that DNA sequence is not the major cause of the phased arrays of nucleosomes observed in vivo near the transcription start sites. We discuss simple models which can account for the formation of nucleosome depleted regions and nucleosome phasing at the gene promoters. We analyze the effects of different factors which influence the chromatin organization in living cells: existence of potential barriers and wells, sequence-dependent nucleosome affinity, nucleosome unwrapping, competition between different DNA-binding proteins, action of ATP-dependent remodelers, among others.

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