



# Chromosomal DNA and its packaging in the chromatin fiber, chromatin structure and function

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# 1. level

- Nucleosomes
  - Histones
    - H1
    - H2A
    - H2B
    - H3
    - H4

# "ATP-Dependent Chromatin-Remodeling Complexes

- Eucaryotic cells contain a large variety of ATP-dependent chromatin remodeling complexes
- Most are large protein complexes that can contain  $10 \leq$  subunits
- The energy of ATP hydrolysis
- Nucleosome sliding, histone exchange etc.

## 2. level

The long strings of nucleosomes are themselves compacted into a secondary helical structure, a cylindrical "solenoid" fiber

## “loop” formation (3. level)

- Each loop contains ~100-200 kb of DNA

# The "loop" formation

- Topoisomerase II (Topo II) is a major component of chromosomal scaffolds and essential for mitotic chromosome condensation
- Biochemical studies on interphase nuclei have suggested that genomic DNA contains regions associated with the scaffold/matrix approximately every 100 kb, a region called the scaffold/matrix attachment region (SAR/MAR)

# Final stage

- The formation of chromatid structure
- Mitotic chromosome is 10.000-fold shorter than its extended length

# The regulation of chromatin structure

1. Epigenetic inheritance
2. The covalent modification of core histone tails

# The covalent modification of core histone tails

- Lysine acetylation
- Lysine mono-, di-, tri- methylation
- Serin phosphorylation

*Reversible chemical changes*

*Enzymes (HAT, HDAC, HMT, HDM vs...)*