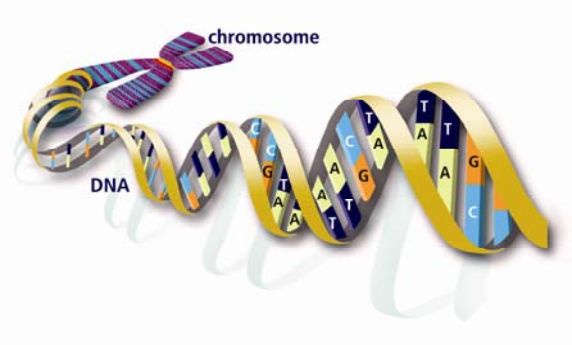
Understanding how DNA is packaged in a cell:

http://en.wikipedia.org/wiki/DNA



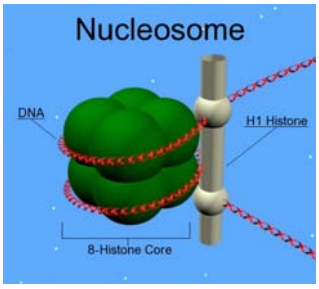
http://genomics.energy.gov/gallery/

We are all familiar with the images of DNA molecules as thread-like strands of double helix. Nevertheless, our 46 chromosomes are not merely made up of naked strands of DNA. The length of straightened out DNA in a single cell is nearly two meters long. And so, DNA must be packaged into cells in a highly compacted state so that it can fit inside the small space of the cell's nucleus.

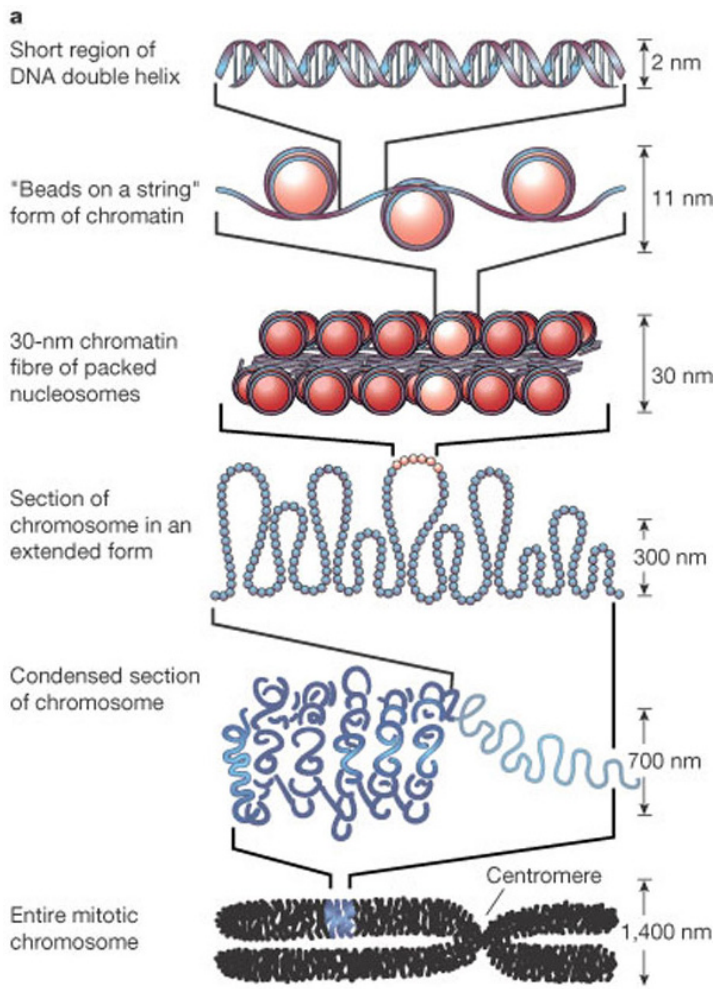
To package DNA inside the nucleus, cells wrap their DNA strands around scaffolding proteins to form a coiled condensed structure called chromatin. Chromatin is further folded into higher orders of structure that form the characteristic shape of chromosomes. Cells exert control over the compactness of the chromatin structure as a means to regulate gene expression. Genes in tightly condensed regions are not as accessible for gene expression. The figure illustrates the winding of DNA to form a 30 nm fiber of chromatin (the scaffolding proteins are not shown).

http://en.wikipedia.org/wiki/Chromatin

Histone proteins act like molecular spools that coil the strands of DNA into bead-like units called nucleosomes. A nucleosome contains eight histones wrapped by DNA, and serves as the repeated primary unit for organizing the higher levels of chromatin structure. There are two copies of four different types of histones in a nucleosome, each having specialized roles (H2A , H2B, H3, H4).



http://en.wikipedia.org/wiki/Nucleosome



a, The organization of DNA within the **chromatin structure**. The lowest level of organization is the **nucleosome**, in which DNA strand is wound around the outside of a **histone octamer**. Nucleosomes are connected to one another by short stretches of linker DNA. At the next level of organization the string of nucleosomes is folded into a fibre about 30 nm in diameter, and these fibres are then further folded into higher-order structures. At levels of structure beyond the nucleosome the details of folding are still uncertain.

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Visit this website: http://www.johnkyrk.com for the animation of chromosome structure.