Cellular & Organismal Diversity:

- Key Concepts:
  - the cells in your body take on diverse shapes & functions even though the genetic material in each of them is the same
  - diversity in cellular & organismal phenotype across individuals of the same species is due to differences in their genotypes that give rise to differences in protein expression
- How do we get diff. types of cells from the same DNA?
  - gene: a particular stretch of DNA that contains the info to specify the amino acid sequence of 1 protein
    - (other def.) some region of genomic sequence, corresponding to a unit of inheritance, that is associated w/ regulatory regions, transcribed regions, &/or other functional sequence regions
  - gene expression: the process of translating the info in DNA into functioning molecules w/ in cell
    - diff. cells express diff. genes; not every cell expresses every gene that's encoded in the DNA
  - a cell decides which protein it needs based on signaling pathways that interpret environmental (chemical) signals that interact w/ genetic regulation

Genes & Gene Regulation:

- Mechanisms of Gene Regulation:
  - Differential gene expression is responsible for creating diff. cell types & allows them to arrange into tissues & coordinate their activity to form the the multicellular society we call an individual
  - prokaryotes & eukaryotes can control gene expression at the levels of transcription, translation & post-translation
- Chromatin Remodeling: all gene expression starts w/ remodeling of chromatin
  - chromatin: proteins called histones are wound around DNA; 8 histones form the nucleosome which is coiled together into a structure (chromatin)

this compacted form of DNA needs to be unwound so that the DNA can be accessed

- Two major types of proteins involved in modifying chromatin structure:

ATP-dependent chromatin-remodeling complexes reshape chromatin

other enzymes catalyze the acetylation (addition of acetyl groups) & methylation (addition of methyl groups) of histones

acetylation of histones is usually associated w/ activation of genes

methylation of histones can be correlated w/ either activation or inactivation

- Acetylation & Deacetylation alter chromatin structure to influence gene expression

acetylation: attaching an acetyl group to a molecule