Chapter 11 Gene Expression

Cells use information in genes to build hundreds of different proteins, each with a unique function, but not all proteins are required by the cell at one time. By regulating gene expression, cells are able to control when each protein is made.

Role of Gene expression:
Gene expression is the activation of a gene that results in the formation of a protein.

- a gene is said to be "expressed", or turned on, when transcription occurs.
    - Some proteins play structural roles, others are enzymes, some serve only in immune responses.
    - We don't want genes (proteins being made) turned on if we don't need them.
        - Think about it – if your entire genome was turned on, you'd have skin the color of your eyes, hair the color of your eyes, perhaps legs growing out of your eyes, etc.
            - Genome – the complete genetic material contained within an individual.

Protein synthesis in Prokaryotes is controlled by "On-Off" switches

- When you eat or drink a dairy product, *E. coli* in your stomach absorbs the lactose and breaks down into it's 2 parts, glucose and galactose. This requires 3 different enzymes, which are each coded for by 3 different genes.
- There is an "on-off" switch that transcribes and then translates the 3 genes when lactose is present, and "turns off" the gene when lactose is not there (Operator).
- There is a promoter, which is a DNA sequence that recognizes the enzyme RNA polymerase, and thus promotes transcription.
- There are structural genes present that code for particular polypeptides (enzymes) to be made when lactose is present.
        - A group of genes that code for enzymes involved in the same function (structural genes), their promoter site, and the operator, all make up the operon.
        - The operon that controls the metabolism of lactose is called the lac operon.