READING STRATEGIES

As a college student, you have many reading assignments to balance. Here are some strategies to make your reading more effective.

How to Prepare for Reading

- Consider your environment. Make sure you're away from distractions like texting or music, and you can focus and be comfortable.
- Have everything ready before you start—books, places to take notes, and food or drinks. Then you can dive in!
- Make sure your body is ready to study. Get the sleep and nutrition you need to focus.
- Your mental state is important. Have a good attitude, be well-rested, and have a reward for when you're done reading.

Goals

- ☐ Evaluate where you read, when, and your state of mind. Identify 1-2 ways to improve and try it out for a week.
- ☐ Implement the SQ4R method [*see back*] in your reading for a week.
- ☐ Review how each goal went with your counselor.
- ☐ _____
- ☐ _____

Next Appointment

_____

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How to Read

You can use the SQ4R method to make sure you're reading as effectively as possible. It may seem like more work, but it will make your reading more efficient!

1) **Survey** what you will be reading. Look at the heading, subheading, and bold words to give you an idea of what you will be studying.

2) Begin each section by **questioning**. Turn the header into a question: "What is the genome? What does it do?" Then look for the answers as you read.

3) Begin **reading** each section. Ask yourself, "Am I understanding this?" If not, reread, look up words, etc., so you can answer your questions.

6 | REPRODUCTION AT THE CELLULAR LEVEL

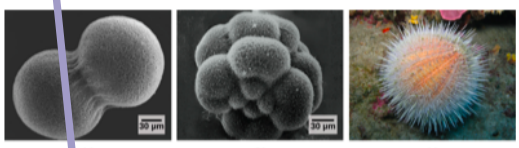

Figure 6.1 A sea urchin begins life as a single cell that (a) divides to form two cells, visible by scanning electron microscopy. After four rounds of cell division, (b) there are 16 cells, as seen in this SEM image. After many rounds of cell division, the individual develops into a complex, multicellular organism, as seen in this (c) mature sea urchin. (credit a: modification of work by Evelyn Spiegel, Louisa Howard; credit b: modification of work by Evelyn Spiegel, Louisa Howard; credit c: modification of work by Marco Busdraghi; scale-bar data from Matt Russell)

Chapter Outline

Introduction

The individual sexually reproducing organism—including humans—begins life as a fertilized egg, or zygote. Trillions of cell divisions subsequently occur in a controlled manner to produce a complex, multicellular human. In other words, that original single cell was the ancestor of every other cell in the body. Once a human individual is fully grown, cell reproduction is still necessary to repair or regenerate tissues. For example, new blood and skin cells are constantly being produced. All multicellular organisms use cell division for growth, and in most cases, the maintenance and repair of cells and tissues. Single-celled organisms use cell division as their method of reproduction.

6.1 | The Genome

By the end of this section, you will be able to:

- Describe the prokaryotic and eukaryotic genome
- Distinguish between chromosomes, genes, and traits

The continuity of life from one cell to another has its foundation in the reproduction of cells by way of the cell cycle. The cell cycle is an orderly sequence of events in the life of a cell from the division of a single parent cell to produce two new daughter cells, to the subsequent division of those daughter cells. The mechanisms involved in the cell cycle are highly conserved across eukaryotes. Organisms as diverse as protists, plants, and animals employ similar steps.

Genomic DNA

Before discussing the steps a cell undertakes to replicate, a deeper understanding of the structure and function of a cell's genetic information is necessary. A cell's complete complement of DNA is called its **genome**. In prokaryotes, the genome is composed of a single, double-stranded DNA molecule in the form of a loop or circle. The region in the cell containing this genetic material is called a nucleoid. Some prokaryotes also have smaller loops of DNA called plasmids that are not essential for normal growth.

In eukaryotes, the genome comprises several double-stranded, linear DNA molecules (Figure 6.2) bound with proteins to form complexes called chromosomes. Each species of eukaryote has a characteristic number of chromosomes in the nuclei of its cells. Human body cells (somatic cells) have 46 chromosomes. A somatic cell contains two matched sets of chromosomes, a configuration known as **diploid**. The letter *n* is used to represent a single set of chromosomes; therefore a diploid organism is designated 2*n*. Human cells that contain one set of 23 chromosomes are called **gametes**, or sex cells; these eggs and sperm are designated *n*, or **haploid**.

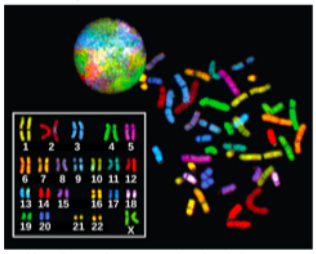

Figure 6.2 There are 23 pairs of homologous chromosomes in a female human somatic cell. These chromosomes are viewed within the nucleus (top), removed from a cell in mitosis (right), and arranged according to length (left) in an arrangement called a karyotype. In this image, the chromosomes were exposed to fluorescent stains to distinguish them. (credit: "718 Bot"/Wikimedia Commons, National Human Genome Research)

The matched pairs of chromosomes in a diploid organism are called **homologous chromosomes**. Homologous chromosomes are the same length and have specific nucleotide segments called **genes** in exactly the same location, or **locus**. Genes, the functional units of chromosomes, determine specific characteristics by coding for specific proteins. Traits are the different forms of a characteristic. For example, the shape of earlobes is a characteristic with traits of free or attached.

Each copy of the homologous pair of chromosomes originates from a different parent; therefore, the copies of each of the genes themselves may not be identical. The variation of individuals within a species is caused by the specific combination of the genes inherited from both parents. For example, there are three possible gene sequences on the human chromosome that codes for blood type: sequence A, sequence B, and sequence O. Because all diploid human cells have two copies of the chromosome that determines blood type, the blood type (the trait) is determined by which two versions of the marker gene are inherited. It is possible to have two copies of the same gene sequence, one on each homologous chromosome (for example, AA, BB, or OO), or two different sequences, such as AB.

Minor variations in traits such as those for blood type, eye color, and height contribute to the natural variation found within a species. The sex chromosomes, X and Y, are the single exception to the rule of homologous chromosomes; other than a small amount of homology that is necessary to reliably produce gametes, the genes found on the X and Y chromosomes are not the same.

4) Stop after every section and **recite** (write or tell yourself) what you have read. Reread if you can't remember or are still confused.

5) Once you have finished the entire reading, **relate** what you have learned to what you already know from past chapters. Answer any last questions.

6) **Review** the text, make sure you understand each section, and reread if you have forgotten stuff. This puts information into long-term memory.

Textbook Sample: Samantha Fowler, Rebecca Roush, and James Wise, Concept of Biology , available through OpenStax.