

Precepts of Anatomy & Physiology



The Human Body

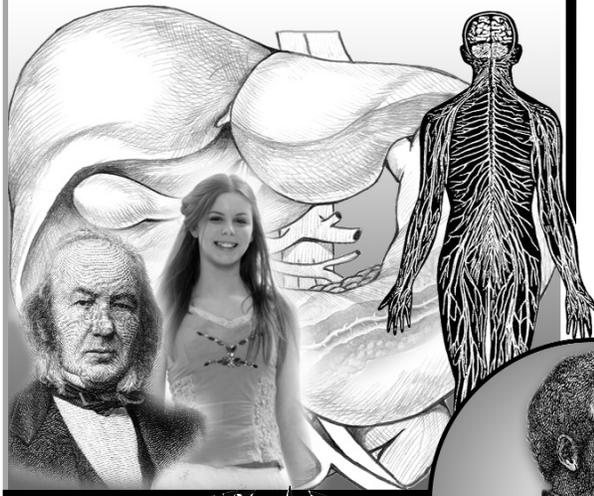
Lesson 1

Chapter 1

Section 1

Lessons 1-5

THE HUMAN BODY: ORGANIZATION



VOCABULARY

Anatomy: from Greek words meaning “to cut” or “to dissect”

Dissection: the cutting up of a dead body into sections for scientific study

Vivisection: to cut or section, to operate on a living body

Cadaver: a dead body; specifically one intended for dissection

Tissue: mass of similar cells that performs a specific function

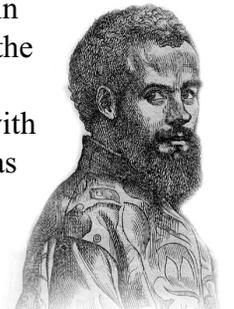
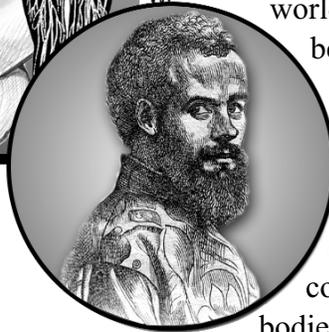
Organ: a group of tissues that work together to perform a specific function

Organ system: a group of organs that perform closely related functions

Studies of the human body, its workings and its origins, have fascinated scientists for thousands of years. Both biology and **anatomy** are rooted in the healing arts. The founder of anatomy as a scientific discipline was a Greek surgeon named Herophilus in the first part of the third century B.C., who pioneered the study of human **dissection** using hundreds of corpses. He also founded a school of anatomy.

A hundred years later Rome ruled the world, and another Greek named Galen became the most important physician in the Roman Empire. Rome, however, had harsh laws against dissection of human corpses. Although fatally wounded gladiators or other nearly-dead victims of the Roman arena could be **vivisectioned**; once dead, the bodies could not be cut. Therefore, Galen performed most of his experiments on apes and other animals.

For various reasons, dissection of **cadavers** in the study of human anatomy was not allowed until the time of Andreas Vesalius (1514-1564). Vesalius, a Flemish physician, was a devout Roman Catholic with a tremendous respect and awe for the human body as a product of creation. Vesalius developed a great interest in anatomy by studying the body parts of human cadavers. After completing a medical degree at age 22, Vesalius taught younger medical students by performing dissections during medical lectures. Although his methods were considered radical for his time, at the age of 28 Vesalius was able to write the most accurate and comprehensive book on human anatomy ever written up to that time. The 600-page work was lavishly illustrated with 300 detailed, hand-made engravings. His book boldly challenged contemporary medical teachings on how the human body operates. Galen’s works, which contained many



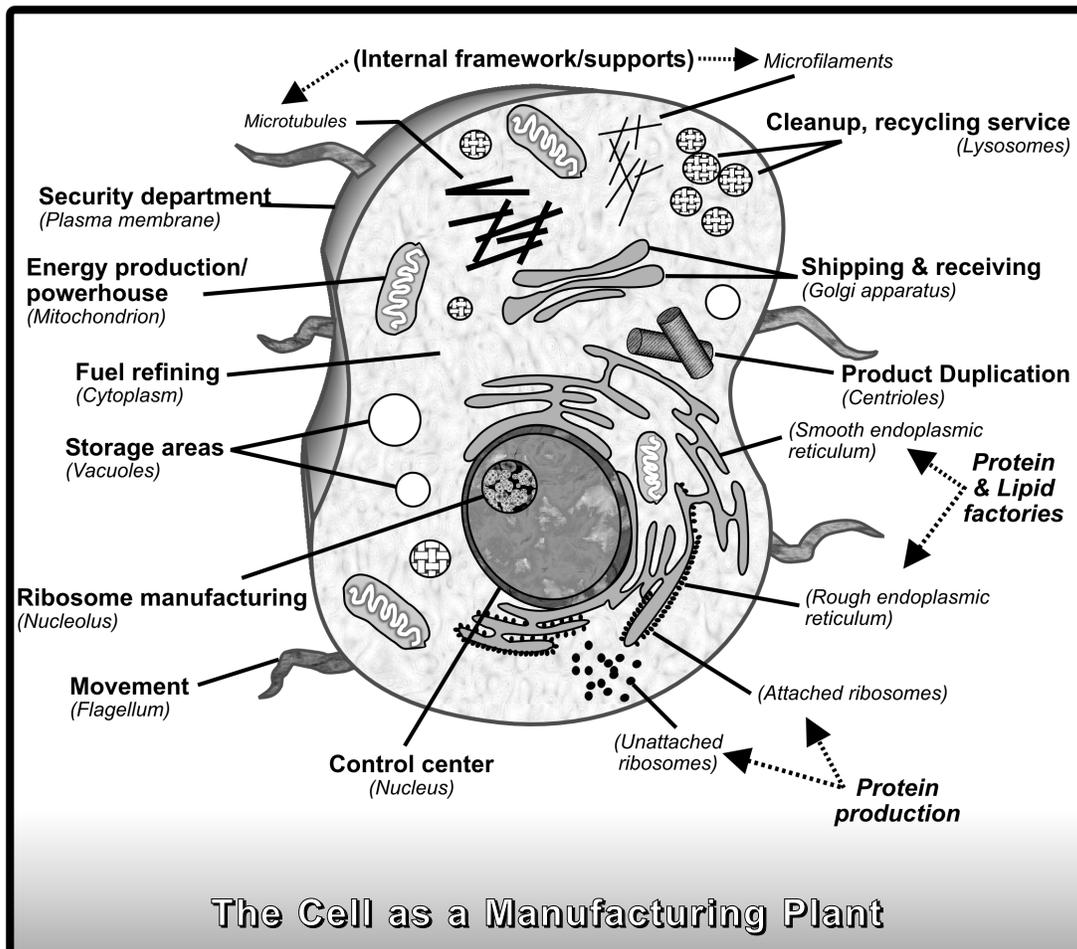
Andreas Vesalius

errors, had been the standard medical reference for nearly 1500 years. Many traditional anatomists who revered Galen attacked Vesalius' book, but were not able to refute Vesalius' arguments. His text and the vivid drawings were verified by meticulous dissection of human cadavers.

Hundreds of years ago, before the advent of advanced technology, Vesalius firmly believed humans were the product of a master designer. Today, scientists are still awed by the incredible human body. Webster's dictionary defines design as a plan, a scheme, a project or a purpose with intention or aim. The evident design of human beings is causing many to question the theory of human evolution. Biologists are recognizing that human beings reflect the ultimate in anatomical precision.

LEVELS OF ORGANIZATION

The human body consists of an estimated 30 to 100 trillion cells, depending on the size of the individual. Each of these cells has a purpose of its own, but each is also part of something much larger. Among Earth's over six billion people, every person is an individual. However, most people associate in groups. The most basic of these groups is the family. Communities, counties, states and nations form groups of people who work together to organize and operate governments. Because human beings are complex creatures, they reflect many organizational levels that keep societies running properly. The human body functions in a similar way, constructed according to levels of cell organization that increases in size and complexity.



Cells form the basic structural and functional units of life; they are the smallest living parts of our bodies. The trillions of human body cells are nearly alike, chemically speaking, but “are as different as animals in a zoo” in terms of appearance and function. The remarkable complexity and organization within each cell operates much like the operation of a manufacturing plant.

Groups of cells are programmed to come together to form **tissues**. Your body contains many tissues. Five basic types of tissues are: *epithelial*, *connective*, *nerve*, *bone* and *muscle tissues*. *Epithelial tissue* covers interior and exterior body surfaces. *Connective tissue* provides support for the body and connects all its parts. *Nerve tissues* transmit nerve impulses throughout the body. *Bone tissue* provides body framework, strength and freedom of movement. *Muscle tissues* connect with bones to enable the body to move efficiently.

ORGANS

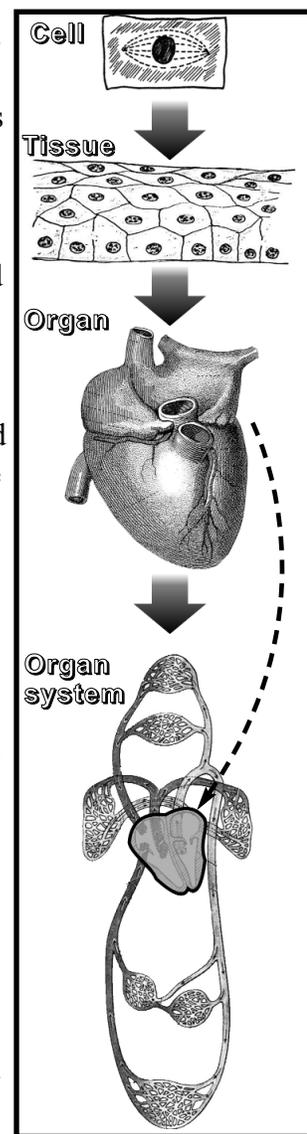
A group of tissues united together to perform a single function is called an **organ**. The eye is an organ made up of epithelial tissue, nerve tissue, muscle tissue and connective tissue. Even though these tissues are very different, they all work together to perform a single function.

ORGAN SYSTEMS

Two or more organs, along with their associated structures, join forces to perform certain vital functions, such as digestion or reproduction. A group of organs working together is called an **organ system**. For example, the eye is one of the organs of the nervous system which gathers information about the outside world and uses it to control many of the body’s functions.

The human body consists of eleven marvelous organ systems, each with its own job but all highly interdependent. Unfortunately, when these systems operate well, we tend to take them for granted—scarcely giving them a passing, grateful thought.

The main job of the *skeletal system* is to protect our inward parts and to support us. Muscles of the *muscular system* help us move and respond to external stimuli. The task of the *endocrine system* is to maintain order among the body’s trillions of cells. Both the *digestive* and the *respiratory systems* provide raw materials to sustain daily functions and to enhance growth. Both systems also help discard wastes. The *circulatory system* transports nutrient and oxygen-rich blood throughout the body. The *excretory system* rids our body of liquid and solid wastes. The *nervous system* interprets and responds to stimuli from outside, as well as from inside the body. The job of the *reproductive system* is to ensure survival of mankind. The *integumentary system* is the skin that fits us like a “seamless body stocking”, holding the whole body together and helping protect us from invading



bacteria. The *immune system* (includes the *lymphatic system*) fights off invading germs and provides protection from diseases and parasites.

The intricate organization of cells, tissues and organs combine to make human life rich with stimulating experiences, such as the skillful hand of a pianist, the eye and brain focus required in reading this text, or the muscle coordination of a world-class gymnast. No other creature in the animal kingdom performs the diverse talents and skills operative in human beings.

A bird may sing, but it cannot lead an orchestra. A flock of geese may fly in a wedge formation, but a goose cannot design an airplane. A chimpanzee may crack a nut, but it cannot operate a pecan farm or design an orchard. A dog may play with a ball, but it cannot write a poem or send an e-mail to a friend. Only humans have the intelligence for these and countless other activities.

In the next lesson, we will examine the communication and control within the human body.

LIFE PRINCIPLE



“The great thing in this world is not so much where we are, but in what direction we are moving.”

—Oliver Wendell Holmes (1809-1894), American physician and writer