A literal Greek translation of the word anatomy is “cutting open”. **Anatomy** as it is used today is the study of internal and external structures and the physical relation among body parts.

**Physiology** is another word adopted from the Greek. As we use physiology today is the study of how living things perform their vital functions. In simple terms, it is how the anatomical parts work.

**Anatomy & Physiology** are generally studied together because they are intimately related. The anatomical **FORM** provides clues as to how the physiology **FUNCTIONS**. The old idea that “FORM follows FUNCTION and Function follows Form” is really true here.

In the past, the structures of the body were well known, but sometimes the structures eluded our understanding. For example, the anatomy of the human heart was clearly described in the 1400s, but it wasn’t till the 1600s that the pumping action of the heart was demonstrated (by William Harvey).

• These are the basic characteristics of all living things, however, more complex organisms (like humans) require some other functions in order to accomplish these.

• We are going to look at two specific subjects, Anatomy & Physiology, as they relate to the human body.

• As we go through the course, you will find it useful to learn some common prefixes and suffixes. Many anatomical words have Greek origins, because Galen who was the first world famous anatomist was Greek, and many of the terms he coined are still used today.

Movement: can be internal (moving nutrients, etc.) or external (moving the organism, or parts there of) or both.

**Metabolism & Excretion**: organisms carry out complex chemical rxns. to convert stored energy to a form that is useful for living. They also synthesize proteins, nucleic acids, fats, and carbohydrates. This chemistry is known as the Metabolism of organisms. The body also produces waste materials from these rxns.. These wastes need to be evacuated from the body, and this is known as excretion.

All living things share certain characteristics:

**Responsiveness**: organisms respond to their environment (adaptability)

**Growth & Differentiation**: all organisms start out as one cell, but most grow by adding more cells. Some cells become specialized for performing certain functions. This is called differentiation. Growth and differentiation often cause changes in form and function.

**Reproduction**: organisms make successive generations of similar organisms.
Anatomy

There are basically two types of Anatomy, that depend on the level of detail you are interested in:

Microscopic Anatomy: requires optical instruments to see, and is anatomy in fine detail (i.e.- Microvilli on the intestinal wall which absorb nutrients).

Gross Anatomy (Macroscopic Anatomy): (The word gross coming from the German, meaning Large): can be seen with the naked eye (i.e.- the small intestine)

Microscopic Anatomy comprises two basic disciplines: Cytology and Histology

Cytology: is the analysis of the internal structure of living cells. Our lives depend on the chemical processes that happen within the trillions of cells that make up our bodies, and their organelles.

Histology: involves the study of tissues. Tissues are groups of specialized cells and cell products that work together to perform specific functions.

Organization of the human body (smallest to largest):

atom → molecule → cell → tissue → organ → organ system → organism

Gross Anatomy involves the examination of relatively large structures that can be approached in several ways

Surface Anatomy: study of general form and superficial markings.

Regional Anatomy: study of anatomical organization in a specific part (region) of the body. Often the form used in advanced anatomy courses.

Systematic Anatomy: study of the entire organ system (digestive, reproductive, cardiovascular, etc.). Looks at how the groups of organs function in a coordinated manner.

There are 11 organ systems in the human body.

Developmental Anatomy: looks at the changes in form that occur from conception through adulthood. The most extensive change takes place between conception and 2 months. The study of the early period is known as Embryology.

There are several other anatomical specialties that are important in a clinical setting:

Medical Anatomy (looks at changes that take place during illness)

Radiographic Anatomy (anatomical structures as seen by special imaging equipment)

Surgical Anatomy (anatomical landmarks that are important in surgery)

*Physician typically use a combination of anatomical, physiological an behavioral information when they evaluate a patient.

Physiology

Human Physiology is the study of functions of the human body. These tend to be complex and more difficult to study than Anatomy.

Cell Physiology: The study of the function of living cells. This discipline deals with the chemical rxns. within and between cells.

Special Physiology: The Study of the physiology of specific organs (i.e.- Cardiac Physiology is the study of how the heart works)

Systematic Physiology: The study of all aspects of the function of specific organ systems. (i.e.- Cardiovascular Physiology).
**Pathological Physiology:** the study of the effects of diseases on organs or organ systems. “Pathos” is the Greek word for disease. Modern medicine involves an understanding of both normal and pathological physiology.

*It is important to understand that things that adversely affect any ONE level or organization will eventually end up affecting ALL levels of organization.

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**The Human Organ Systems**

There are 11 systems in the human body

They are:

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<table>
<thead>
<tr>
<th>Organ System</th>
<th>Major Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integumentary system</td>
<td>Protection from environmental hazards; temperature control</td>
</tr>
<tr>
<td>Skeletal system</td>
<td>Support; protection of soft tissues; mineral storage; blood formation</td>
</tr>
<tr>
<td>Muscular system</td>
<td>Locomotion; support; heat production</td>
</tr>
<tr>
<td>Nervous system</td>
<td>Directing immediate responses to stimuli, generally by coordinating the activities of other organ systems</td>
</tr>
<tr>
<td>Endocrine system</td>
<td>Directing long-term changes in the activities of other organ systems</td>
</tr>
</tbody>
</table>

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**Homeostasis**

There are two general mechanisms involved in homeostatic regulation

1. **Autoregulation**
   - Occurs when activities of cell, tissue, organ or organ system automatically compensate for environmental variation.
   - (i.e. when cells need more O₂, they release chemicals which dilate blood vessels in the immediate area)

2. **Extrinsic Regulation**
   - Occurs when the nervous or endocrine systems control or adjust many systems simultaneously
In general, the nervous system responds:
- fast
- locally
- specifically

i.e. - octopus color

The endocrine system responds:
- slowly
- globally (systemically)
- affects many tissues or organs
- the effects may last for days or weeks

i.e. - chameleon color

The endocrine system accomplishes this task by releasing chemicals called hormones into the circulatory system.

Homeostatic control requires three parts
1. receptor (sensor)
2. a control center (integration of information)
3. an effector (control center that responds to the cell, tissue or organ)

Negative Feedback

Most homeostatic mechanisms work through a regulation mechanism known as negative feedback.

During negative feedback the effectors act to either oppose or eliminate the initial stimulus.

Positive Feedback

Some feedback mechanisms are positive. In positive feedback some stimulus initiates a response which exaggerates or enhances the original stimulus.

i.e. - gag reflex, labor, etc.
Anatomical Landmarks

Anatomical Position

- supine (AP faces up)
  - prone (AP faces down)

<table>
<thead>
<tr>
<th>Structure</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cephalon (head)</td>
<td>Cephalic region</td>
</tr>
<tr>
<td>Cervix (neck)</td>
<td>Cervical region</td>
</tr>
<tr>
<td>Thoracic (thorax or chest)</td>
<td>Thoracic region</td>
</tr>
<tr>
<td>Brachium (arm)</td>
<td>Brachial region</td>
</tr>
<tr>
<td>Antebrachium (forearm)</td>
<td>Antebrachial region</td>
</tr>
<tr>
<td>Manu (hand)</td>
<td>Manual region</td>
</tr>
<tr>
<td>Abdomen</td>
<td>Abdominal region</td>
</tr>
<tr>
<td>Lumbus (loin)</td>
<td>Lumbar region</td>
</tr>
<tr>
<td>Gluteus (buttock)</td>
<td>Gluteal region</td>
</tr>
<tr>
<td>Pelvis</td>
<td>Pelvic region</td>
</tr>
<tr>
<td>Pubis (anterior pelvis)</td>
<td>Pubic region</td>
</tr>
<tr>
<td>Inguen (groin)</td>
<td>Inguinal region</td>
</tr>
<tr>
<td>Femur (thigh)</td>
<td>Femoral region</td>
</tr>
<tr>
<td>Crus (anterior leg)</td>
<td>Crural region</td>
</tr>
<tr>
<td>Sura (call)</td>
<td>Sural region</td>
</tr>
<tr>
<td>Pes (foot)</td>
<td>Pedal region</td>
</tr>
<tr>
<td>Planta (sole)</td>
<td>Plantar region</td>
</tr>
</tbody>
</table>

Abdominalpelvic Quadrants
Many internal organs are suspended in internal chambers called body cavities. These cavities have two essential functions.

1. They protect delicate organs, such as the brain & spinal cord, from accidental shocks and cushions them from thumps and bumps that occur during walking, jumping, and running.

2. They permit significant changes in size and shape of internal organs. i.e.- lungs, heart, stomach, intestines, urinary bladder, etc. can expand and contract w/o distorting surrounding tissue.
**Dorsal cavity**
- Found within the skull and vertebral column.
- Contains two subdivisions
  - A. Cranial cavity
  - B. Spinal cavity

**Ventral Cavity**
- Often divided as follows
  - A. Thoracic cavity
    1. Pleural cavity
    2. Pericardial cavity
  - B. Abdominopelvic cavity
    1. Abdominal cavity
    2. Pelvic cavity
    3. Scrotal cavity (males only)