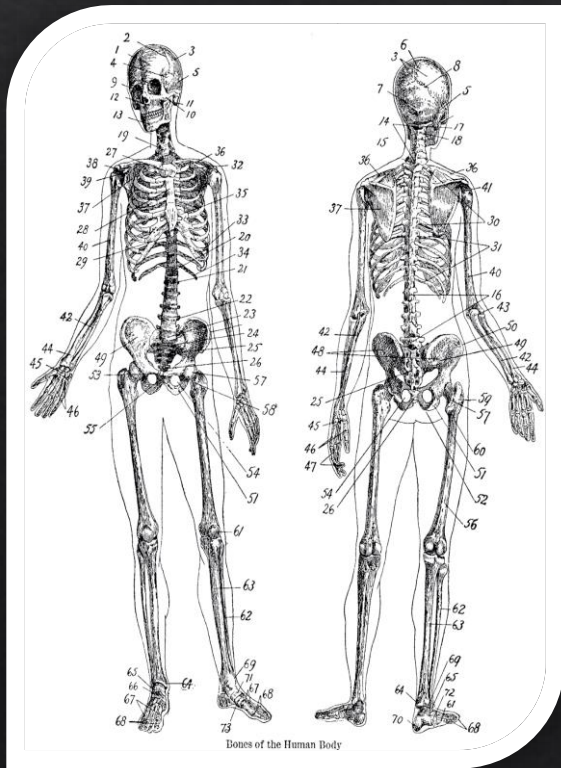


# English Tutorial Classes

## Week 1

### Basic Human Anatomy/Physiology



Junior Researcher: Anja Petrović

Faculty of Sport and Physical Education, University of Niš,  
Serbia

# The Body in Sports

The human body is a highly complex living 'machine' and anatomy deals with the study of the component parts and structure of the body.

Developing an understanding of the body's construction enables a better comprehension of its responses to exercise and training.



# Cells - THE Building Blocks of Life

Human **cells** are the basic building blocks of the human body, and they are the structural and functional units of life.

The human body is composed of millions of small, living cells that collectively form our skin, bones, muscles, brains, and other body parts.

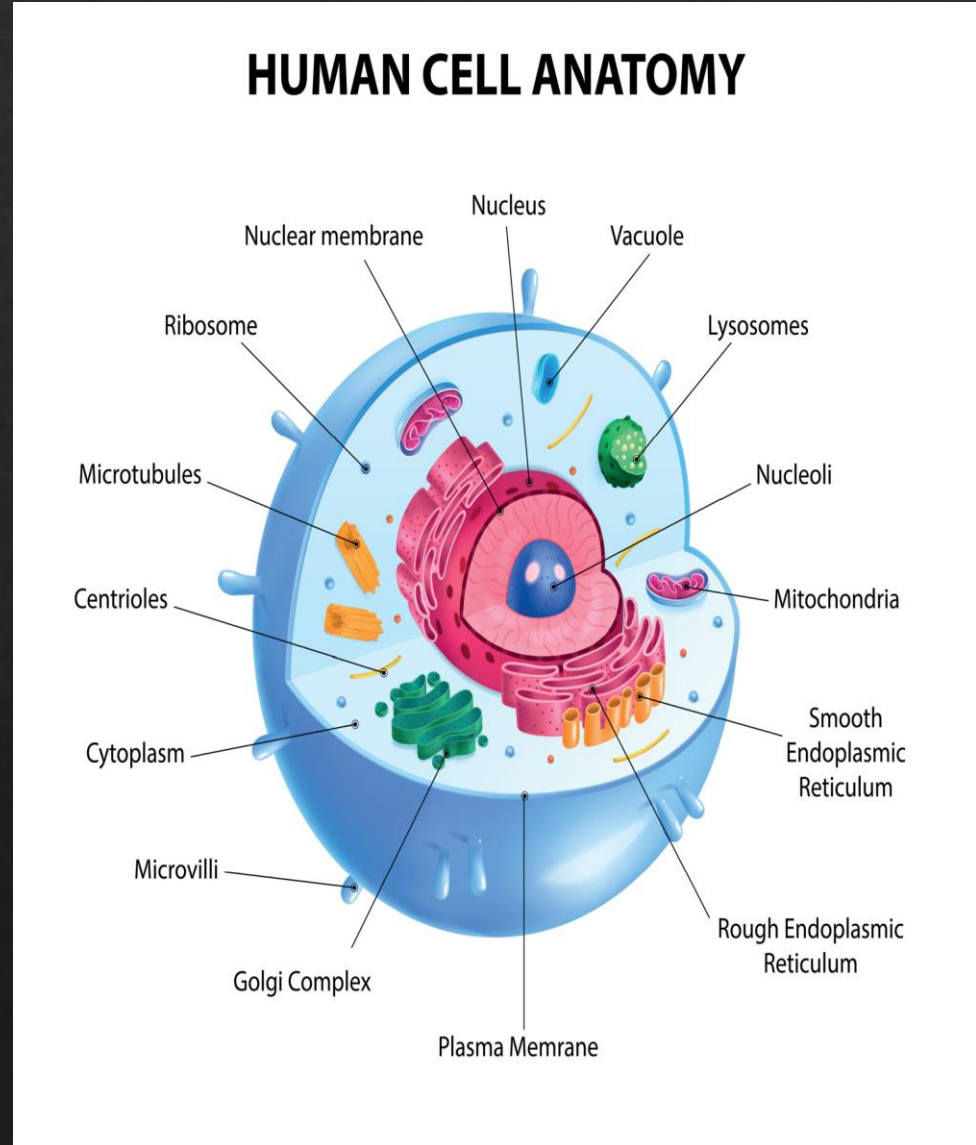
Cell Types:

**Nerve cells** transmit electrical messages.

**Red blood cells** transport oxygen throughout the body.

**Bone cells** provide support for the skeletal system.

**Muscle cells** generate force for body movement.



# The Skeleton

Humans, much like many other large animals, possess an internal framework known as a skeleton, comprising bones and supportive structures. The skeleton serves three crucial purposes:

- Support
- Protection
- Movement

All bones share a common basic structure. As a baby develops in the mother's womb, certain cells give rise to a resilient and flexible material known as cartilage. Throughout childhood and adolescence, a significant portion of this cartilage undergoes a gradual transformation into bone.

# The Skeleton

The human skeleton comprises over two hundred bones.

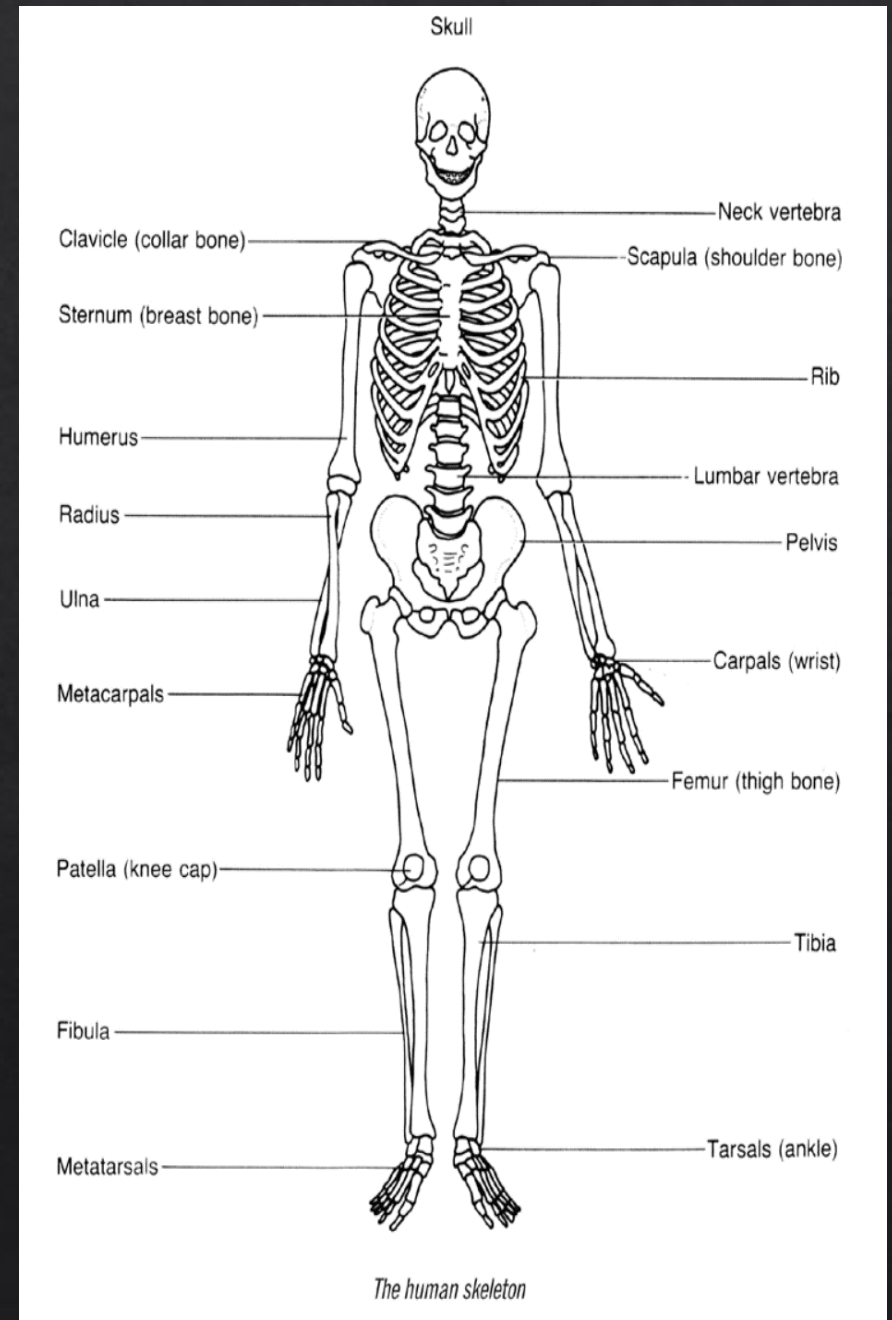
Bones are classified into five main categories: Long (**FEMUR, HUMERUS**)

Short (**TARSAL BONES OF THE FOOT, CARPALS**)

Flat (**FRONTAL BONE OF THE SKULL, SCAPULA, STERNUM**)

Irregular (**VERTEBRAE**)

Sesamoid (**KNEECAP**)



# Muscles

The human body contains over 600 muscles, constituting approximately 40% of its weight.

Bones experience movement at joints due to the contraction and relaxation of muscles connected to them.

The muscles consist of long, thin muscle fibers.



**FACIAL MUSCLES**- these muscles are involved in facial expressions

**PECTORAL MUSCLE**-brings arm to side and across chest

**THORAX**-links the ribs, contracts and relax in respiration

**ABDOMEN** – arranged in sheets and protect abdominal organs

**FLEXORS** – bend wrist and fingers

**ADDUCTORS**- thighs

**RECTUS FEMORIS**- bends hip joint and strengthens knee

**SARTORIUS** – bends knee and hip joints

**SKELETAL MUSCLES:**

### 1. **BICEPS**

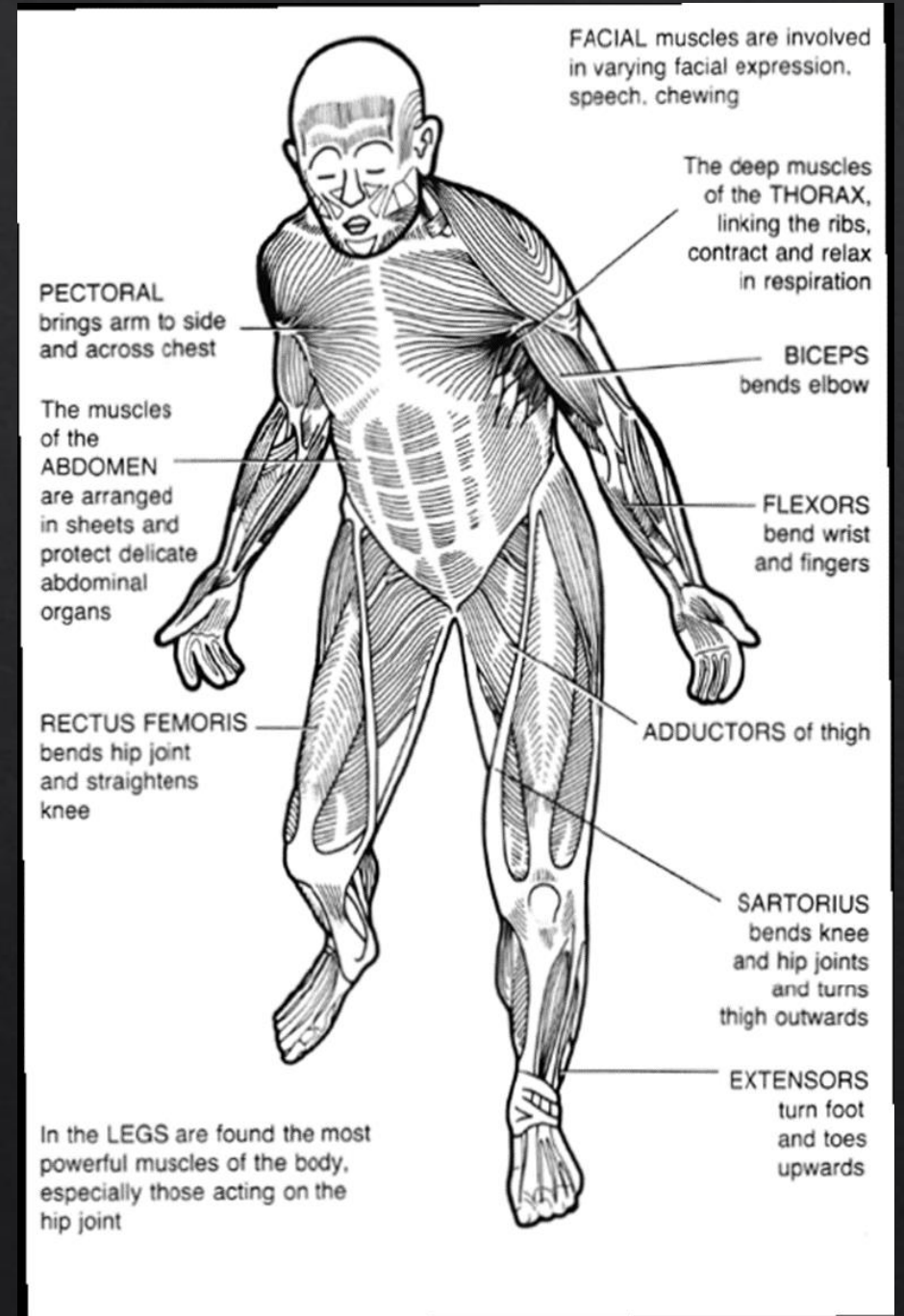
Function: Flexes the elbow joint, supinates the forearm (rotates it palm up), and assists in shoulder flexion.

### 2. **TRICEPS**

Function: Extends the elbow joint, allowing for straightening of the arm.

### 3. **HAMSTRINGS**

Function: Group of muscles on the back of the thigh that flex the knee joint and extend the hip joint.



**EXTENSORS** – straighten the wrist and fingers

**TRICEPS**- straightens elbow

**DELTOID**- raises arm

**TRAPEZIUS** – raises shoulder and pulls back head

**LATISSIMUS DORSI**- draws arm backwards and turns it inwards.

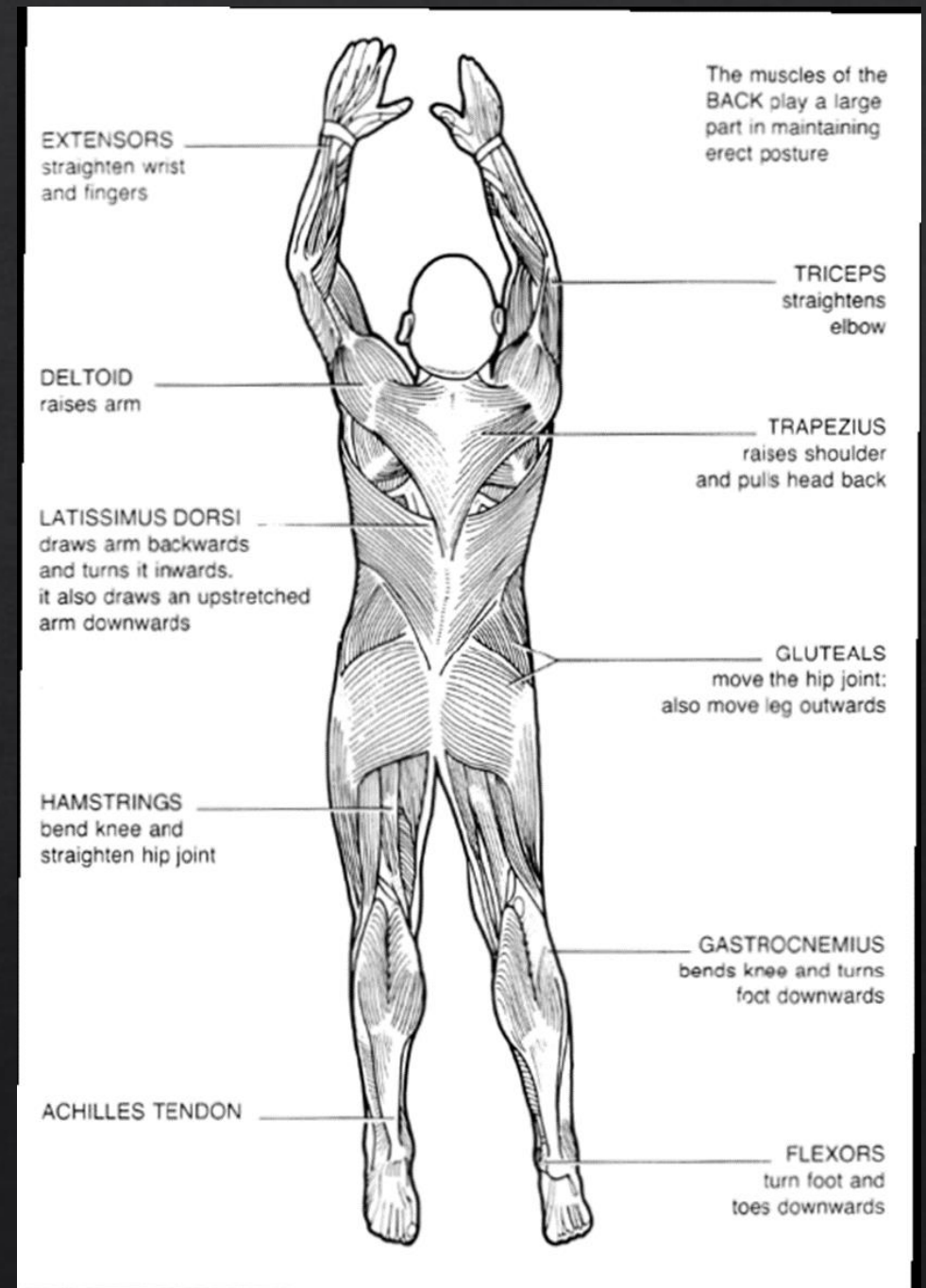
**GLUTEALS**- move the hip joint; move the leg outwards

**HAMSTRINGS**- bend knee and straighten hip joint

**GASTROCNEMIUS**- bends knee and turns foot downwards

**ACHILLES TENDON**

**FLEXORS**- turn foot and toes downwards



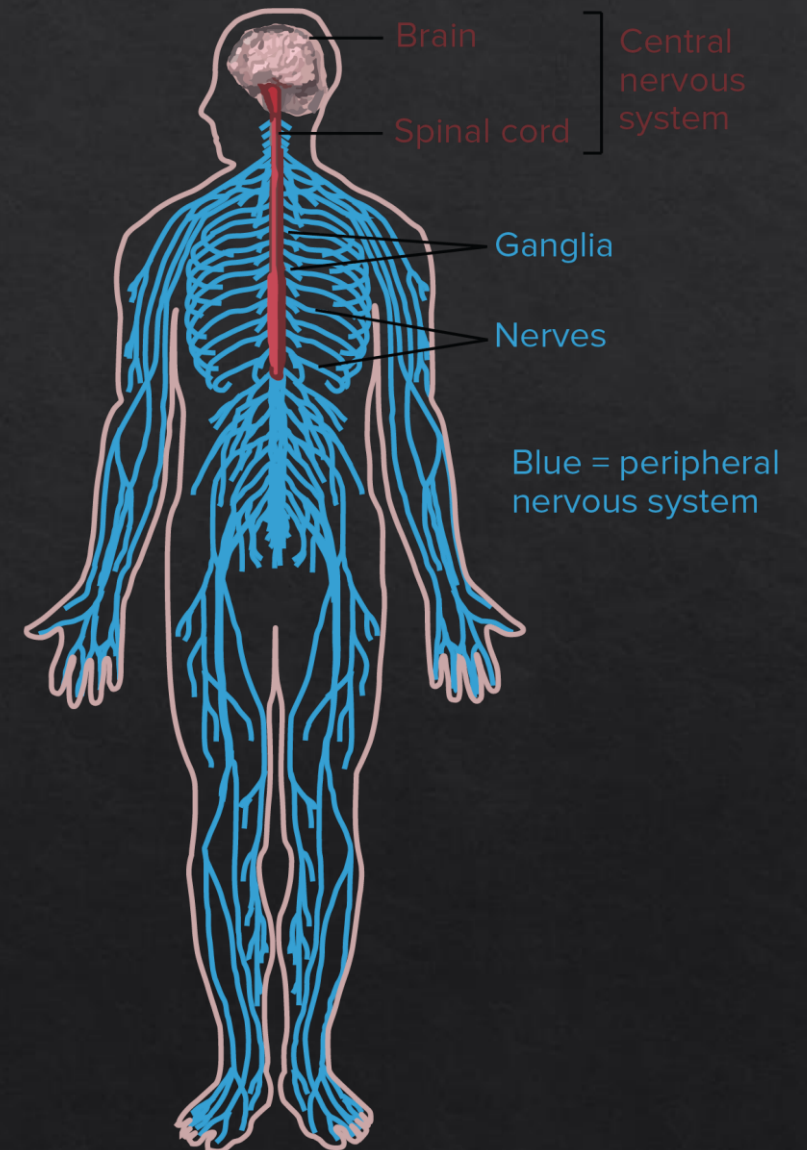


# The Nervous System

The nervous system comprises **the brain, spinal cord, and numerous nerves** extending from the spinal cord to various body parts.

The initiation of muscle fiber contraction occurs through a nervous impulse, **an electrical signal** transmitted by nerve cells.

When your brain sends signals instructing your muscles to contract, these messages are conveyed by specialized nerve cells forming the nerves.



# The Cardio-Respiratory System

The cardiorespiratory system, also known as the cardiovascular system, is responsible for delivering oxygen to the body's cells and removing waste products.

It consists of the heart, blood vessels (arteries, veins, and capillaries), and blood.

**ARTERIES** carry oxygenated blood away from the heart to various parts of the body.

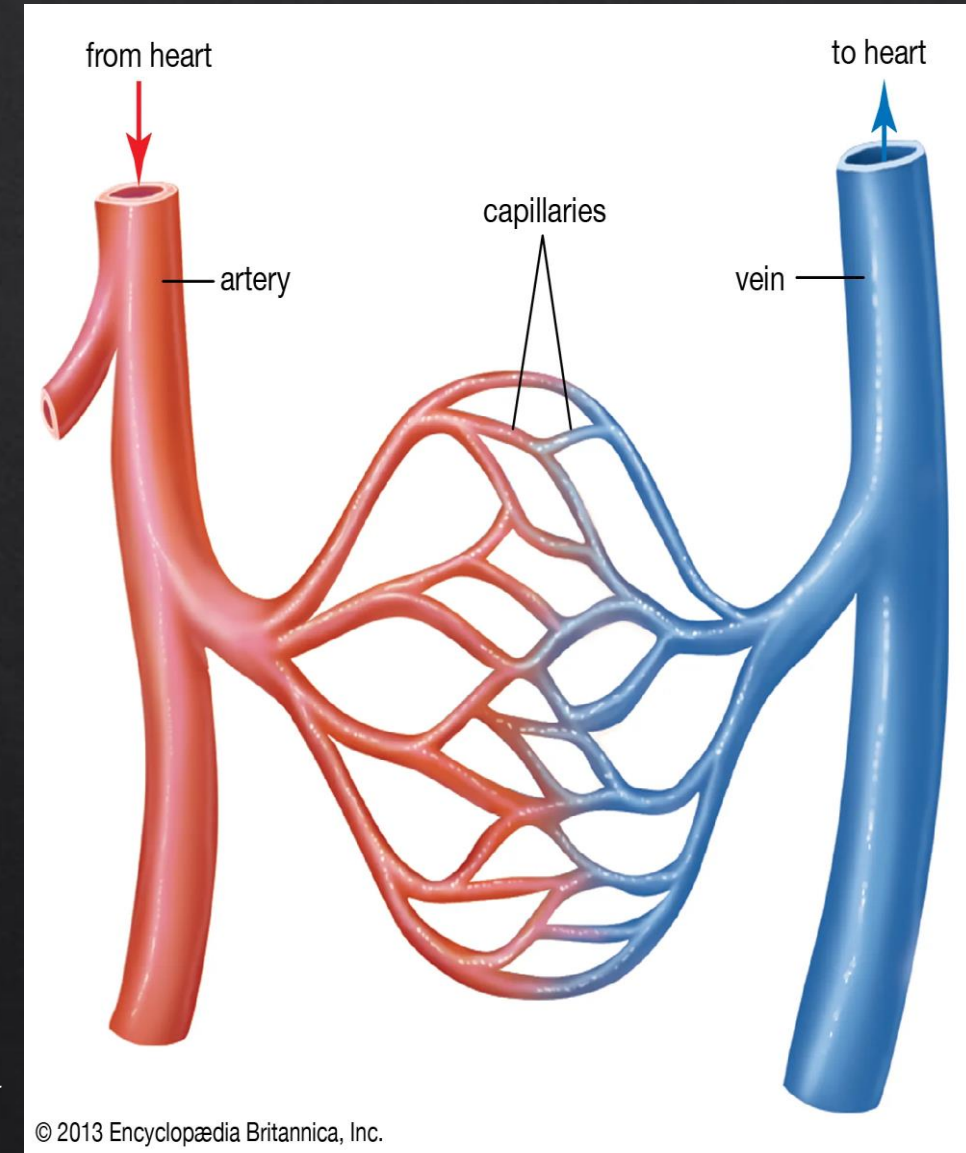
**VEINS** carry deoxygenated blood back to the heart from various parts of the body.

**CAPILLARIES** are tiny, thin-walled blood vessels that connect arteries and veins. They facilitate the exchange of oxygen, nutrients, and waste products between the blood and the body's tissues.



Exercise increases the number of capillaries in muscles, enhancing their efficiency. Blood plays a crucial role by transporting various substances throughout the body. It is essential for:

- **Transporting oxygen** from the lungs and nutrients from the digestive system to the body's cells, facilitated by red blood cells.
- **Transporting carbon dioxide** from cells to the lungs for removal from the body through exhalation.
- **Carrying waste products** from body tissues to the kidneys for excretion.
- **Supporting the body's defense** against infection by aiding in wound healing and combating bacteria and viruses.
- **Releasing oxygen in the capillaries** for utilization by the muscles.



# The Heart

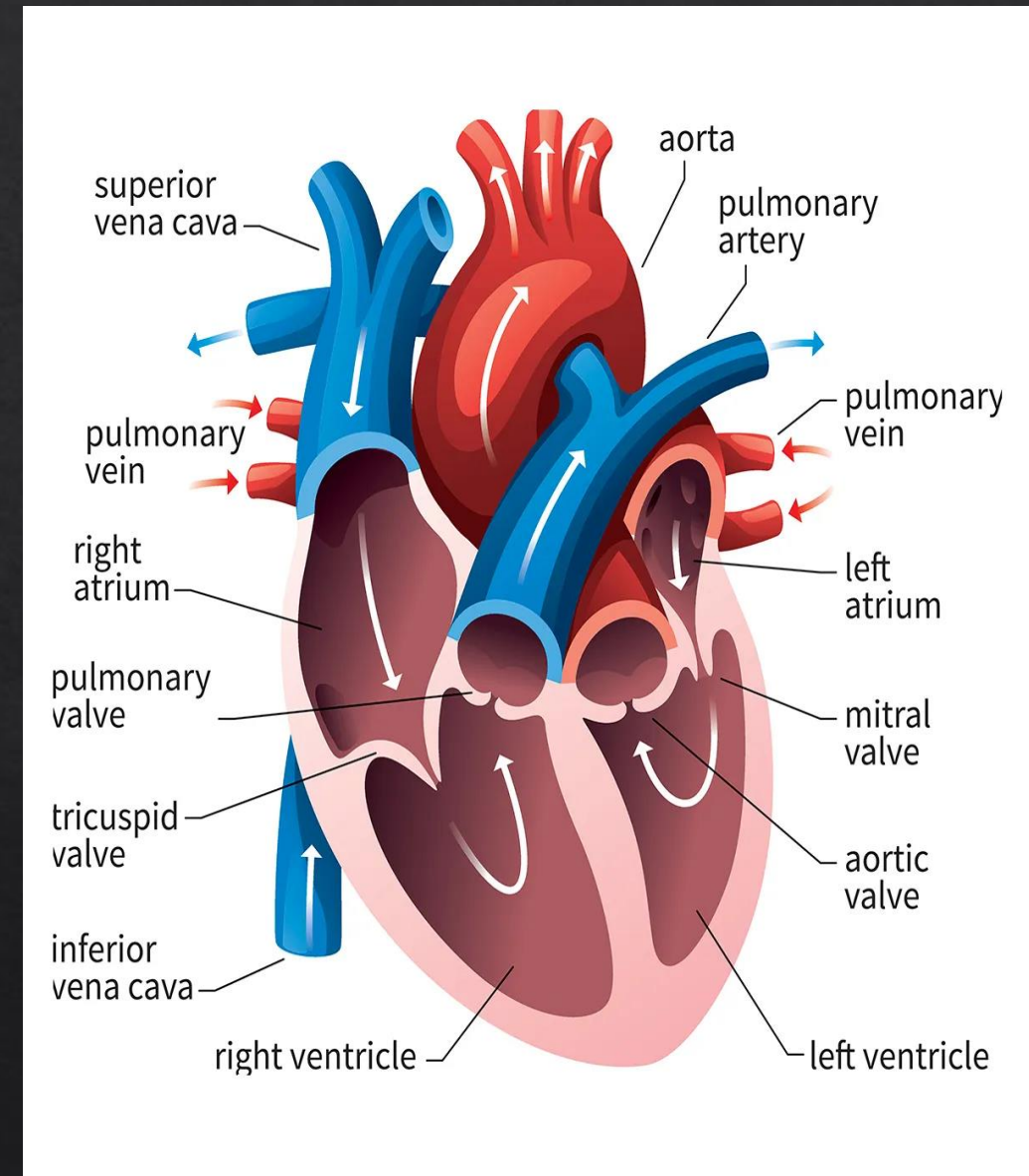
The heart is like a powerful **pump** in your chest that helps circulate blood throughout your body.

Every muscular contraction of the heart is called **A HEARTBEAT**.

When you exercise, your muscles need more oxygen to work efficiently.

To meet this demand, your heart beats faster to pump more blood and deliver more oxygen to your muscles.

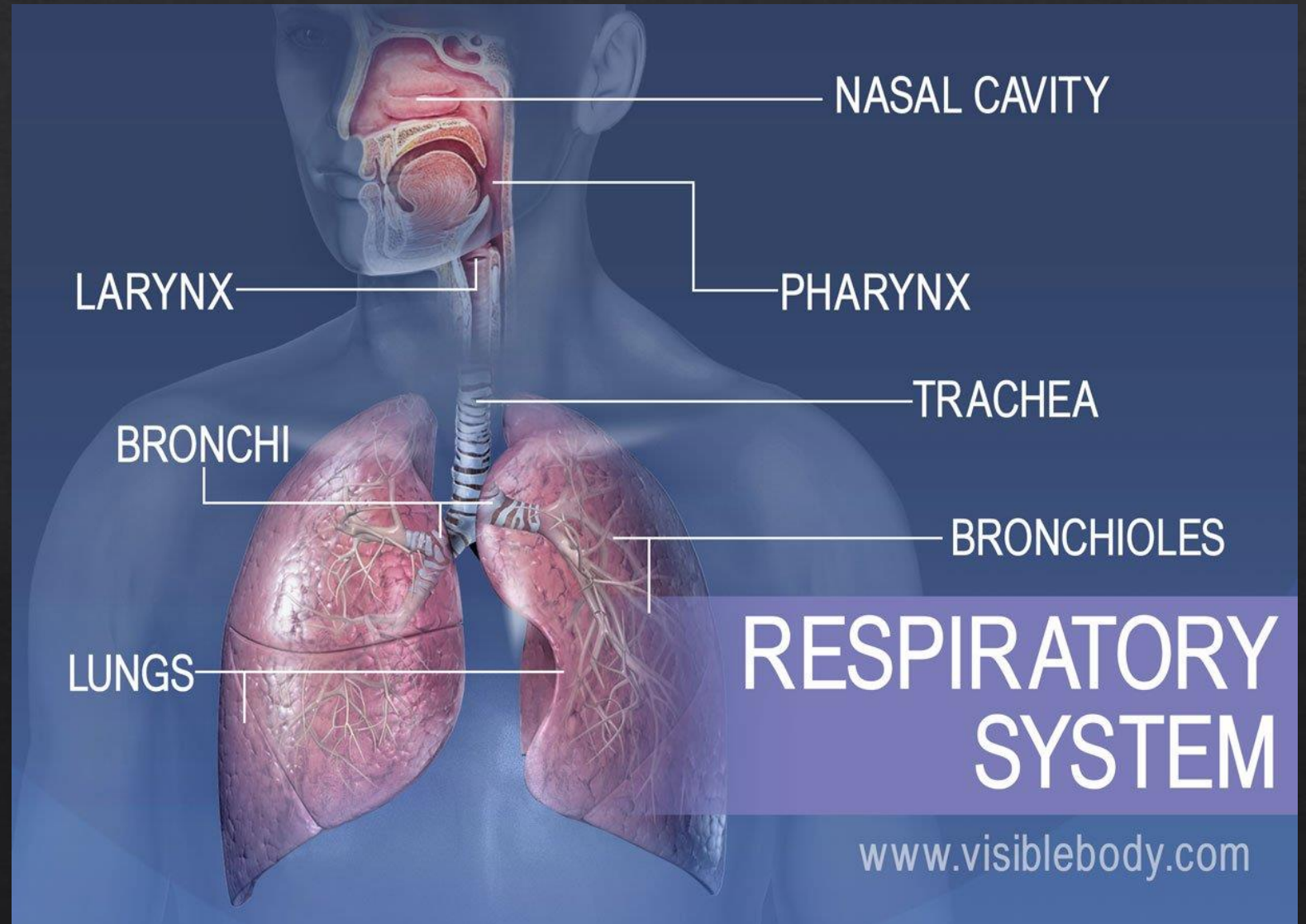
This heart rate can be best felt in **THE PULSE** at the **WRIST** or side of the **NECK**.



# The Respiratory System

It includes the lungs and air passages (**TRACHEA, BRONCHI**).

The lungs take in oxygen from the air and remove carbon dioxide when we breathe out.



# The Lungs

At rest, approximately **10 liters of air** are breathed in every minute.

However, during intense exercise, the breathing rate can increase significantly, reaching **120-150 liters per minute**. It's important to note that the maximum amount of air that can be taken in through the nose is around 50 liters per minute.



# Exercise Physiology

Exercise physiology is the study of **how the body responds and adapts to physical activity and exercise.**

The goal of exercise physiology is to understand how the body's systems, such as the cardiovascular, respiratory, musculoskeletal, and metabolic systems, function and interact during physical activity.

This enables you to design more impactful training regimens for athletes.

A good coach understands the fundamental **physiological variations** that can exist among individuals.



# The Energy Systems

Our bodies utilize three metabolic energy systems to provide the energy necessary for muscle contractions. These systems work continuously, and the extent to which each system contributes depends on the duration and intensity of the physical activity.

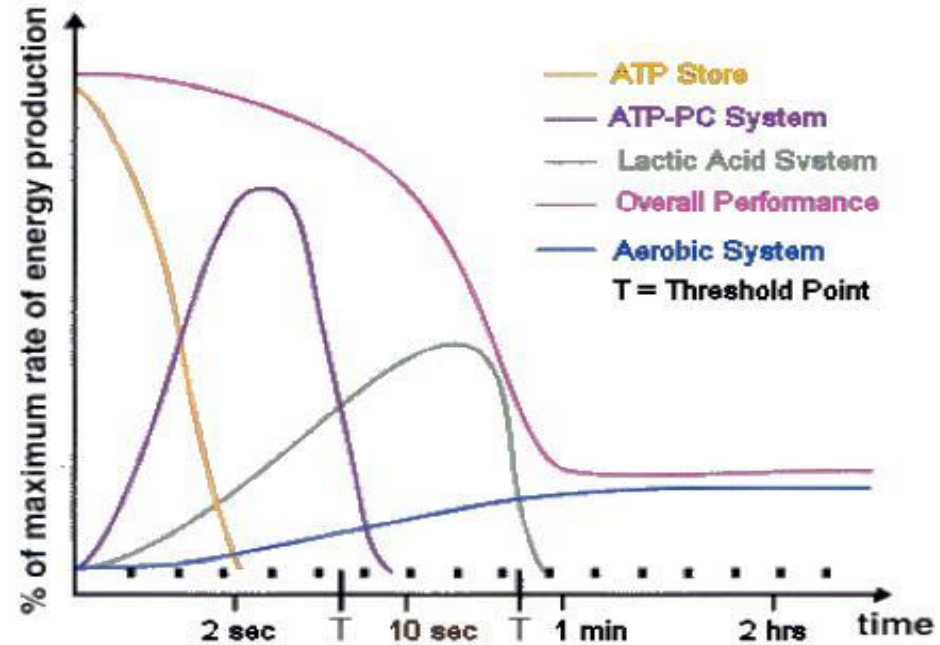
1. **The Aerobic System** – The muscle energy system which requires oxygen;
2. **The Lactate System (anaerobic)** – The ‘linking’ energy system which is capable of operating without oxygen and produces lactic acid;
3. **The Alactic System (anaerobic)** – The stored, start-up energy system which is capable of operating without oxygen but does not produce lactic acid.





# Energy Systems

- Immediate energy
  - ATP-PC
- Short-term energy
  - Lactic acid system
- Long-term energy
  - Aerobic system



Thank you for your attention!