

## Biology Chapter 24 – Locomotion Systems

### 1. General Information

Locomotion systems consist mainly of bones and muscles for movement  
There is a ridiculous amount of memorizing in this chapter. Good Luck. =)

### 2. Single Celled Organisms

Single celled organisms move by extending and retracting portions of itself

**Pseudopods** – temporary projects in single celled organisms to help move the organism

Other single celled organisms move through the beating of cilia

Sperm cells have a single flagellum to propel it through liquid

However, all of these methods require a liquid environment

### 3. Invertebrate Movement Systems

**Hydrostatic skeletons** – a type of skeleton where movement depends on fluid and muscles

Fluid is held in body cavities that can't compress

When the muscles contract, the pressure slowly moves the fluid, like squeezing toothpaste

The movement of the fluid pushes the organism forward

**Exoskeletons** – a type of skeleton where movement depends on a hard skeleton and muscles

Similar to hydrostatic skeletons, except there is a hard protective shell on the outside

Shell is also used as sites for muscle attachment

The muscles attached to the exoskeleton create movement

Exoskeletons can be made of silicon, chitin, or other materials

Exoskeletons do not provide enough support for internal organs, so it's not used in larger animals

### 4. Vertebrate Movement Systems

**Endoskeleton** – an internal skeleton, movement depends on bones and muscles

Advantages over exoskeleton

More flexible

Room for unlimited growth

More movement (less weight)

Support the structure of the organism

Protection of vital organs

Production of corpuscles (red blood cells)

**Cartilage** – an elastic tissue that usually connects bones or covers the ends of bones at the joints

Bones and muscles provide support and protection for the body, as well as movement

Skeletons of different organisms are adapted to their way of life

Bird Skeletons

Very light skeleton to allow flight, but it's still very strong

The vertebrae of birds are fused together with the pelvis, making it very stiff and rigid

The ribs are fused together to provide space for muscles needed to fly

The bones of the forelimb are hollow so they're light enough to fly

**Epidermis** – outer skin layer, very thin, constantly shedding – protects body, prevents water loss

Consists of an outer layer of dead cells and a thin layer of growing cells beneath it

**Dermis** – the inner layer of the skin to further insulate, protect, and prevent water loss

Contains the hair follicles, sensory neurons, capillaries, ducts, sweat and oil glands, etc

Sweat is given off to cool the body (when water is carried away, heat is carried away with it)

### 5. Human Skeletons

**Long Bones** – these are well, long bones. The forearm and the leg bones are examples of long bones

**Short Bones** – smaller, less prominent ends, including wrist and ankle bones

**Flat Bones** – platelike and have broad surfaces, such as skulls and ribs

**Irregular Bones** – a variety of shapes and are usually connected to other bones, such as vertebrae

**Compact Bone** – the center part of the bone, hard, dense, strong

**Cancellous Bone** – spongy bones. Present at the ends of bones, light, airy

**Bone Marrow** – the very center of the bones

Red Bone Marrow – produces corpuscles (red blood cells, white blood cells, etc)

Yellow Bone Marrow – stores fat

**Haversian System** – the basic unit of structure in bones

**Osteocytes** – bone cells

**Canals** – passageways for blood vessels, nerves, and are surrounded by osteocytes

25% of bones consists of water, 45% Calcium Carbonate (CaCO<sub>3</sub>) and Calcium Phosphate

**Joints** – the place where 2 or more bones meet

**Immovable Joints** (Synarthroses Joints) – joints that don't move (ie. Joints in the skull)

**Slightly Movable Joints** (Amphiarthroses Joints) – joints that move slightly

**Freely Movable Joints** (Diarthroses Joints) – joints that move freely

**Hinge Joints** – elbows, knees

**Ball and Socket Joints** – shoulders, hips

**Gliding Joints** – wrists, ankles

There are 206 bones total, 100+ are in the hands and mouth, making up 18% of your body weight

**Axial Skeleton** – head, trunk

**Skull**

**Cranium** – 8 bony plates, fused together, protects the brain

**Facial Bones** – 14 bones fused together

**Ossicles** – ear bones, middle ear, smallest bones in the body (hammer, anvil, stirrup)

**Mandible** – jawbone

**Trunk**

**Vertebral Column** – spine, 26 bones, vertebrae

**Cervical** – neck, 7 vertebrae

**Thoracic** – chest, ribs attached, 6 pairs or 12 bones

**Lumbar** – largest bones in the spine, 5 bones total

**Sacral** - supports and connects the hips

**Coccyx** – tailbone, 5 in kids, fused into 1 during adulthood

**Appendicular Skeleton** – arms, legs, girdle

**Upper Division**

**Pectoral Girdle** – 4 bones total

**Clavicle** – collar bones, 1 on each side

**Scapula** – shoulder blade, 1 on each side

**Humerus** – long bone of upper arm

**Forearm**

**Radius** – associated with thumb

**Ulna** – connects to pinkie

**Carpals** – wristbones, 8 total

**Metacarpals** – palm bones, 5 in each hand

**Phalanges** – finger bones, 14 in each hand

**Lower Division**

**Pelvic Girdle** – pelvis – allows for upright posture, can determine gender, maybe age

**Ilium** – Top of the hip bone

**Ischium** – lower area of the hip bone, attaches to legs

**Pubis** – front of the pelvis

**Femur** – thigh bone, largest bone in the body

**Patella** – knee cap

**Tibia** – shin bone, carries the weight of the body

**Fibula** – skinny, behind the shin bone, smaller, does not carry the weight of the body

**Calcaneous** – heelbone

**Tarsals** – ankle bones – 7 total

**Metatarsals** – foot bones, 5 in each foot

**Phalanges** – toebones, 14 in each foot

## 6. Human Muscular Systems

Muscles and bones combine to provide the body protection and movement

They're controlled by both the nervous and endocrine systems

**Skeletal Muscles** – attached to the bones (striated), voluntary, rapid contraction, but rapid fatigue

**Myosin** – the center dense part of the skeletal muscle cell

**Actin** – the thin, outer layer of the skeletal muscle cell

**Smooth Muscles** – muscles in organs, blood vessels, tubes. Involuntary, slow contraction, no fatigue

Consists of a oval shaped disc with a nucleus

**Cardiac muscle** – found only in the heart, has the strength and build of a skeletal muscle, but no fatigue

**Attachments** – the areas where muscles are attached to the bones

**Origin** – the attachment area of least movement

**Insertion** – the attachment area of most movement

**Antagonists** – one muscle contracts as another relaxes

**Flexors** – muscles that decrease the angle when contracting, ie, biceps

**Extensors** – a muscle that increases the angle when contracting, ie. Triceps

There are 600+ muscles, making up 40% of your body weight

### **Head Muscles**

**Orbicularis Oris** – circular muscles around the mouth, allows you to open/close your mouth

**Orbicularis Oculi** – circular muscles around the eye, allows you to open/close your eye

**Buccinator** – cheek muscles, allows you to whistle, smile, move your cheek

**Masseter** – muscle that follows the jawbone

**Temporal** – a muscle that is at a right angle to the jaw, both muscles help move the jaw

**Tongue** – nearly the most muscular organ, almost all muscle

### **Neck Muscles**

**Sternocleidomastoid** – a muscle that runs from the ear to the shoulders

**Trapezius** – runs from the back of the neck to the shoulders, both allow head movement

### **Upper Extremities**

**Trapezius** – see above, also the muscle between the shoulder blades

**Latissimus Dorsi** – the back muscle, allows for movement

**Pectoralis Major** – breast muscles, covers the chest, shoulders – allows you to push objects

**Serratus Anterior** – runs from the armpit to the waist, allows you to raise your arms

**Deltoid** – muscular cap to the shoulders – protection

**Biceps Brachii** – flexor, allows you to pick up stuff

**Triceps Brachii** – back of the upper arm, extensor, allows for pushing

**Flexor & Extensor Carpi** – bending/straightening your wrist, muscles are in the upper forearm

**Flexor & Extensor Digitorum** – finger muscles, located in the lower forearm

### **Trunk**

**Diaphragm** – right beneath the lungs, allows for breathing

**Intercostals** – muscles between the ribs, allows for breathing

**Abdominal Wall** – protection of internal organs, since no bone covers them

**External Oblique** – outer most layer, muscles run left to right

**Internal Oblique** – middle layer, muscles run up and down

**Transversus Abdominus** – innermost layer, muscles run diagonally

**Perineum** – muscle that covers the pelvis

### **Lower Extremities**

**Gluteus Maximus** – yo ass =)

**Adductors** – inside of the thighs, allows you to press your thighs together

**Sartorius** – runs from the hip to the knee, allows you to cross your legs

**Quadriceps Femoris** – thigh muscle, extensors, located in the front leg

**Biceps Femoris** – back leg, hamstring, flexor

**Gastrocnemius** – calf muscle

**Tibialis Anterior** – muscle that allows you to stand on your heels

**Flexor & Extensor Digitorum** – located in the lower legs, allows you to move your toes