Joints
Joints

- Occur where two bones meet
- Allow various ranges of motion?
- Are they found in only the appendicular skeleton?
Two ways to classify joints

• **Range of motion**
  - Synarthrosis, amphiarthrosis, diarthrosis

• **Composition of the joint**
  - Boney, fibrous, cartilaginous, synovial
Synarthrosis (immovable)

• Would these be strong joints?
• Examples?
  - Sutures (skull bones)
  - Gomphoses (teeth)
  - Synchondroses (epiphyseal cartilages)
  - Synostosis (epiphyseal lines of mature long bones)
Fibrous articulations

(a) Suture
- Dense fibrous connective tissue
- Suture line

(b) Syndesmosis
- Fibula
- Tibia
- Ligament

Synarthrotic

Amphiarthrotic
Amphiarthroses (slightly movable)

- Would these be strong?
- Joint is formed with collagen fibers or cartilage
- Examples:
  - Syndesmosis (ligaments)
  - Symphyses (separated by fibrocartilage; pubic symphysis, vertebral discs)
Diarthroses (freely movable)

- Are these joints strong?
- What is the key function?
- **All diarthrotic joints** are synovial joints
- Examples?
  - Knee
  - Shoulder
  - Hip
Parts of articulations

- Periosteum
- Ligament
- Joint cavity (contains synovial fluid)
- Articular (hyaline) cartilage
- Fibrous capsule
- Synovial membrane
- Articular capsule

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Synovial joints

- **Plane**: slight movement
- **Pivot**: slight rotational movement in 1 direction
- **Hinge**: movement in 1 direction
Synovial joints

- **Saddle**: major movement in 1 direction; slight in another

- **Ball & Socket**: movement in **multiple** axes

- **Condyloid**: 2 or more axes
Synovial joints have lots of structures

**Bursa:** Connective tissue pads

**Meniscus:** Fibrocartilage pads

**Synovial fluid:** proteoglycan-rich fluid for:

1. Lubrication
2. Shock absorption
3. Nutrient delivery
Compare shoulder & hip

Frontal section

Acromion process (articular surface)
Subacromial bursa
Joint cavity
Tendon sheath on tendon of long head of biceps brachii
Biceps brachii (long head) tendon
Humerus
Biceps brachii (long head) muscle

Joint capsule

Pelvic bone
Articular cartilage
Joint cavity
Ligamentum teres
Head of femur
Neck of femur
Lesser trochanter
Femur

Frontal section
Shoulder joint

- Most mobile joint
- Weakest joint
- Small ligaments hold shoulder together
- Small, thin muscles stabilize humerus
- Shallow joint capsule
Hip joint

Very Stable

- Acetabulum swallows head of femur
- Multiple ligaments wrap entire joint capsule
- Massive muscles stabilize position
Knee joint: complex

(a) Anterior view, superficial layer

(b) Posterior view, superficial layer
Knee joint

(c) Deep posterior view, extended

(d) Deep anterior view, flexed
Elbow joint

**Most stable:** interlocking bones; single joint capsule; strong, wrapping ligaments
Joint Disorders

• Arthritis
  - Rheumatoid arthritis: Affects connective tissues; most pronounced & crippling in joints of hands & feet
  - Autoimmune disease (body attacks itself)
  - CT cells of synovial membrane proliferate, grow into articular cartilage of bones; bones eventually fuse
Joint Disorders

• Arthritis
  - Osteoarthritis: Natural degeneration with age and lack of exercise
  - Gout: Accumulation and storage of crystals of uric acid (waste) in kidney & joints
    • Most often affects base of big toe & other leg & foot joints
Joint Disorders

- **Sprains**: pulled or torn joint stabilizing ligaments
  - Results when bones of joints are pulled forcefully apart
- **Dislocation**: the end of one bone is pulled OUT of socket.
  - Occurs in ball & socket, ellipsoid or pivot joints
- **Cartilage injuries**: “Hammering” on articular cartilage squashes and kills chondrocytes
Joint Disorders

• Bursitis: Inflammation of bursa
  - Inflammation of bursae around shoulder and elbow is common
    • Caused by muscle instability or underdevelopment
  - Bursitis at base of big toe = Bunion
    • Often caused by wearing shoes too tight