

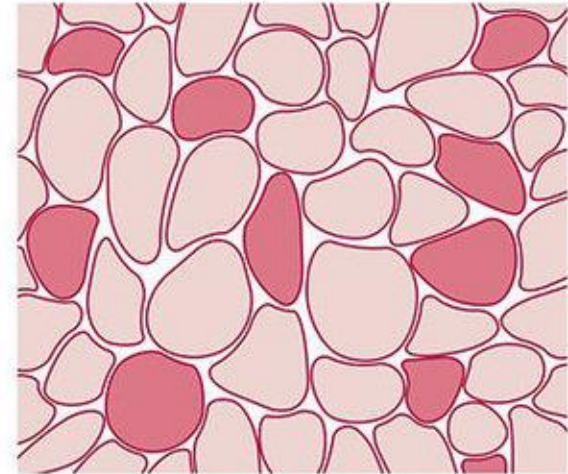
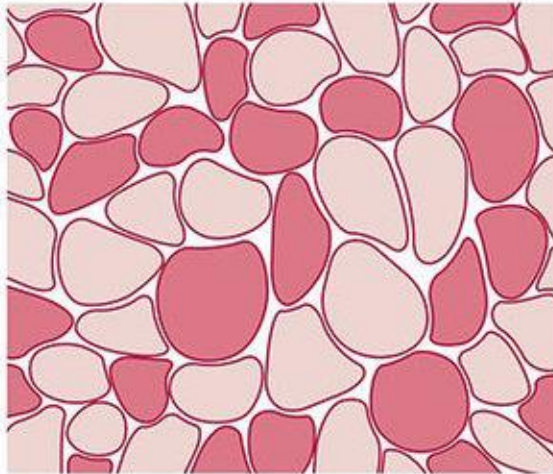
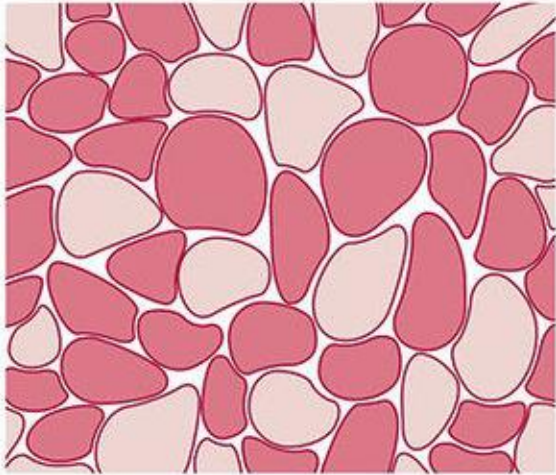
# Biology



# Classification of skeletal muscle fibers

- Type I or slow, red oxidative fibers:
- Type IIa or fast, intermediate oxidative-glycolytic fibers:
- Type IIb or fast, white glycolytic fibers:





# Atypical Striated Muscle

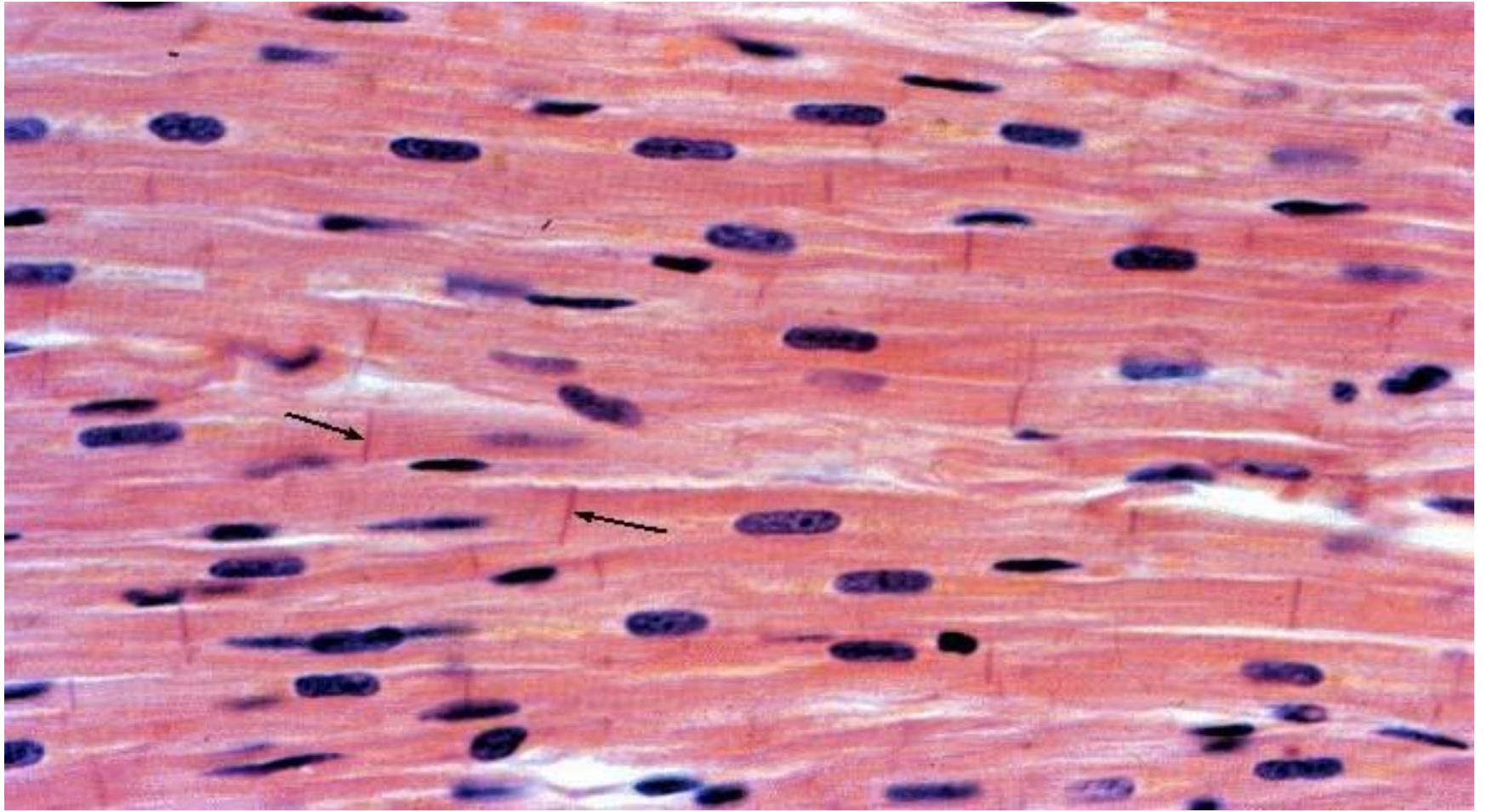
- cremaster muscle (near the spermatic cord).
- esophageal striated muscle, external urethral sphincter, external anal sphincter.



# CARDIAC MUSCLE

- The muscle **fibers branch** (bifurcate) and are arranged in series to form an anastomosing network.
- Each myocyte has one or two **central nuclei** (unlike the many peripheral nuclei of syncytia of skeletal muscle fibers).
- The fibers have more sarcoplasm.
- The mitochondria are larger and better developed.
- **All the fibers are Type I** (red fibers, with abundant myoglobin).
- **Glycogen** may also present.
- The myocytes have specialized areas of contact - the **intercalated disks**.
- **Contractions are rhythmic, spontaneous and involuntary.**

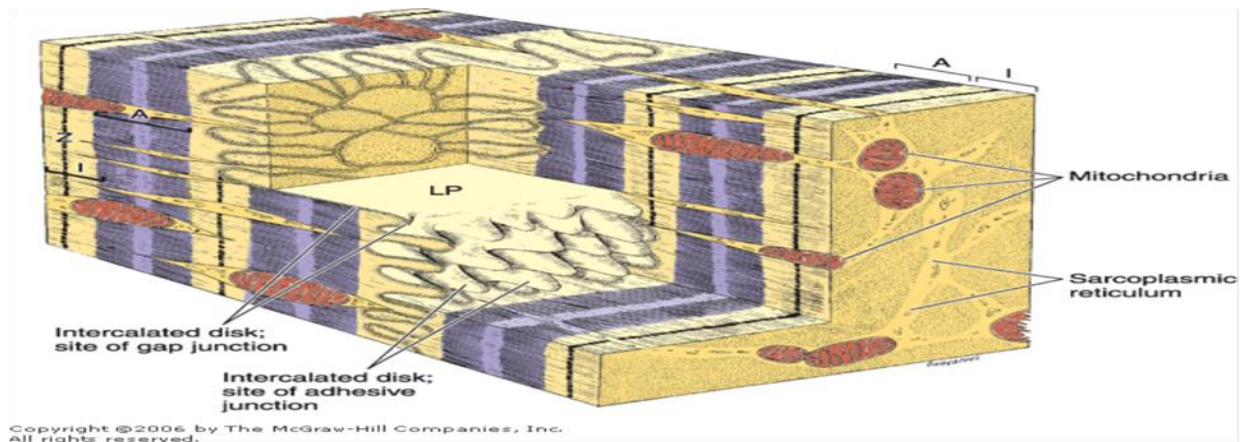




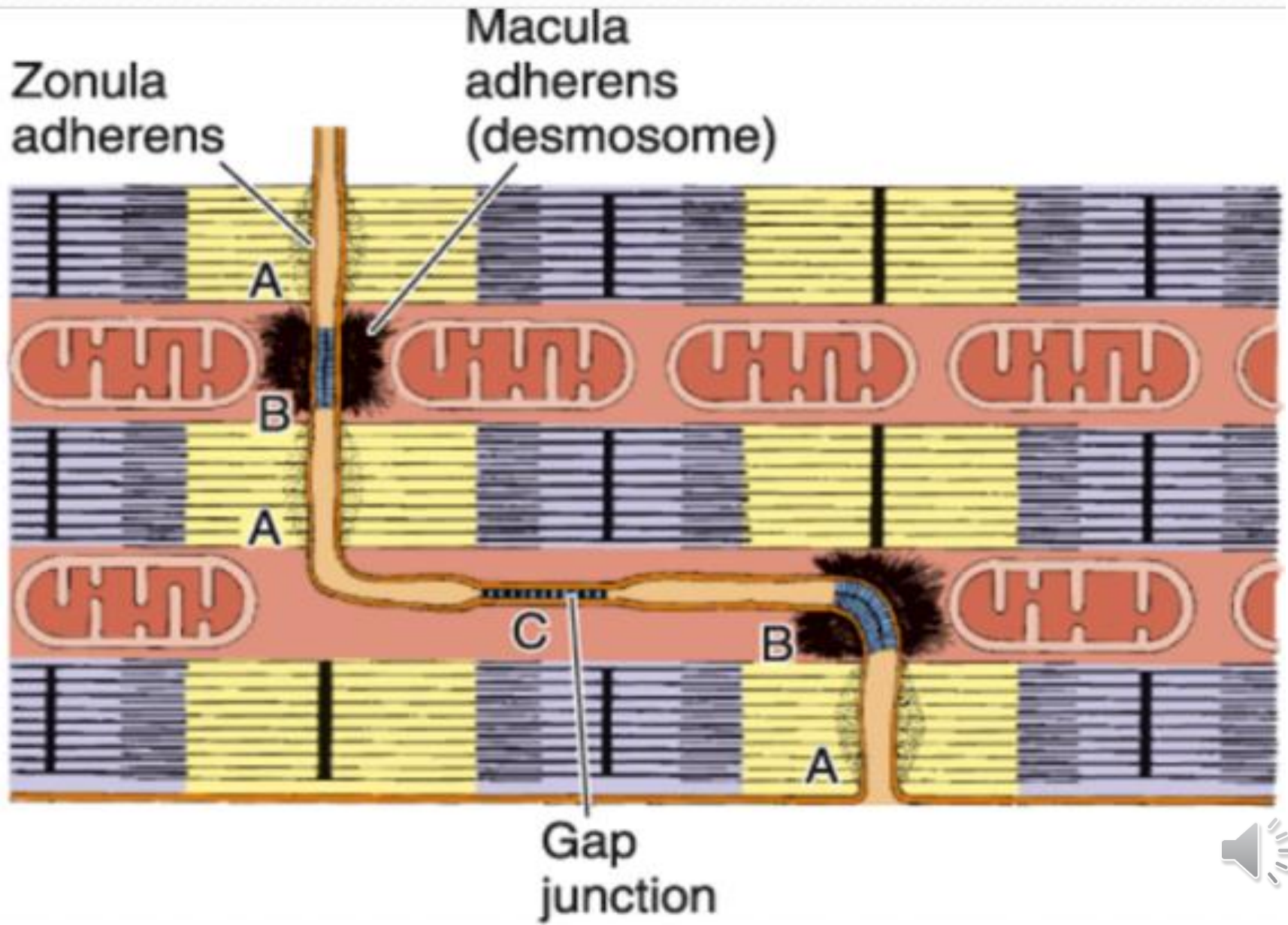


# Cardiac muscle cells

- The **T tubule system** and **sarcoplasmic reticulum** are not as regularly arranged in the cardiac myocytes.
- **Diads end near Z disc**
- sarcomere
- Lipofuscin pigment granules (aging pigment)



# Intercalated disks

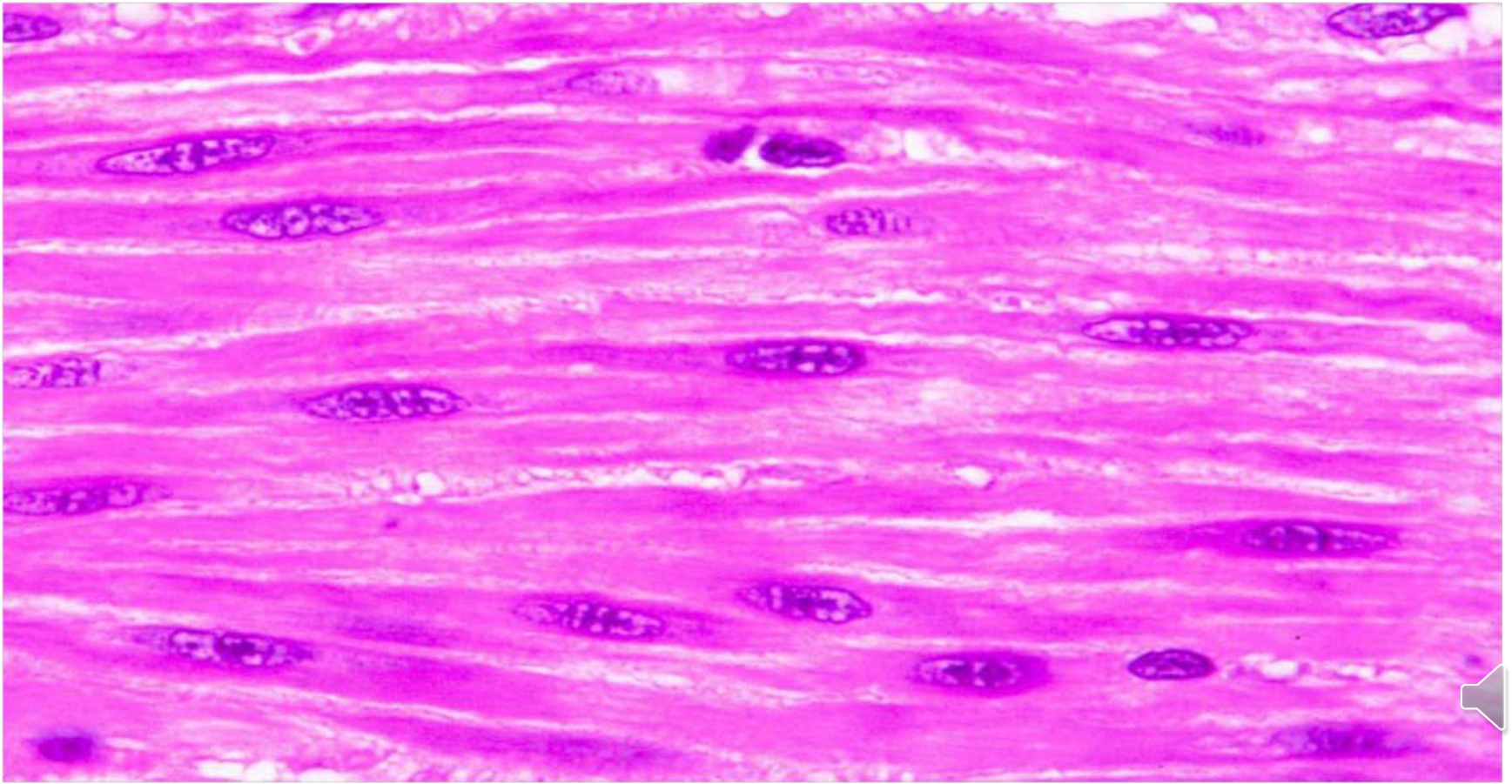




# **SMOOTH MUSCLE**

innervated by the **autonomic nervous system**

**involuntary muscle**

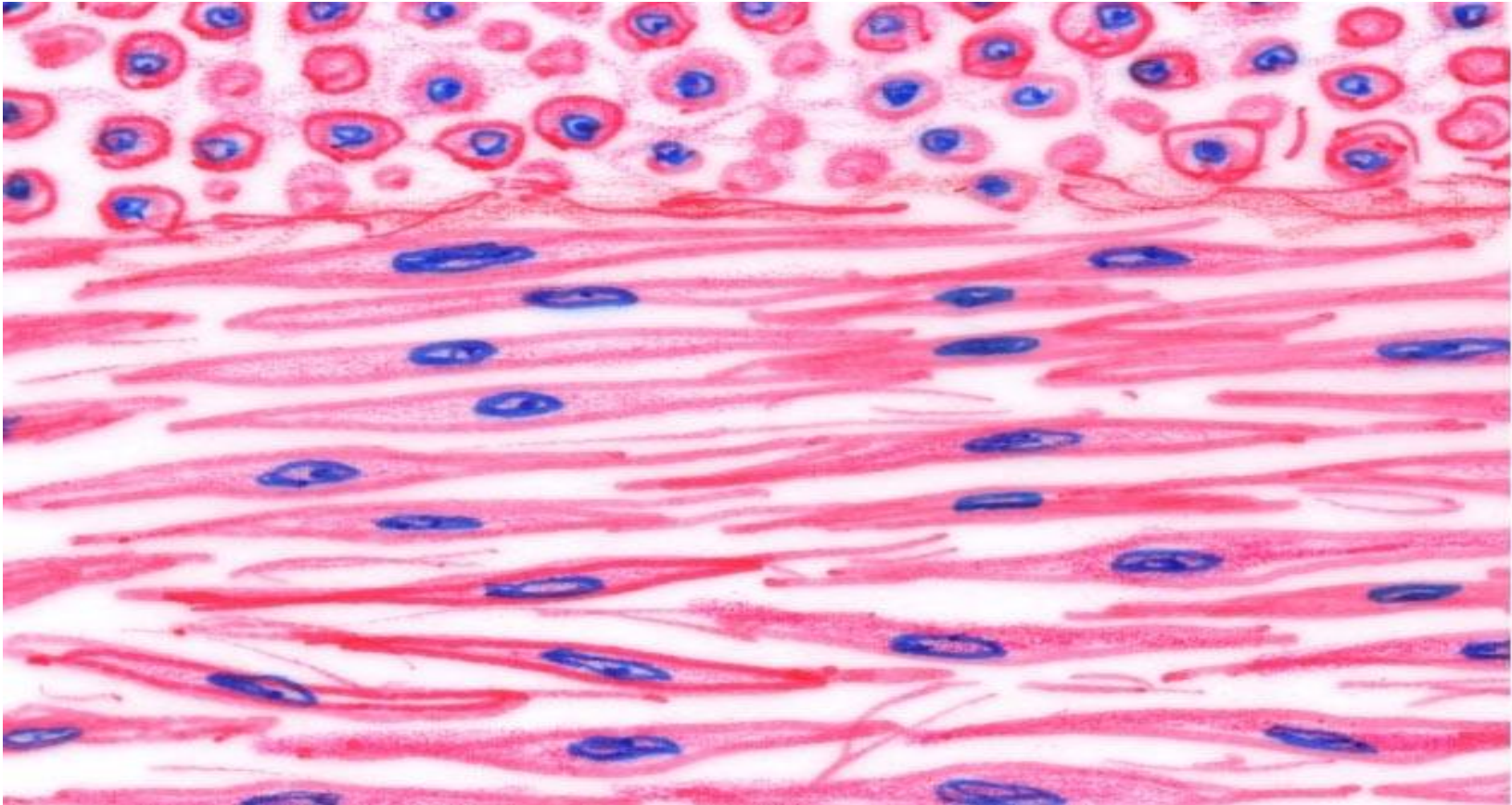


# Location of smooth muscle

- Smooth muscle is found in the **walls of the hollow internal organs**
- **walls of blood vessels** (vascular smooth muscle, especially in arterial vessels).
- Smooth muscle is found in the **dermis of the skin** (arrector pili).
- Smooth muscle is found in the eye (**iris diaphragm**, controlling the amount of light reaching the retina).



# Structure of smooth muscle fibers



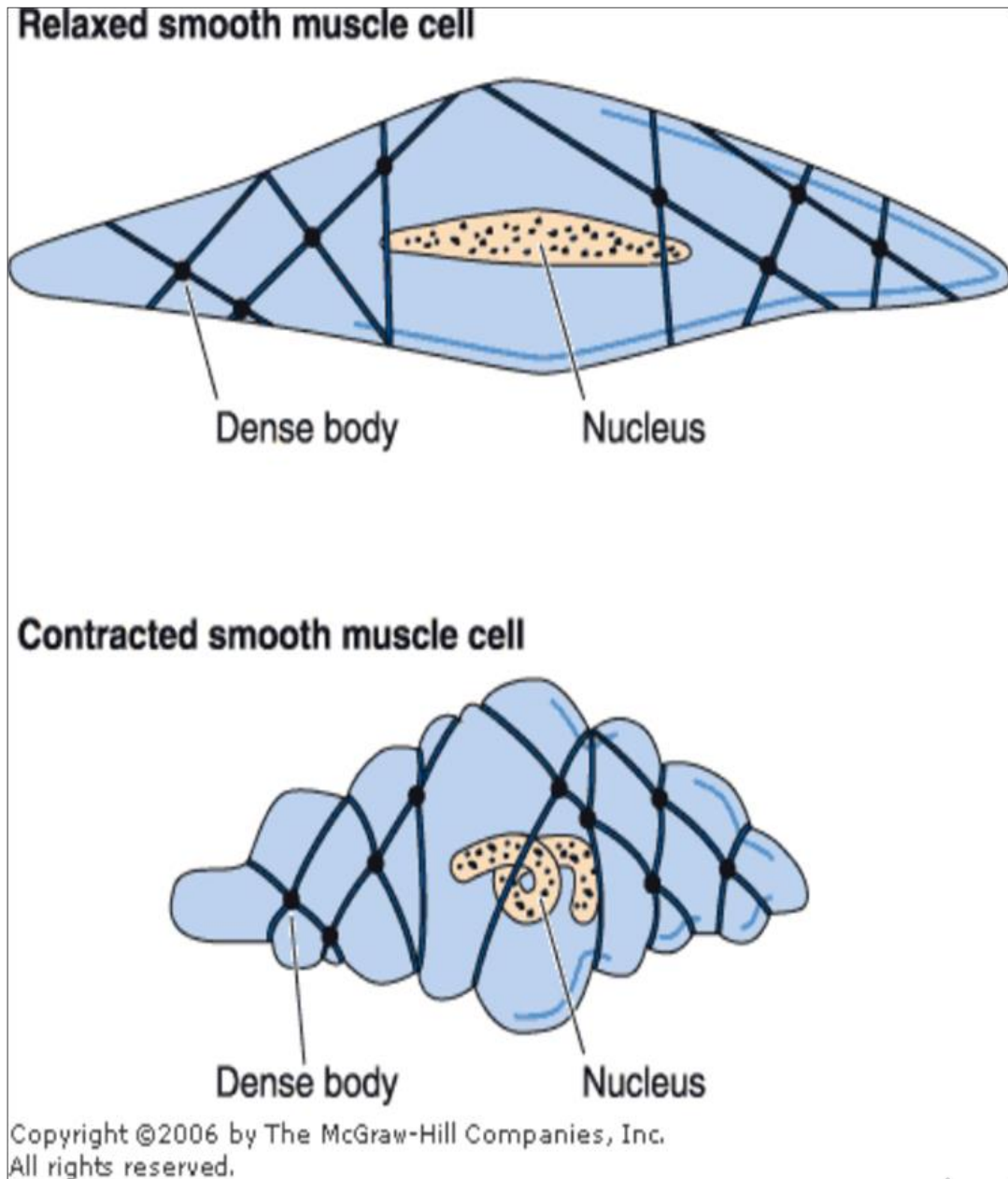
# Smooth muscle sheath

- Sheath (proteoglycan, reticular, collagen & elastic fibers)
- Myofilaments:
  1. **thin myofilaments (actin)** which are the most common type
  2. **thick myofilaments (myosin)** which are less common
  3. **intermediate filaments (desmin)** These may be grouped as "dense bodies" and are also found in contact with the sarcolemma (attachment plaques of thin and intermediate filaments that are functionally similar to Z disc of skeletal and cardiac muscles).





No T- tubule  
sacculles  
caveolae.





# Origin of smooth muscle

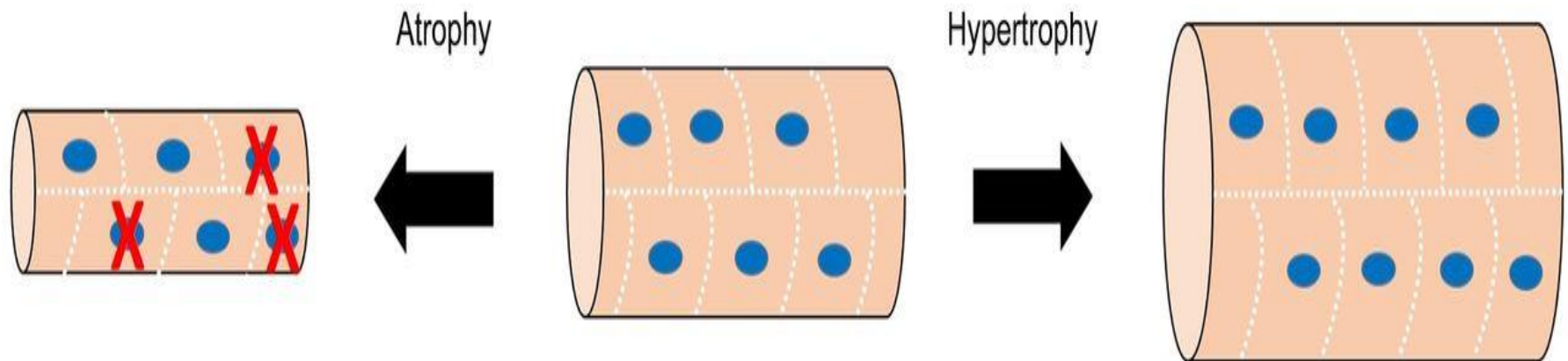
- **Mesoderm**
- **From mesenchyme as connective tissue cells**
- **myoepithelial cells**
- **part of the esophagus, anal sphincter, tarsi of eyelids**



# Repair and regeneration after injury

## Skeletal muscle

- hypertrophy of use
- disuse myopathy or atrophy



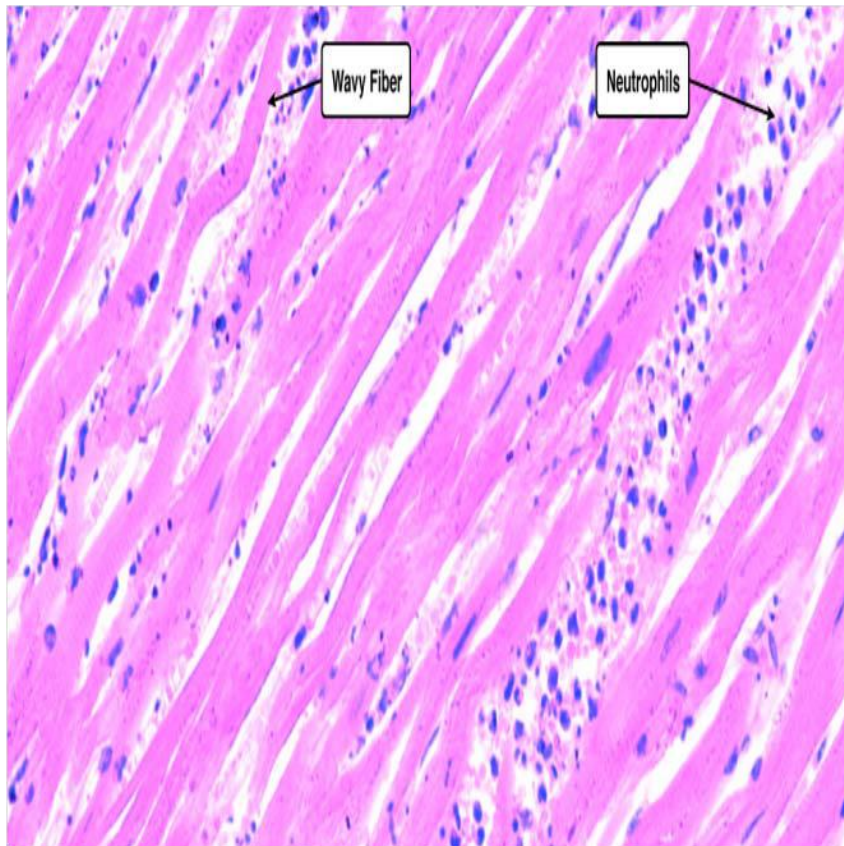
- Loss of myonuclei (apoptosis)
- Myofibre CSA ↓
- Myofibrillar proteins ↓

- Addition of myonuclei
- Myofibre CSA ↑
- Myofibrillar proteins ↑

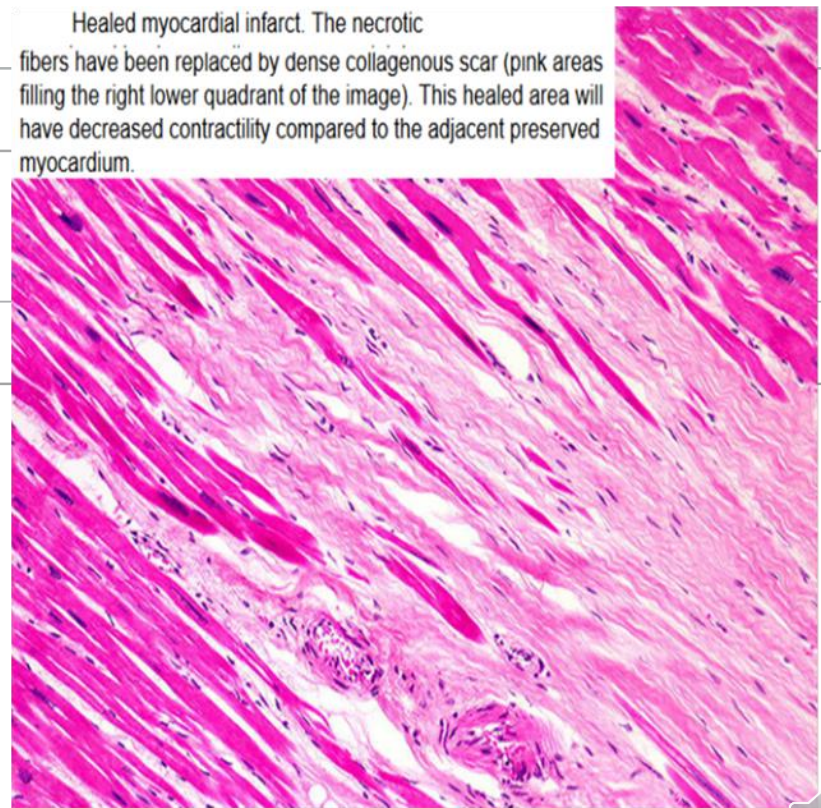


# Regeneration of cardiac muscle

## Acute Myocardial Infarction



## Healed myocardial infarction



# Regeneration of Smooth muscle

hyperplasia and hypertrophy



Thank you &  
Good luck

