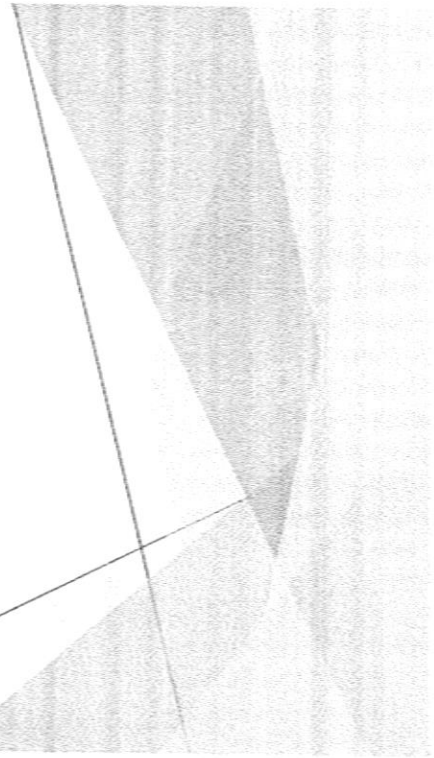
أ. الهادي احمد

Muscular tissue

- Muscle tissue is composed of differentiated cells containing contractile proteins. The structural biology of these proteins generates the forces necessary for cellular contraction, which drives movement within certain organs and the body as a whole.
- **Types of muscle tissue**
- Three types of muscle tissue in mammals can be distinguished on the basis of morphologic and functional characteristics, and each type of muscle tissue has a structure adapted to its physiologic role.
- ***Skeletal muscles*** : is found mainly in association with bones.
- ***Cardiac muscles***: is found exclusively in the walls of the heart.
- ***Smooth muscle***: is found mainly in the walls of hollow organs (e.g. intestines and blood vessels).



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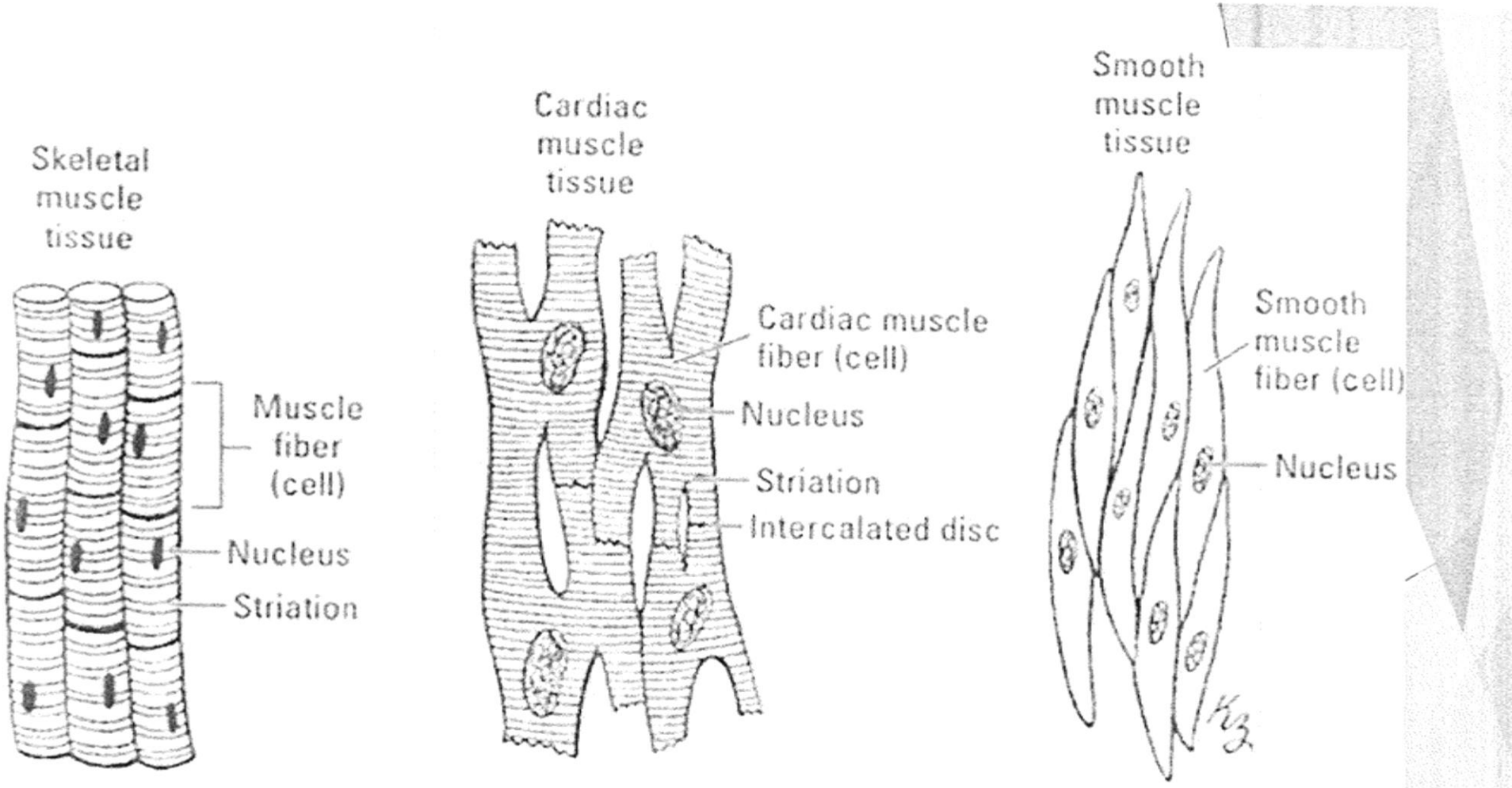

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- **1- Skeletal muscle**
- They are striated and voluntary muscles.
- They are attached to the skeleton, so, their contraction moves the skeleton.
- Under the microscope, the cells show transverse dark and light bands.
- Their contraction is quick, forceful, and usually under voluntary control.
- It is caused by the interaction of **thin actin filaments** and **thick myosin filaments** whose molecular configuration allows them to slide upon one another.

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- Skeletal muscle consists of **muscle fibers,** bundles of very long (up to 30 cm) cylindrical multinucleated cells .
- The oval nuclei are usually found at the periphery of the cell under the cell membrane. This characteristic nuclear location is helpful in distinguishing skeletal muscle from cardiac and smooth muscle, both of which have centrally located nuclei.
- Loose CT arranged around and between muscles fibers and bundles. CT carries blood vessels, lymphatic's, and nerve fiber to muscle. The connective tissues are arranged as:-
- **1**- Epimysium: the outer coat of the muscle.
- **2**- Perimysium: around the muscle bundles and fascicles.
- 3- Endomysium: between each muscle fiber.

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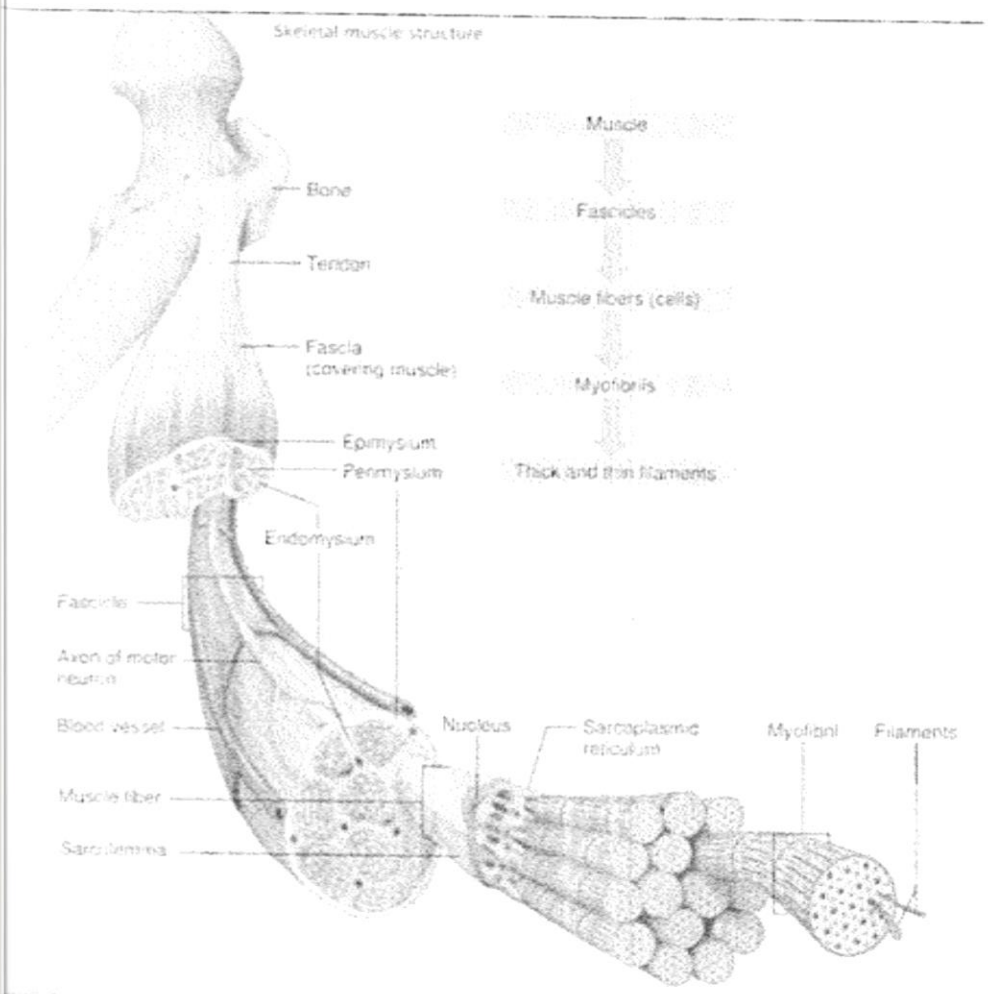

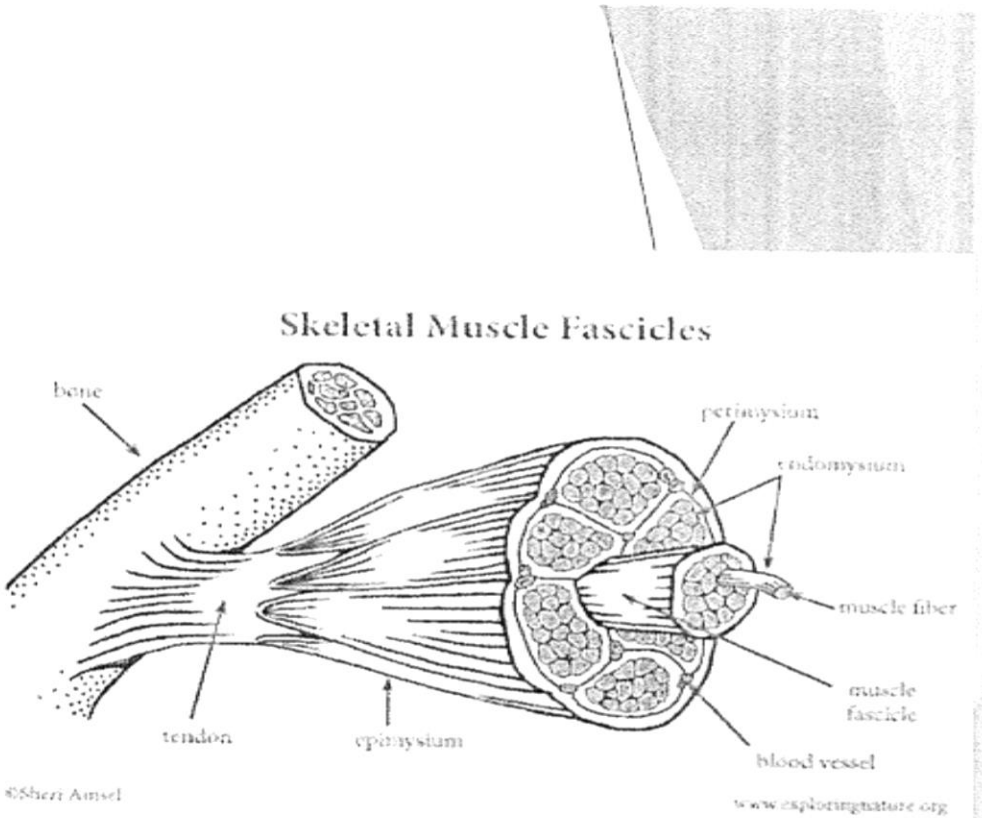

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- ***Skeletal muscle cell or fiber***
- The muscle fiber is long and cylindrical in shape.
- The nuclei are multiple, peripheral and elongated.
- The cytoplasm (sarcoplasm) shows alternative dark (A- band) and light (I – band) striations.
- In the middle of the dark A- band there is a pale region called **H-zone.**
- In the middle of the light band there is a dark line called Z- line.
- The distance between two successive Z - lines is called Sarcomere which serves as the functional unit for muscle contraction.
- Organization of myofilaments showing the dark and light bands as well as actin and myosin filament in the sarcomere.

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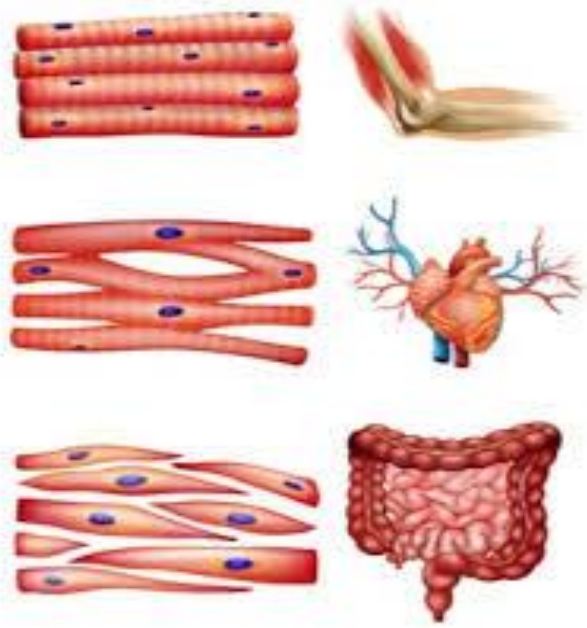

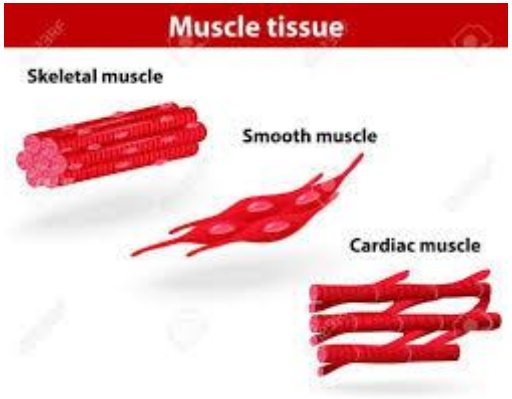

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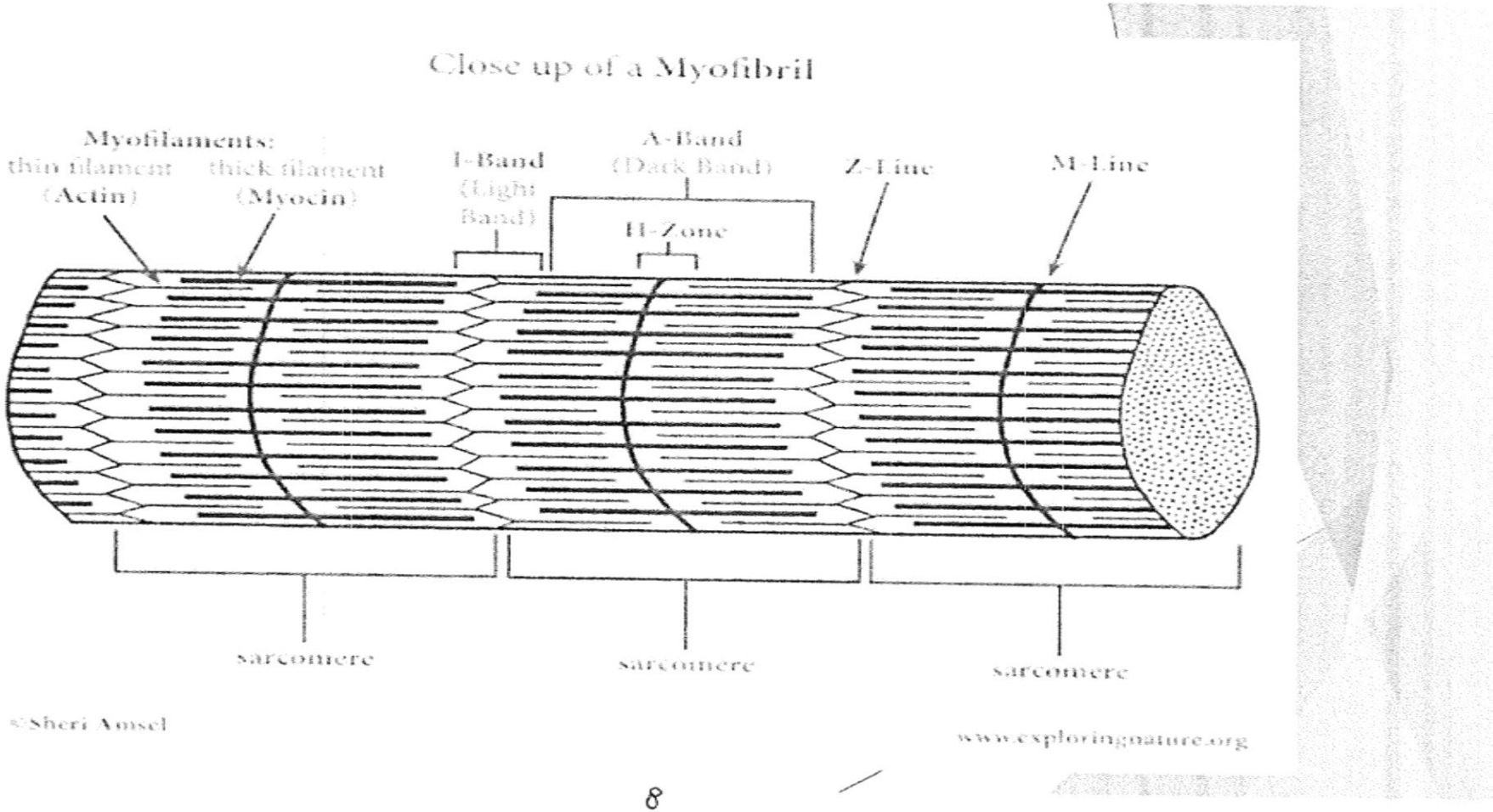

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- **Types of skeletal muscle fibers**
- There are three types of skeletal muscle fiber differ in myoglobin content, number of mitochondria, and speed of contraction. In man, most skeletal muscles are composed of a mixture of these fiber types.
- a. ***Red fibers:*** contain more myoglobin and mitochondria and are capable of sustained contraction. They predominate in muscles of limbs.
- ***b. White fibers*** : contain less myoglobin and fewer mitochondria. They predominate in the extraocular muscles.
- ***c. Intermediate***: fibers have structural and functional characteristics between those of red and white fibers but are considered a subclass of white type. They are found dispersed among the red and white fibers in muscles where either type predominates.

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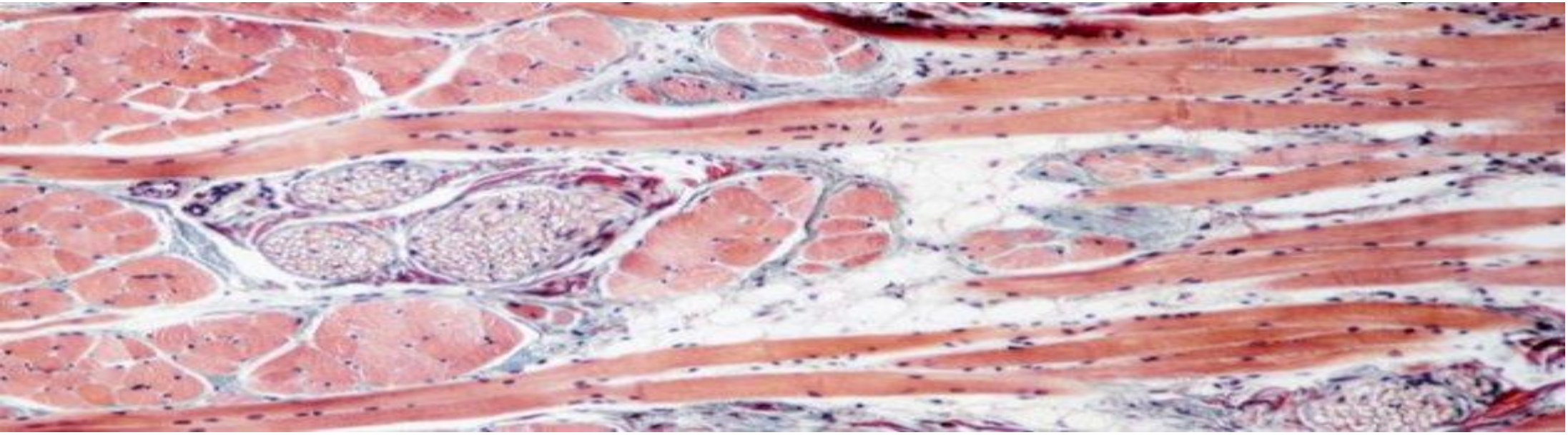

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- **2- Cardiac muscle**
- Cardiac muscle (heart muscle) like skeletal muscle, is also striated but involuntary muscle responsible for the pumping activity of the vertebrate heart.
- Cardiac muscle can contract without extrinsic nerve or hormonal stimulation. It contracts via its own specialized conducting network within the heart.
- Cardiac muscle cells are short and branched with a single, centered nucleus. They are also involuntary or not under immediate conscious control.
- The short cardiac muscle fibers are joined together by intercalated discs.
- These discs appear as dark lines.
- The sarcoplasm contains single, oval, prominent and central nucleus.
- The sarcoplasm near the nuclear poles contains many mitochondria, glycogen granules and some lipofuscin pigment.

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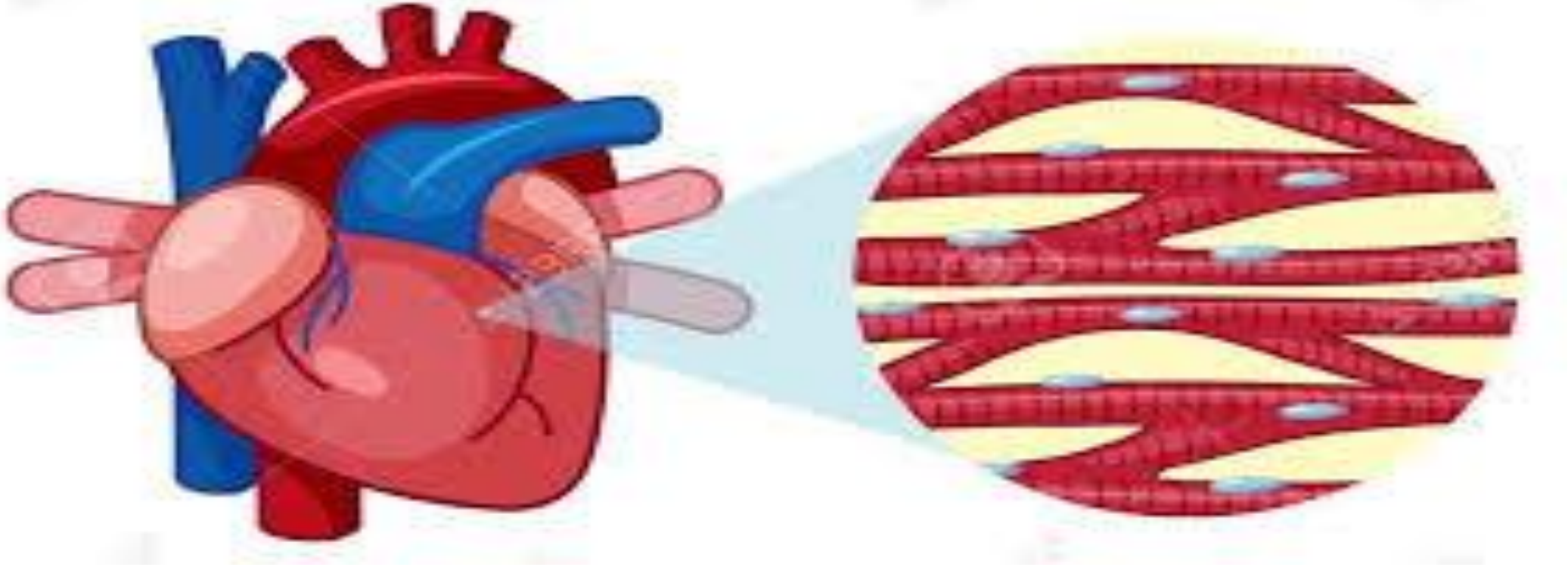
Cardiac Muscle Tissue



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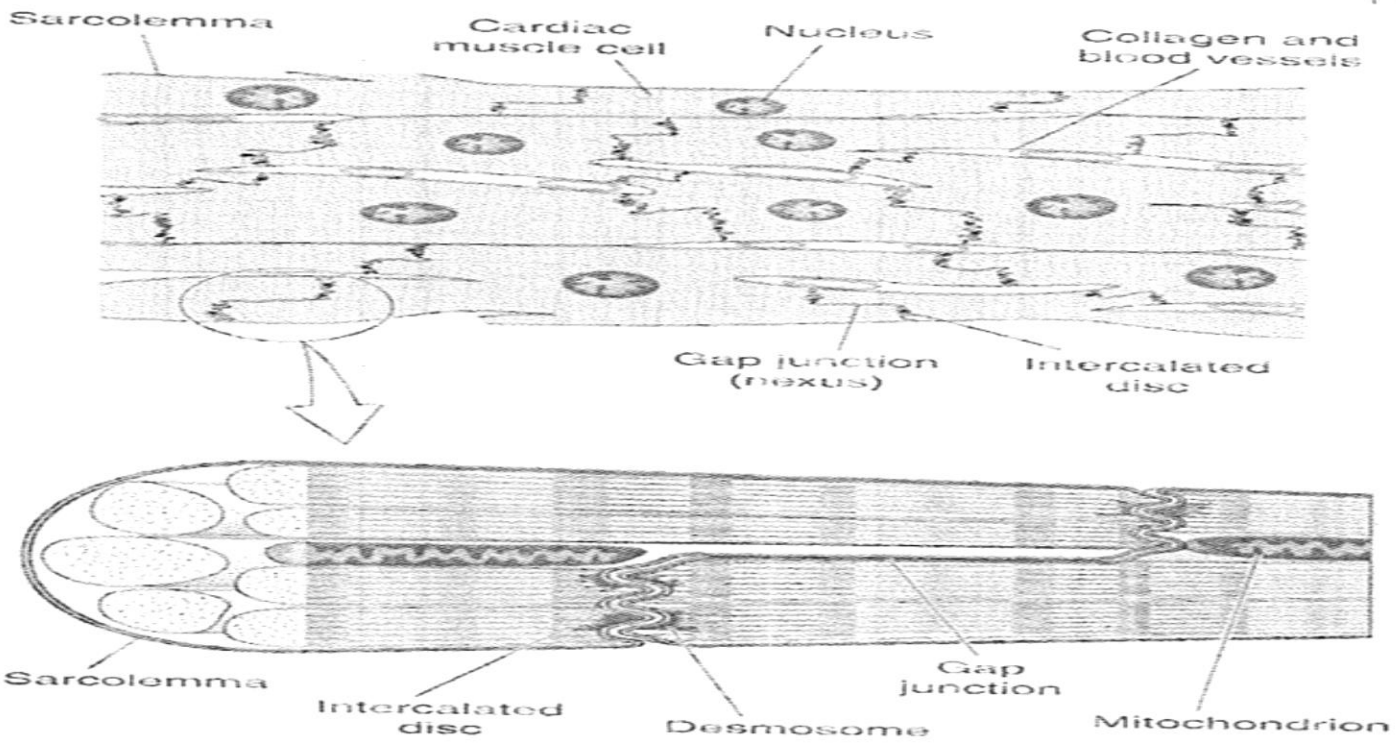

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- **3- Smooth muscle**
- Smooth muscle consists of collections of fusiform cells that do not show cross-striations.
- Their contraction process is slow and not subject to voluntary control.
- Smooth muscle is responsible for the contractility of hollow organs, such as blood vessels, the gastrointestinal tract, the bladder, or the uterus.
- Mature smooth muscle fibers are spindle-shaped cells with a single central ovoid nucleus.
- Each of smooth muscle cell is enclosed by a basal lamina and a network of reticular fibers . The last two components serve to combine the force generated by each smooth muscle fiber into a concerted action, eg, peristalsis in the intestine.

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