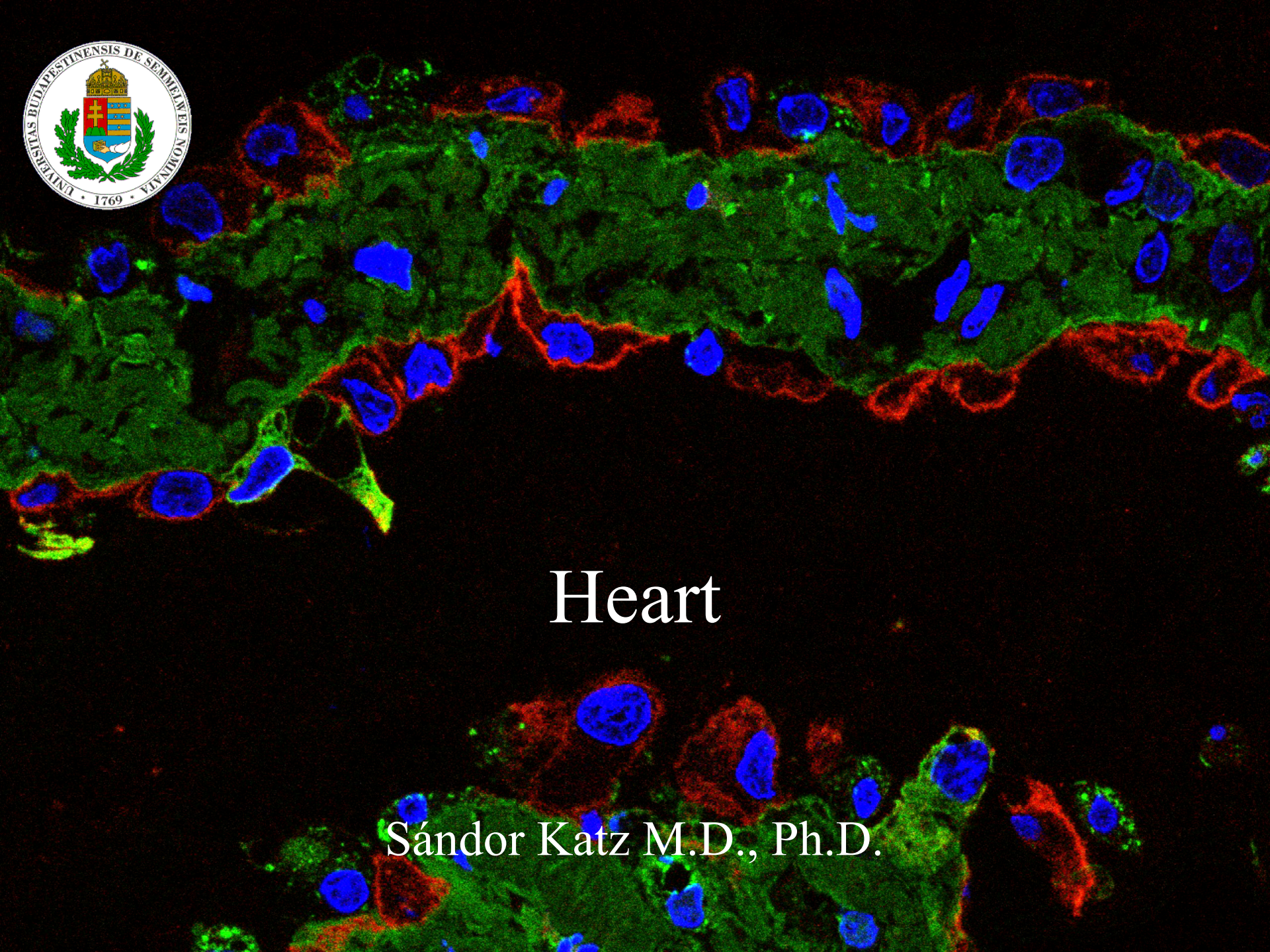
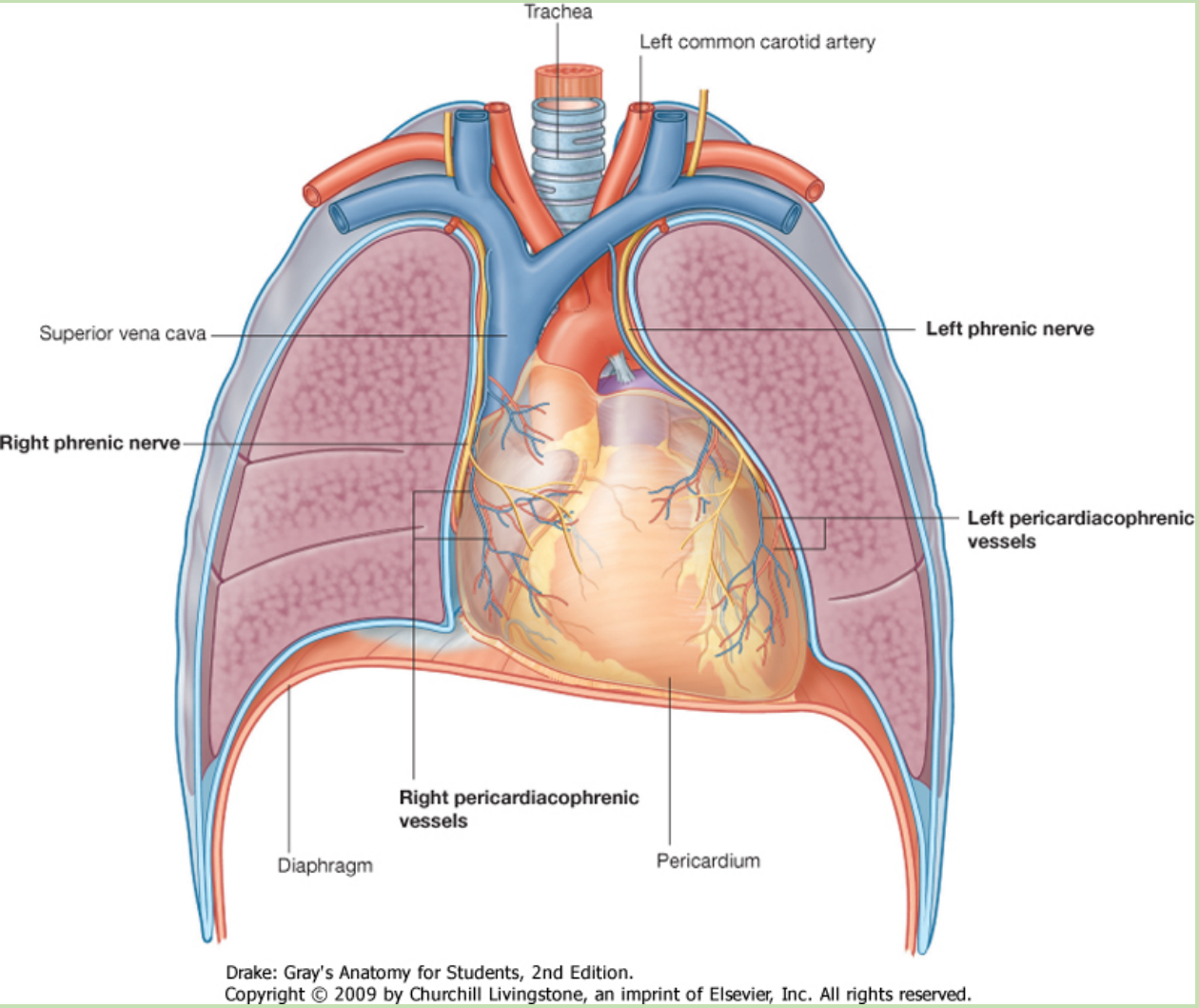


Heart

Sándor Katz M.D., Ph.D.

The heart in situ



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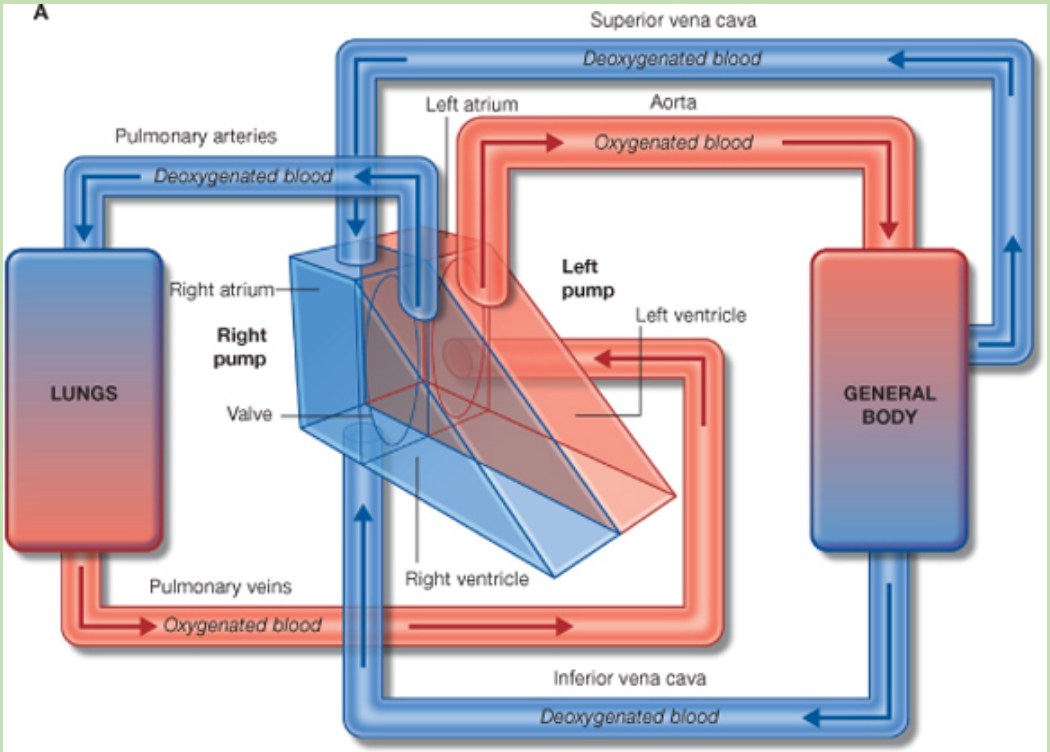
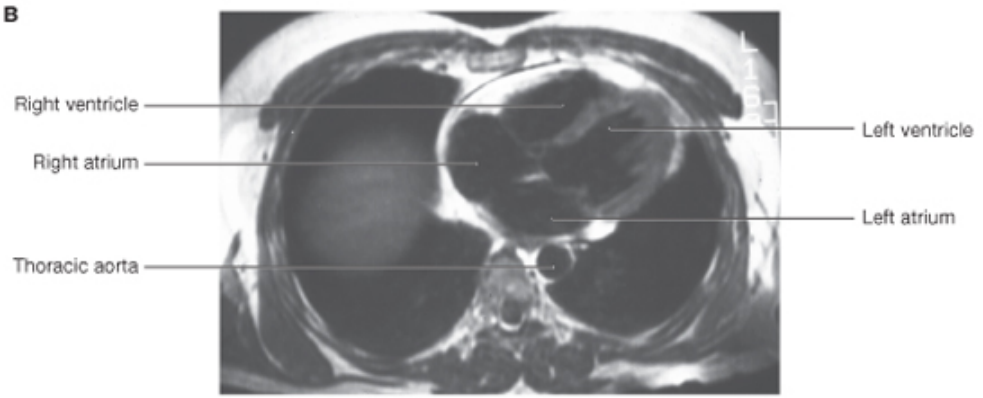
Location:
Between the two lungs in the mediastinum.

Function





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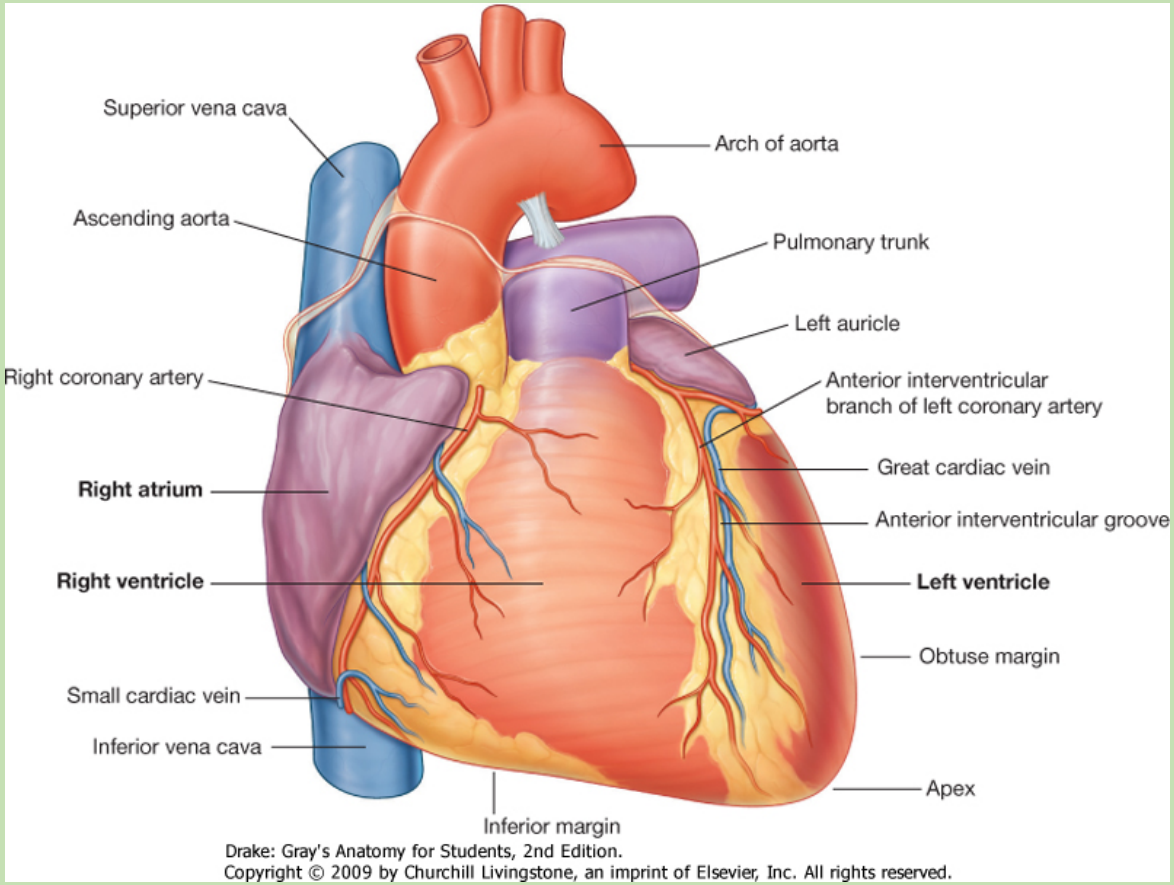
- The heart pumps blood trough the blood vessels, keeping up the **systemic and pulmonary circulations.**

Overview



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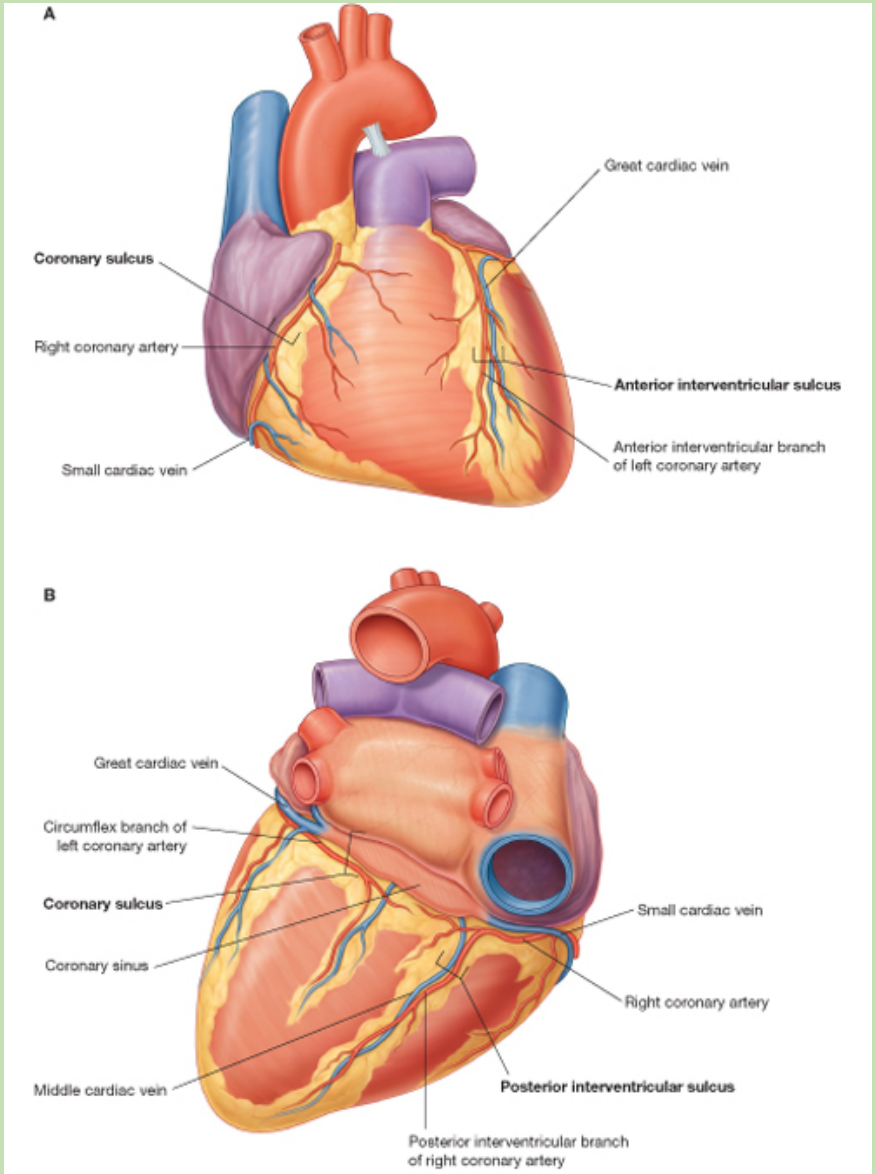
- The heart consists topographically of a **base**, **apex** and **three surfaces**.

Coronary sulcus

It separates atria from the ventricles, contains coronary arteries.

Surfaces of the heart



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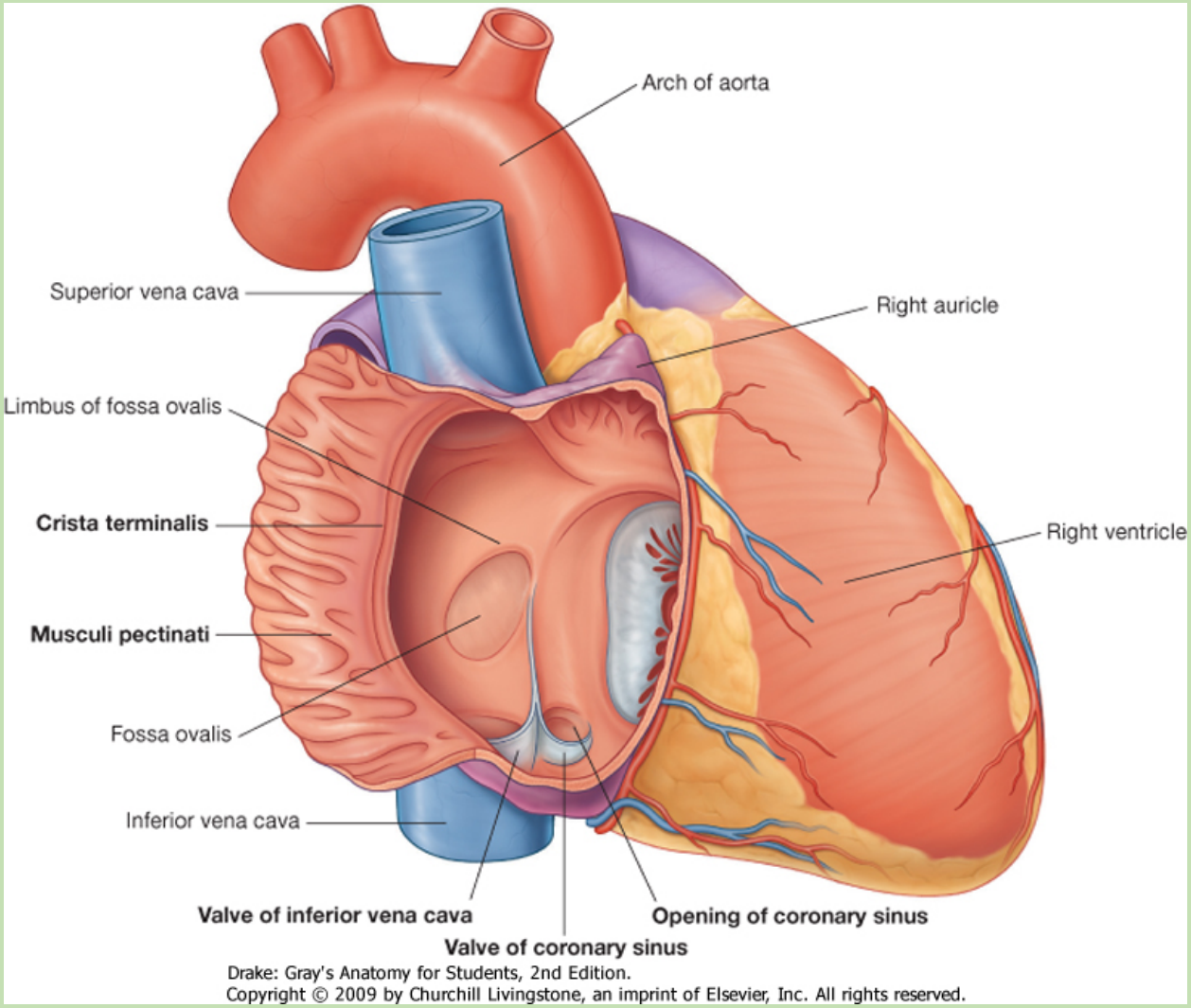
- **Sternocostal (anterior) surface**
- **Diaphragmatic (inferior) surface**
- **Posterior surface**

Right atrium



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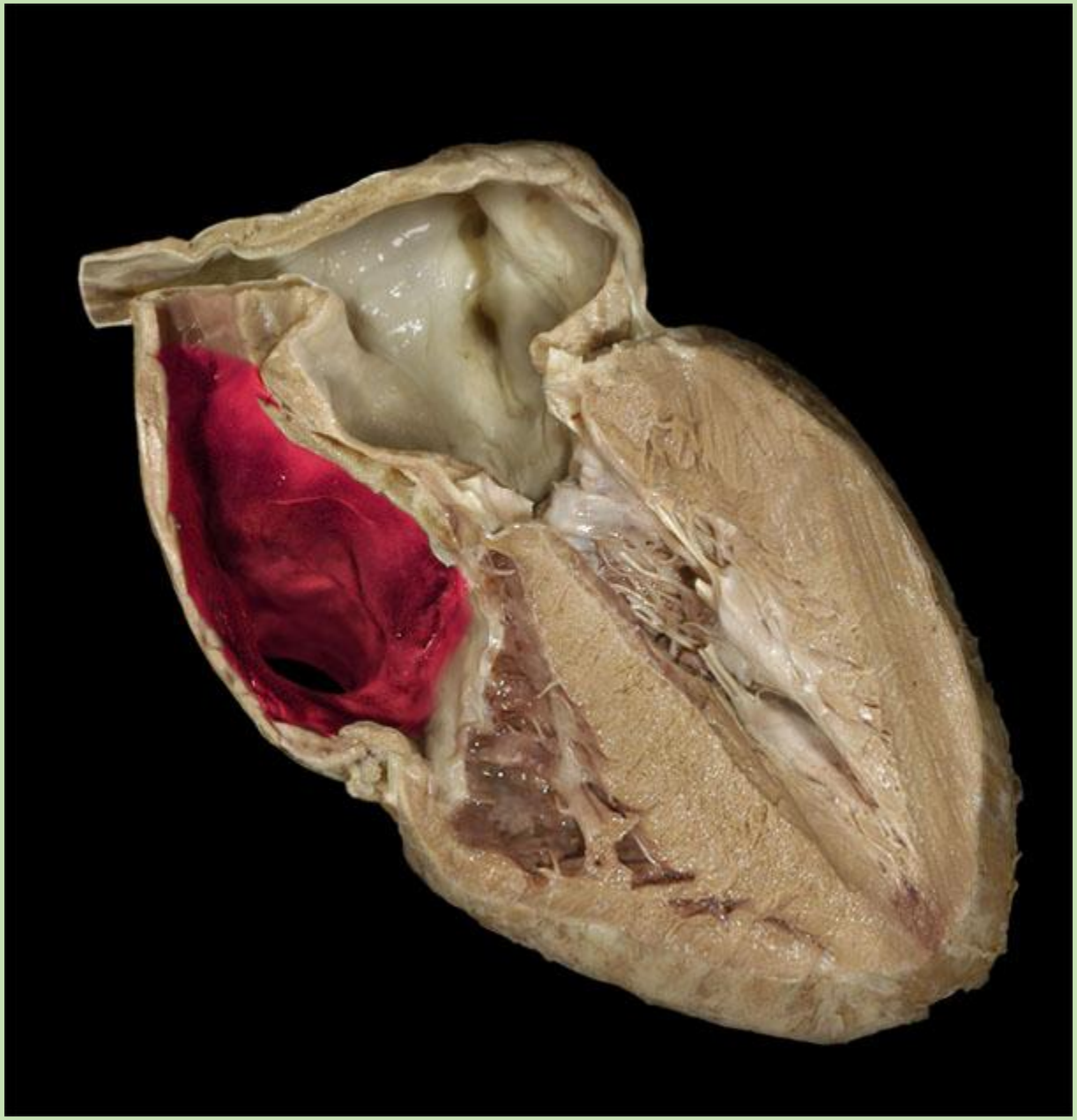
- It consists of the smooth-walled **sinus venarum** and pectinate muscles lined **proper right atrium**.

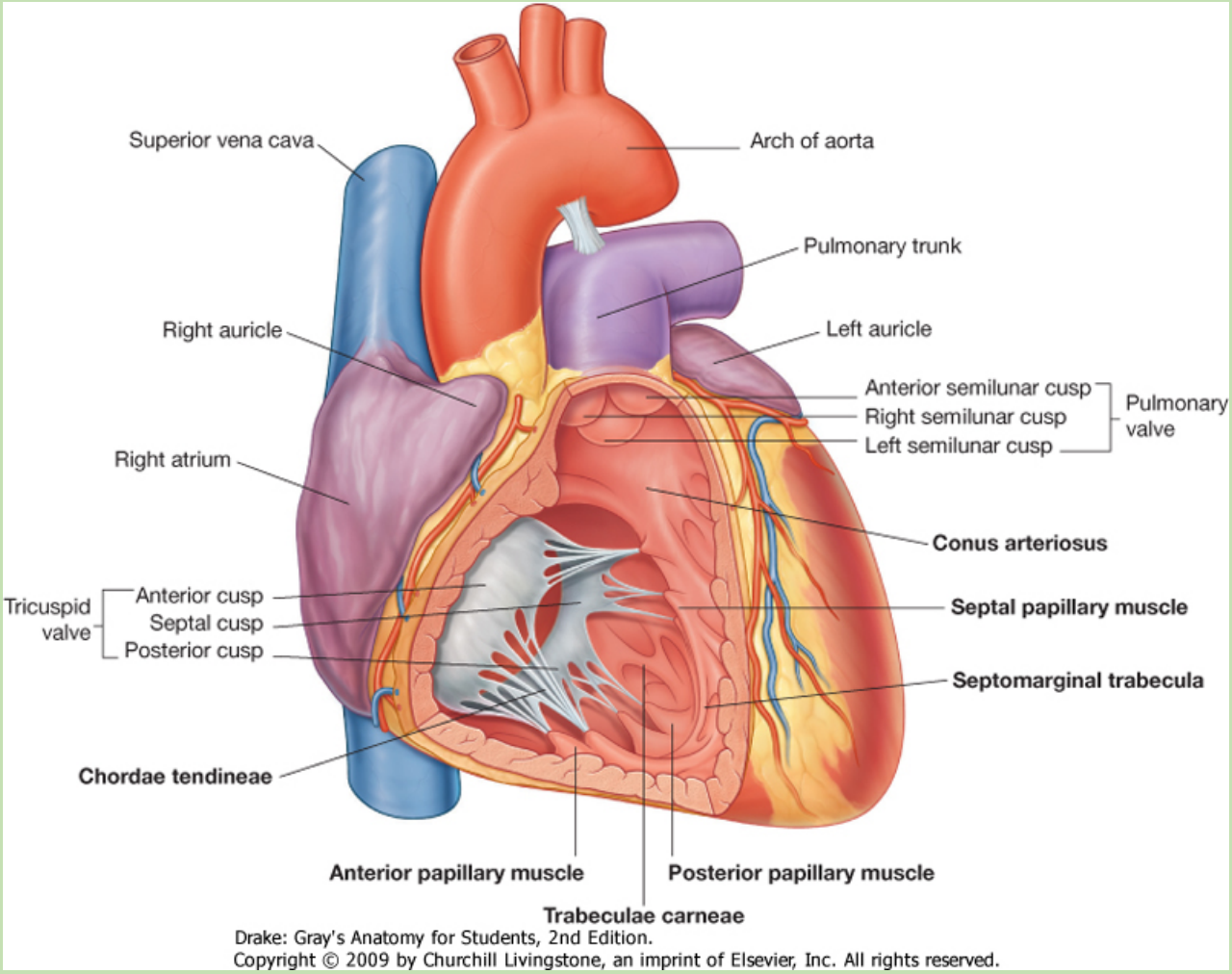
Parts:

- **Openings of the superior vena cava, inferior vena cava, coronary sinus;**
- **Terminal crest,**
- **Oval fossa,**
- **Right auricle**.



right atrium

Right ventricle



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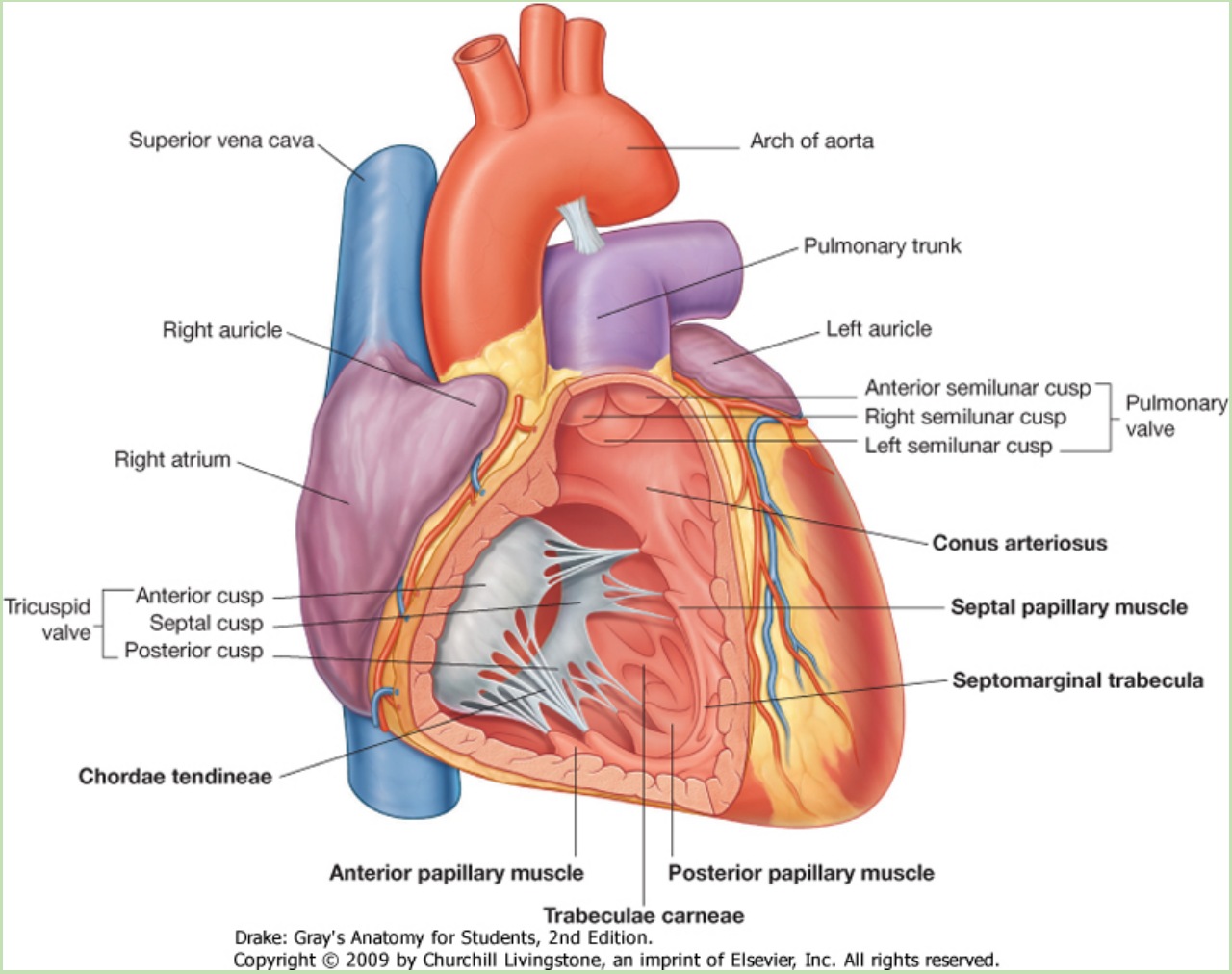
- It is divided into two segments: the **inflow tract** posteroinferiorly and the **outflow tract** anterosuperiorly.

Right ventricle



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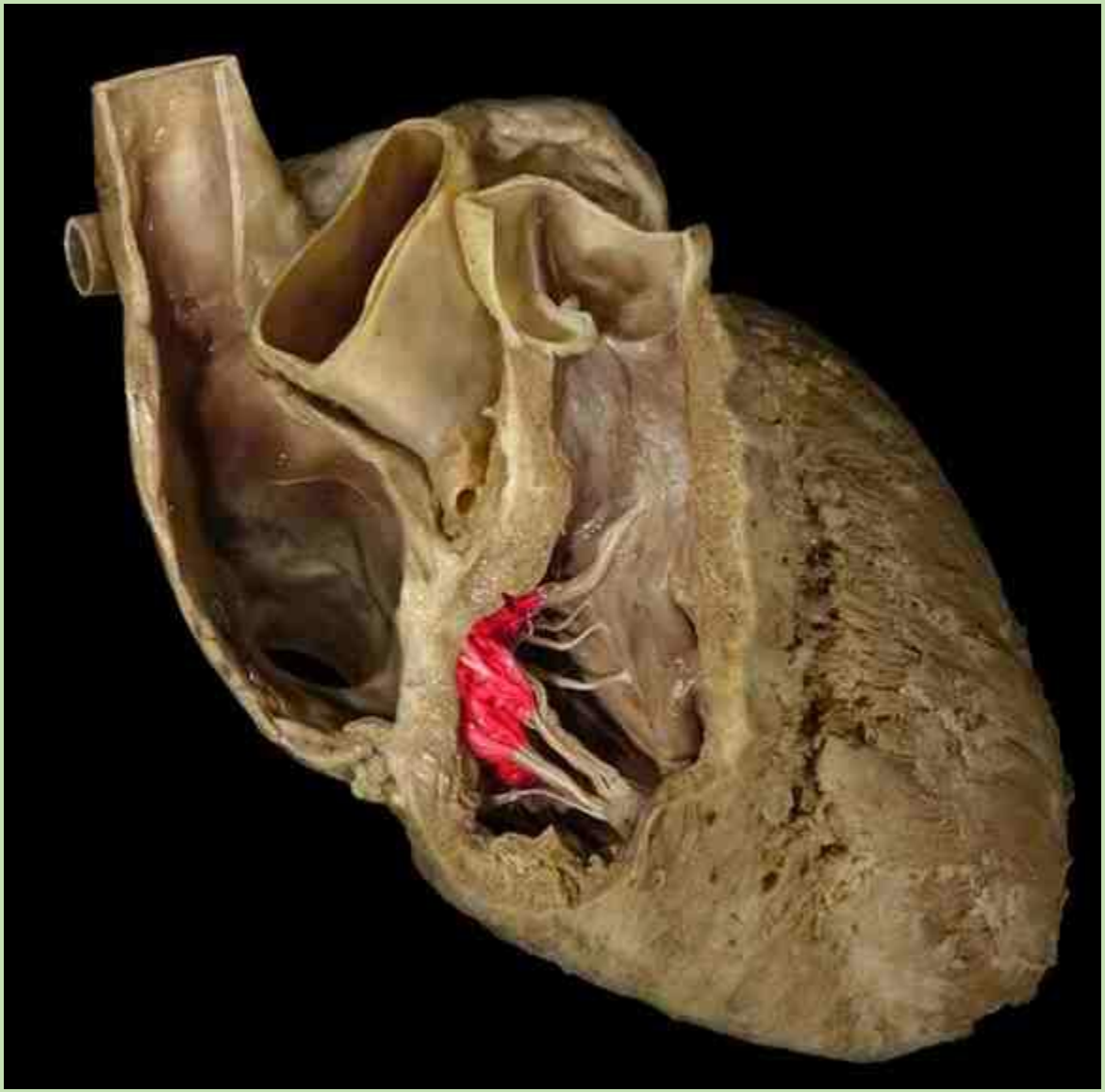
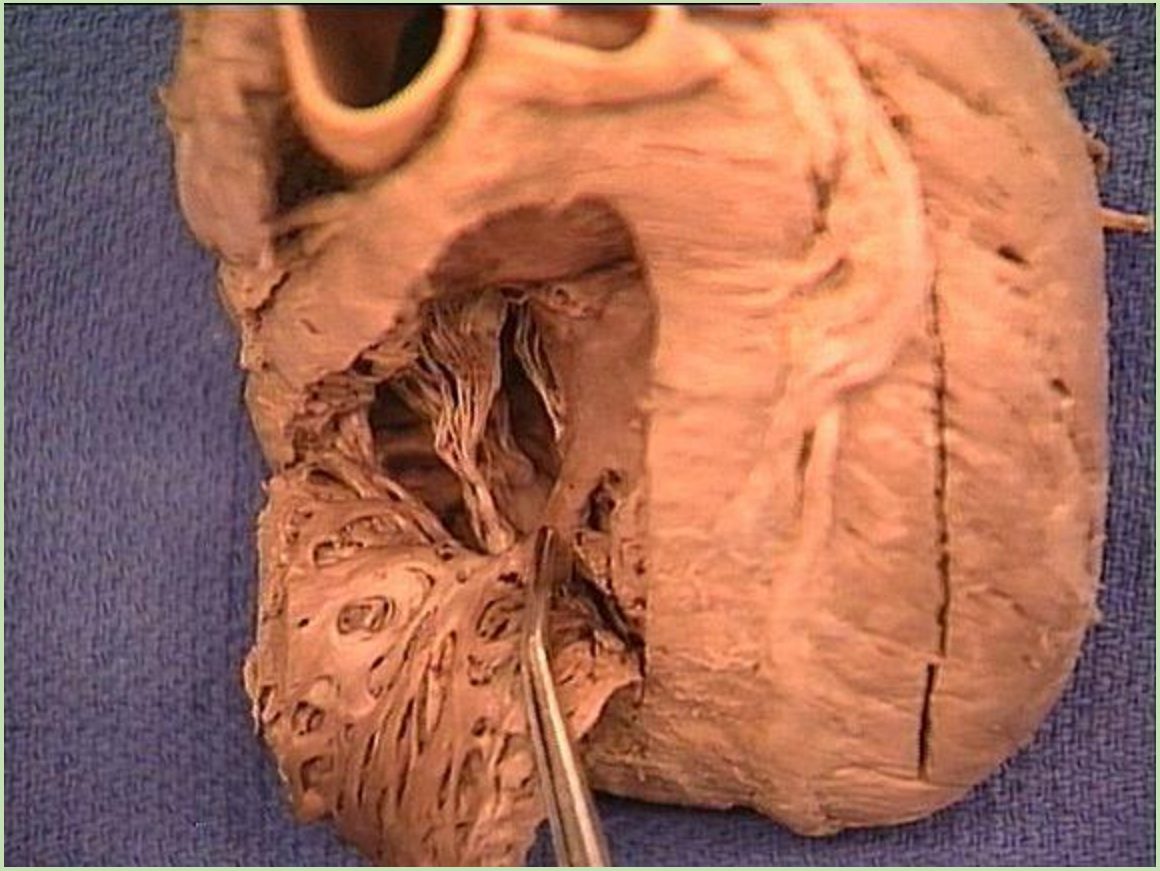
Parts:

- **Septomarginal trabecule** (moderator band),
- **Trabeculae carneae**,
- Right atrioventricular valve=**tricuspid valve** (papillary muscles, chordae tendinae, cusps)
- **Conus arteriosus**
- **Orifice of the pulmonary trunk** - guarded by the pulmonary valve.

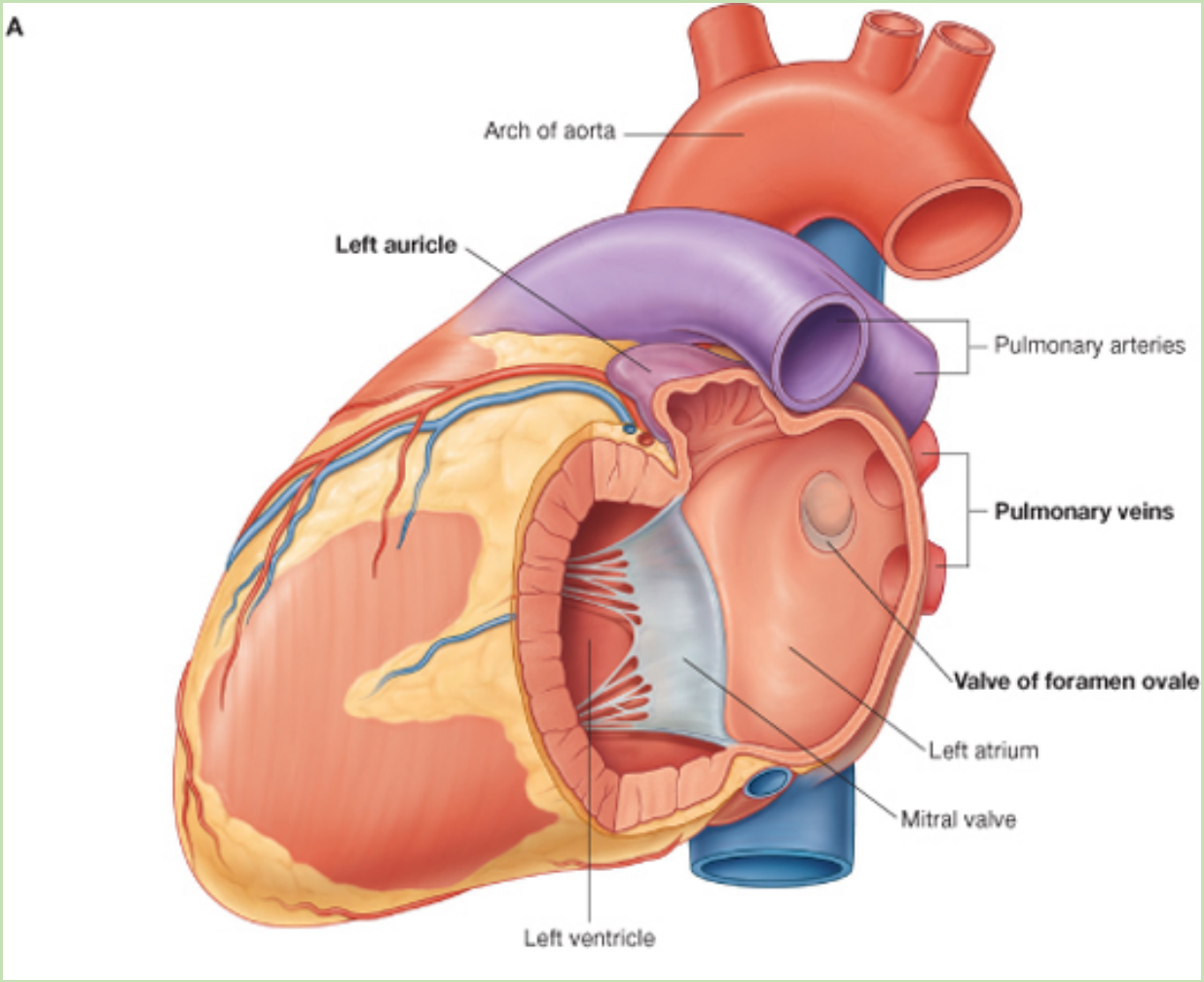


tricuspid valve

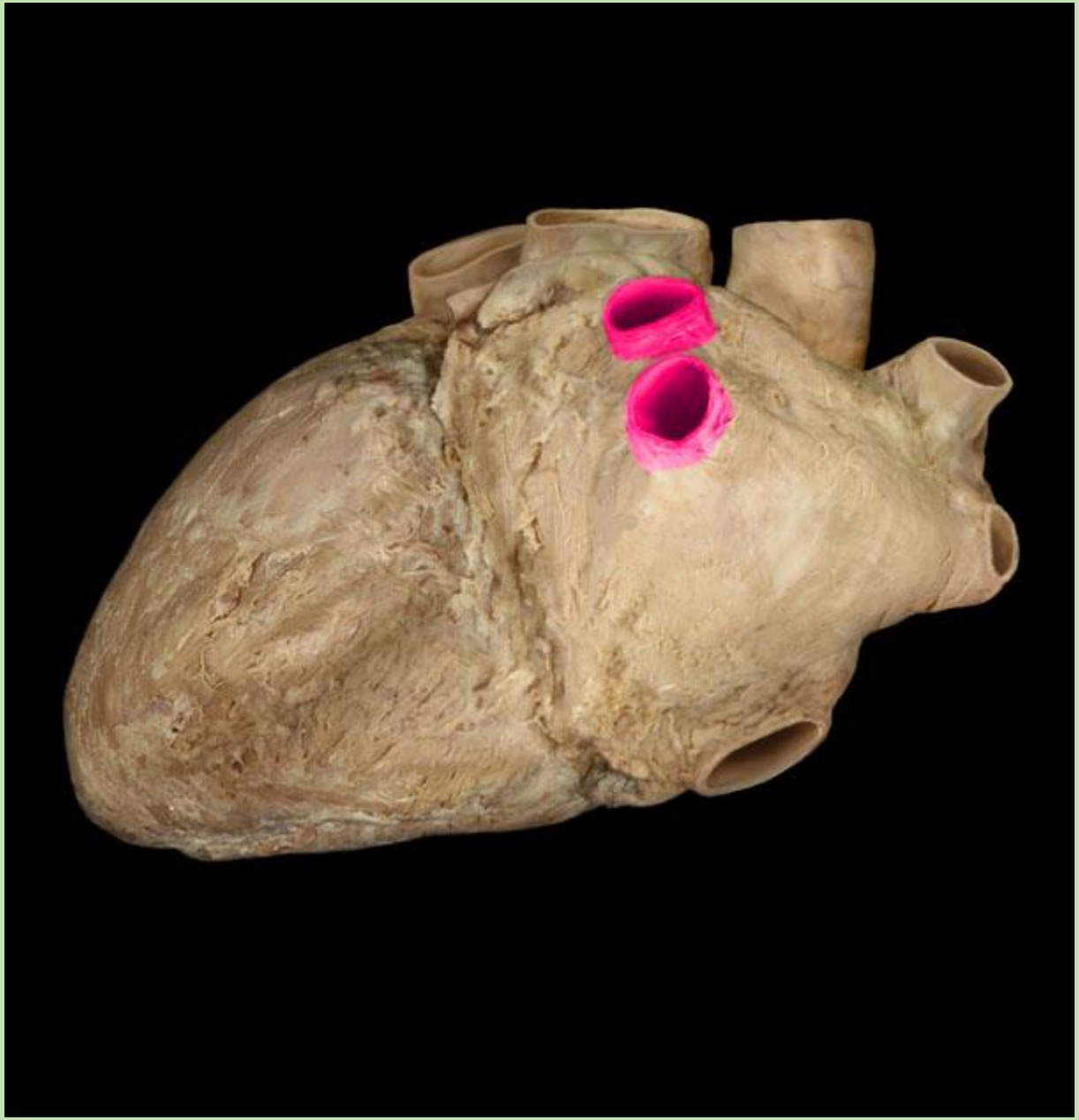


septomarginal trabecule

Left atrium

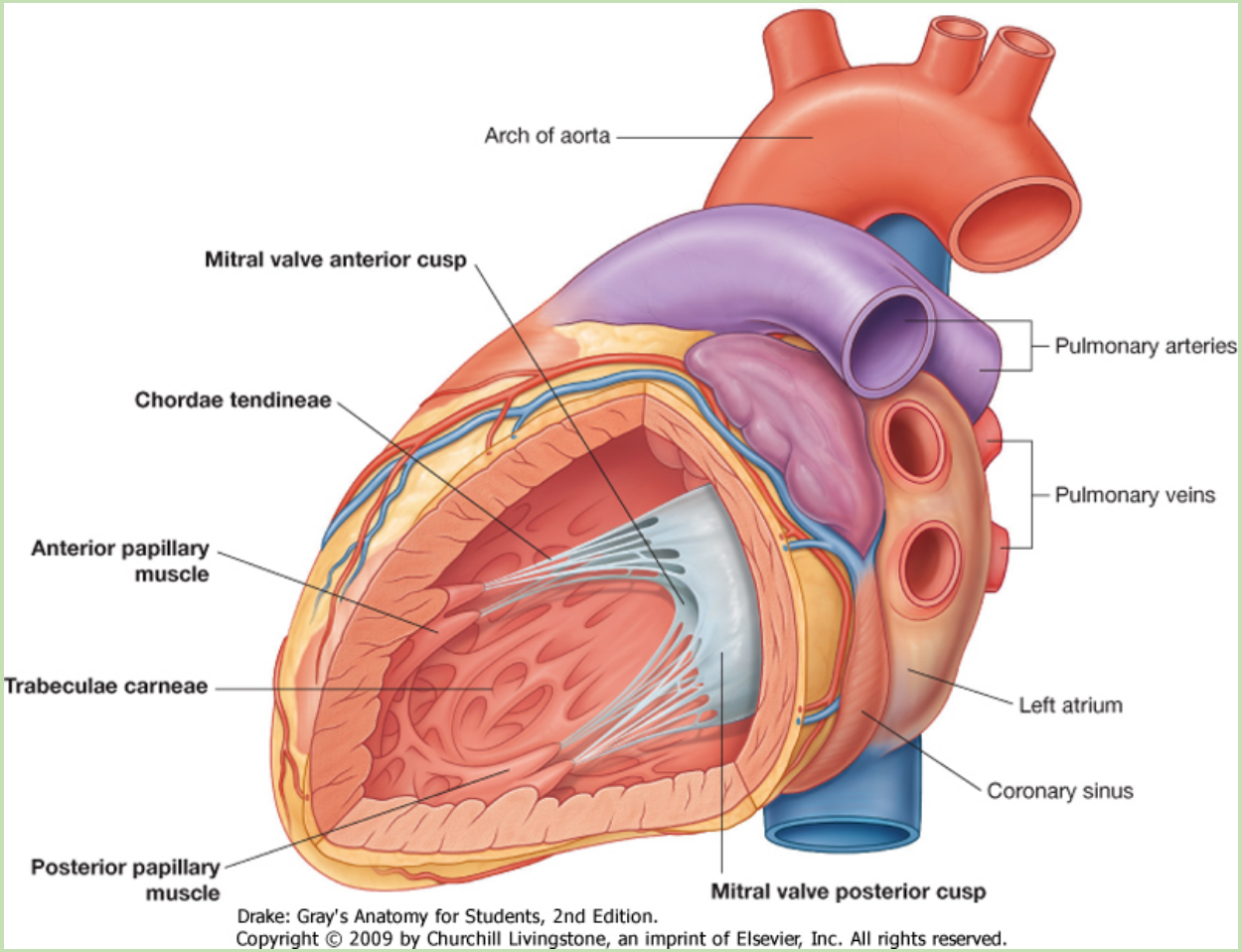


- Smooth wall, except in the **left auricle**
- **Four openings of the pulmonary veins**



pulmonary veins

Left ventricle



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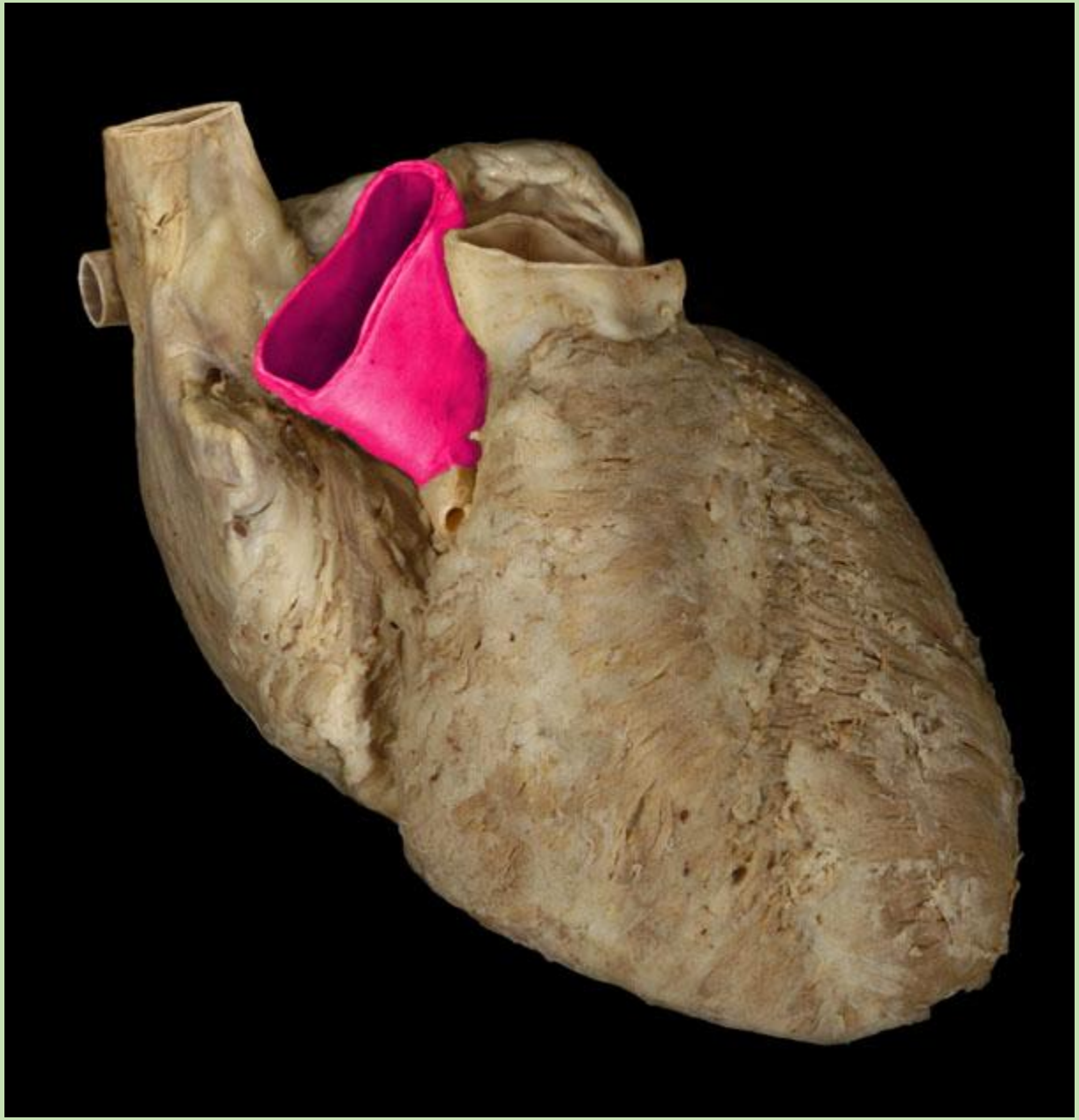
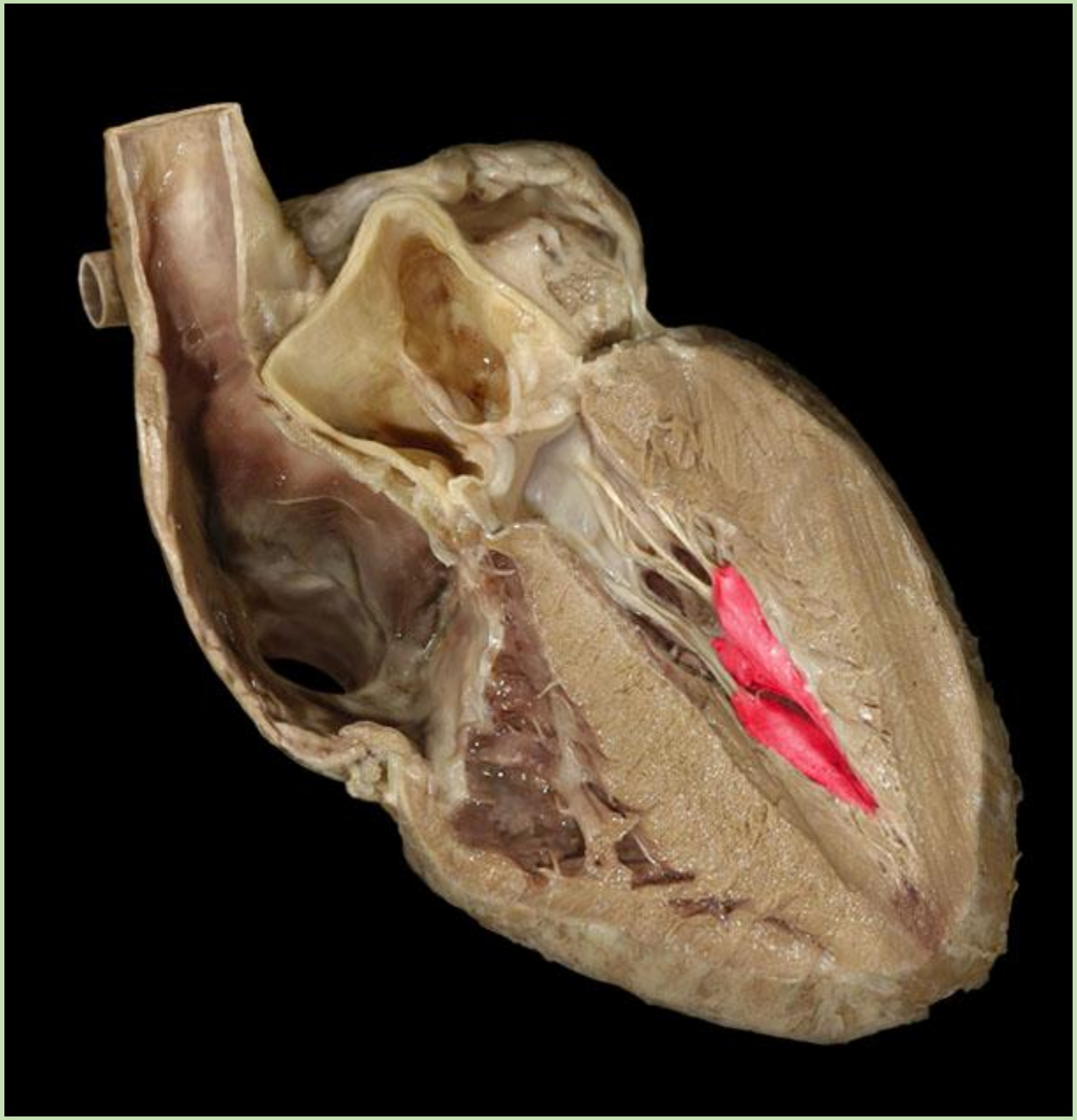
Parts:

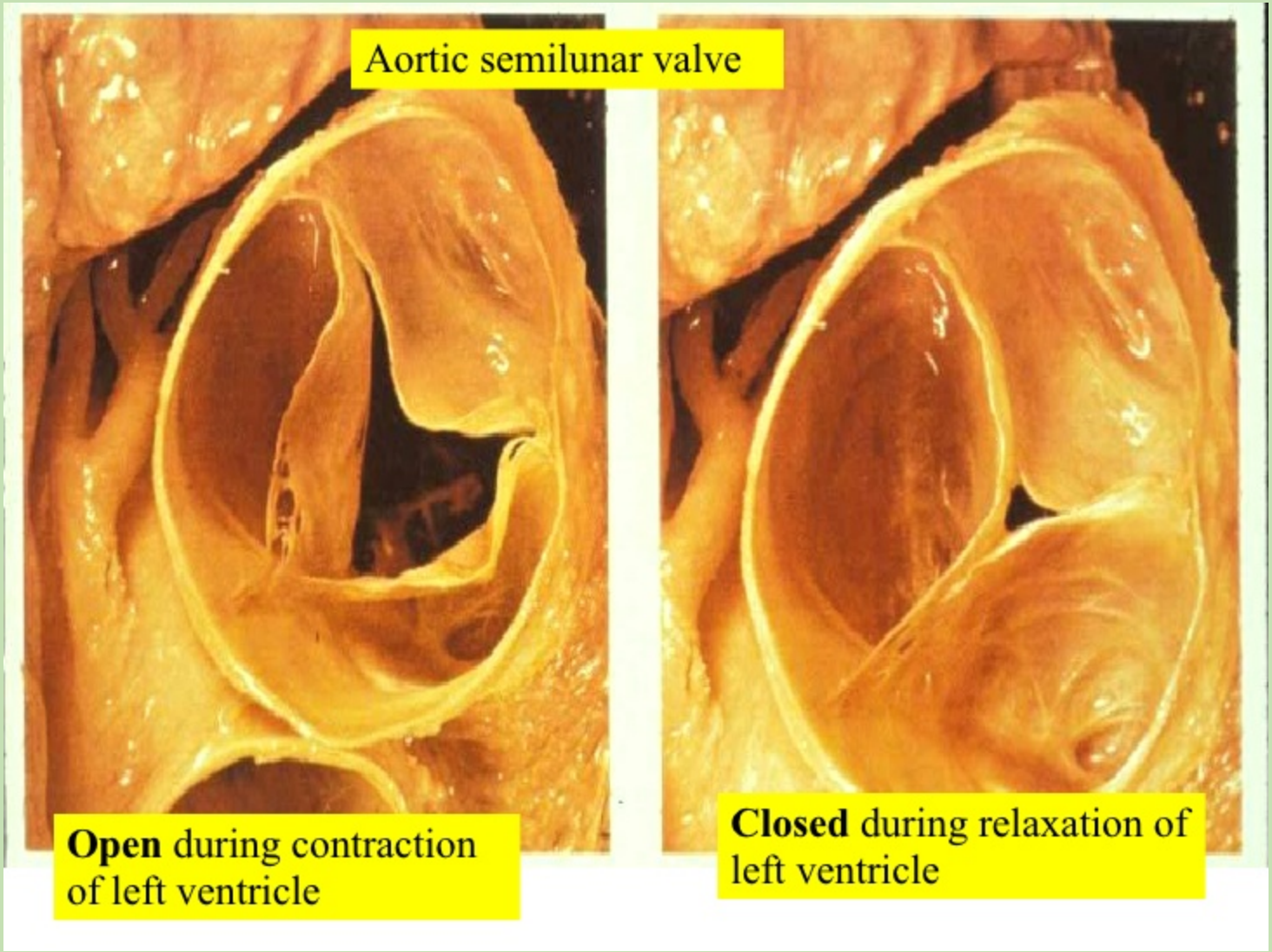
- **Trabeculae carneae**,
- Left atrioventricular valve=bicuspid valve=**mitral valve** (papillary muscles, chordae tendinae, cusps)
- **Orifice of the aorta -** guarded by the aortic valve.



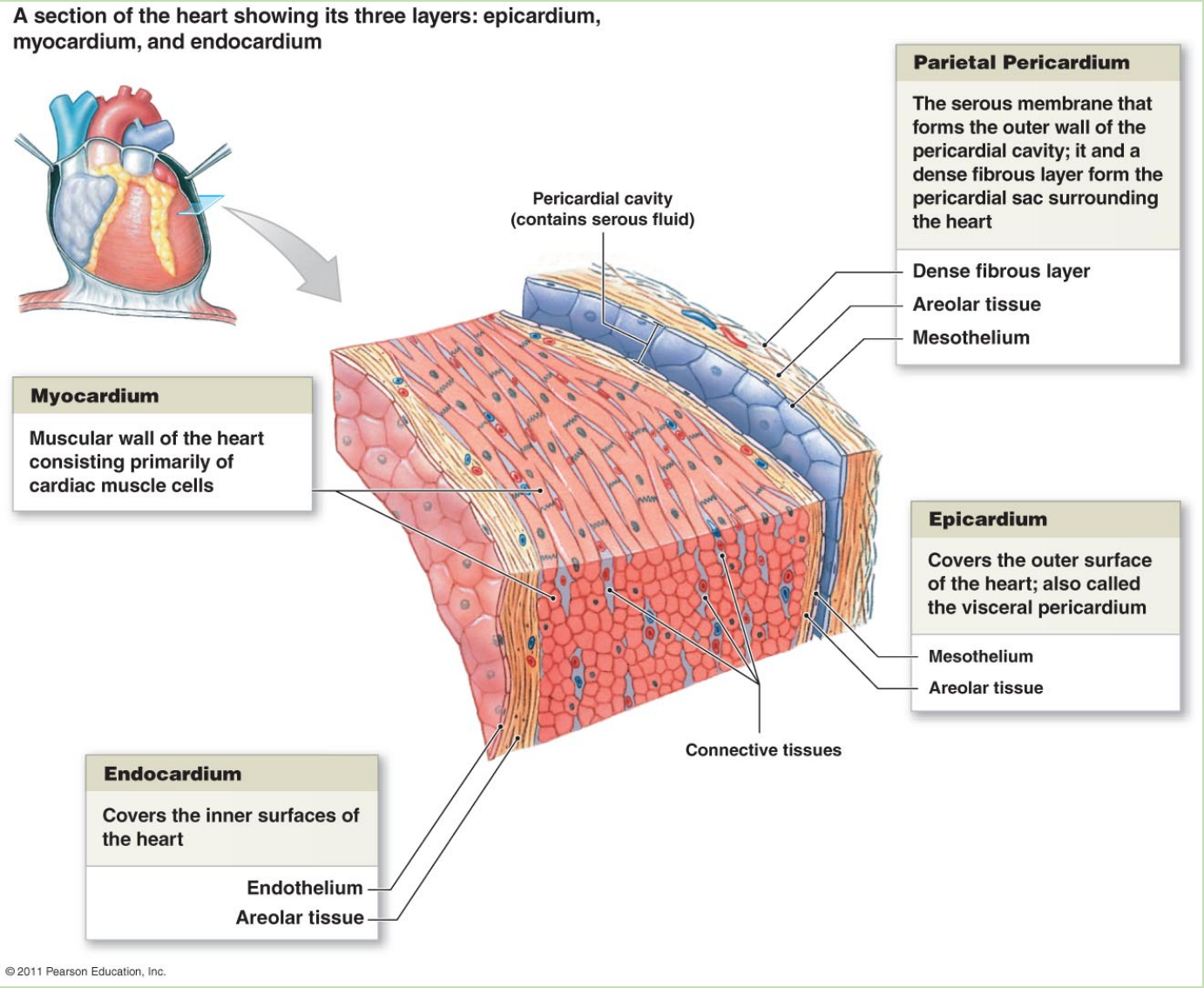
aorta



papillary muscles

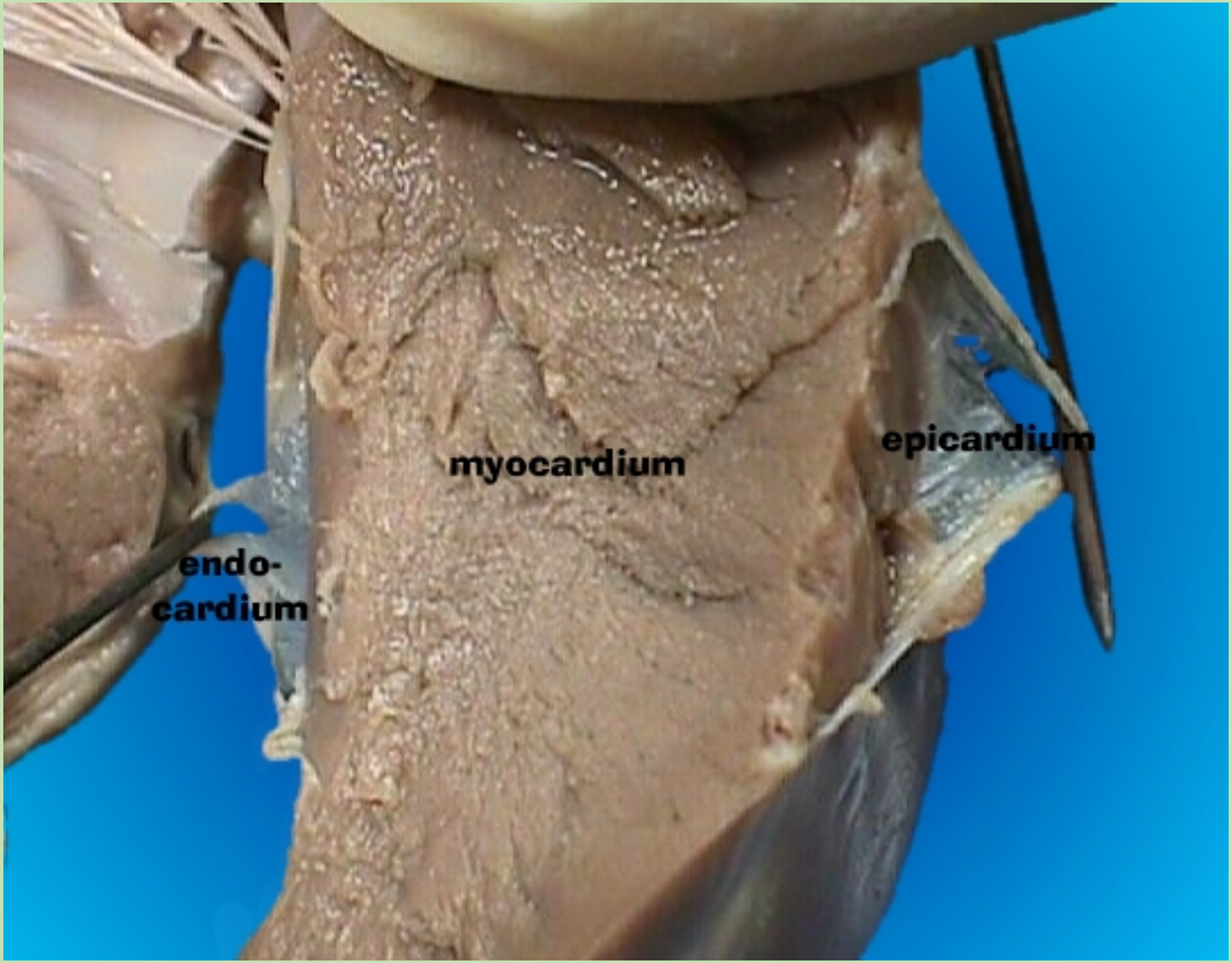

Aortic semilunar valve
Open during contraction of left ventricle
Closed during relaxation of left ventricle

Cardiac wall

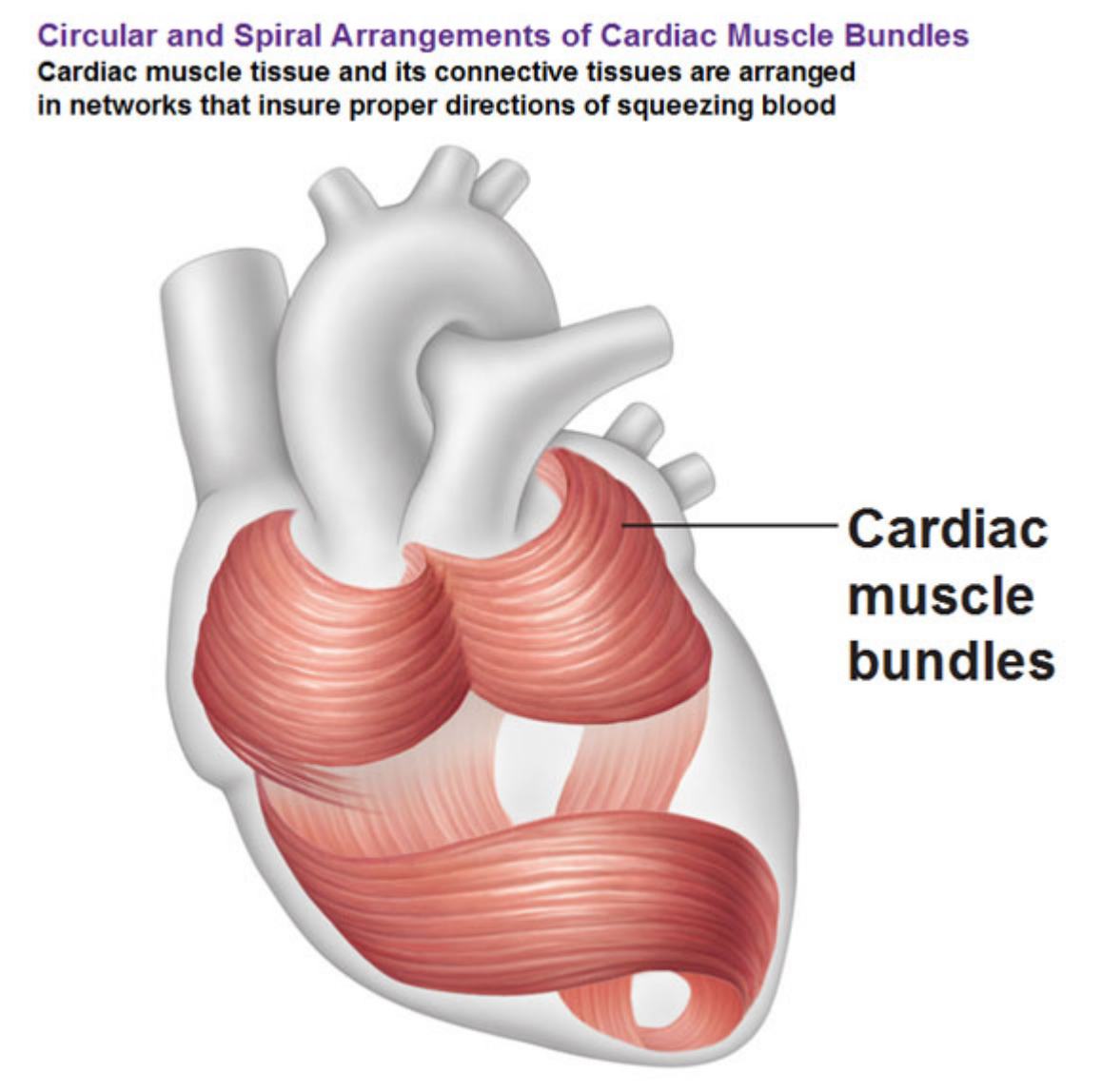


- **Endocardium**
- **Myocardium**
- **Epicardium**

Cardiac wall



Myocardial architecture - layers



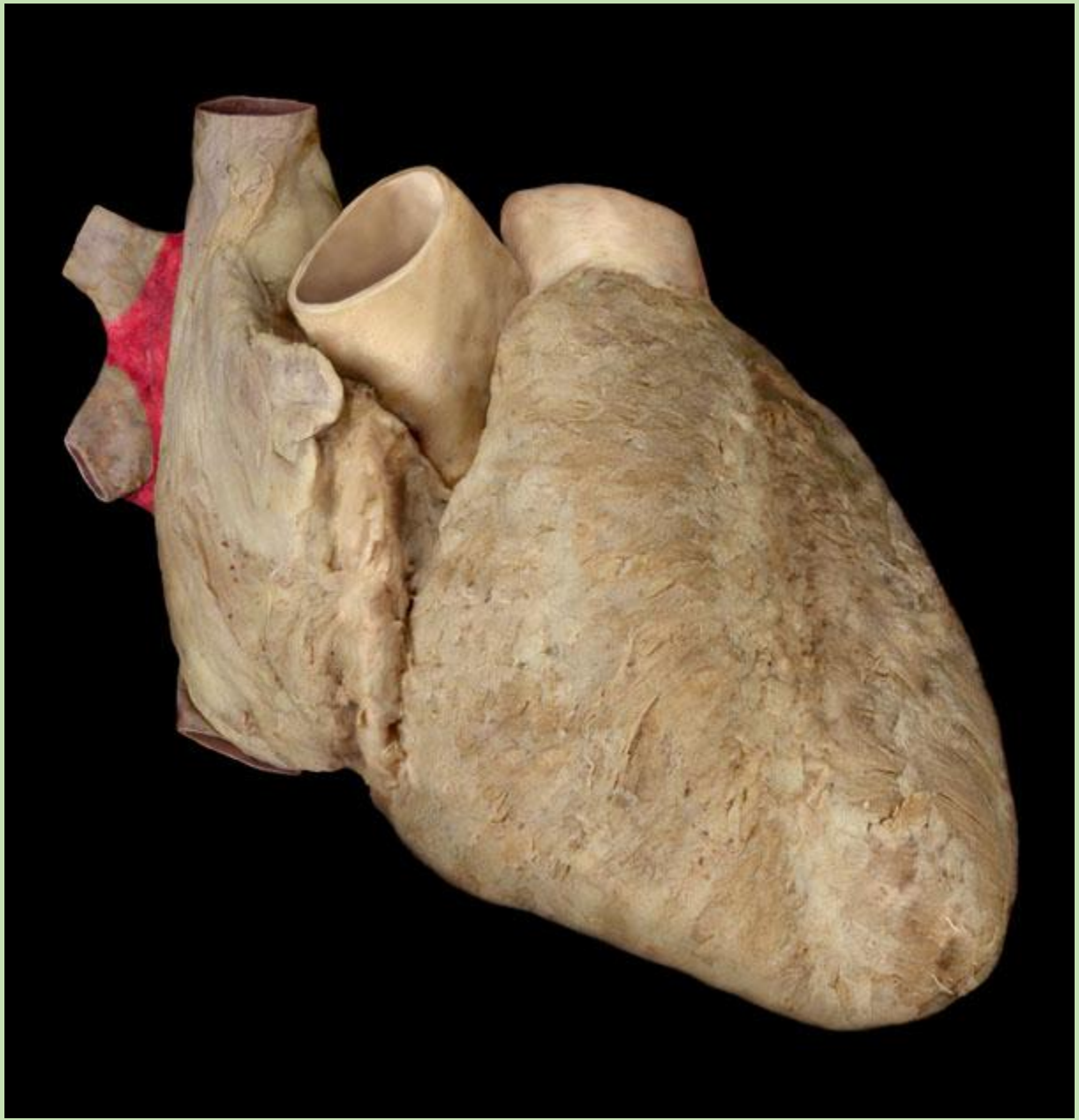
Atria:

- Outer circular
- Inner longitudinal

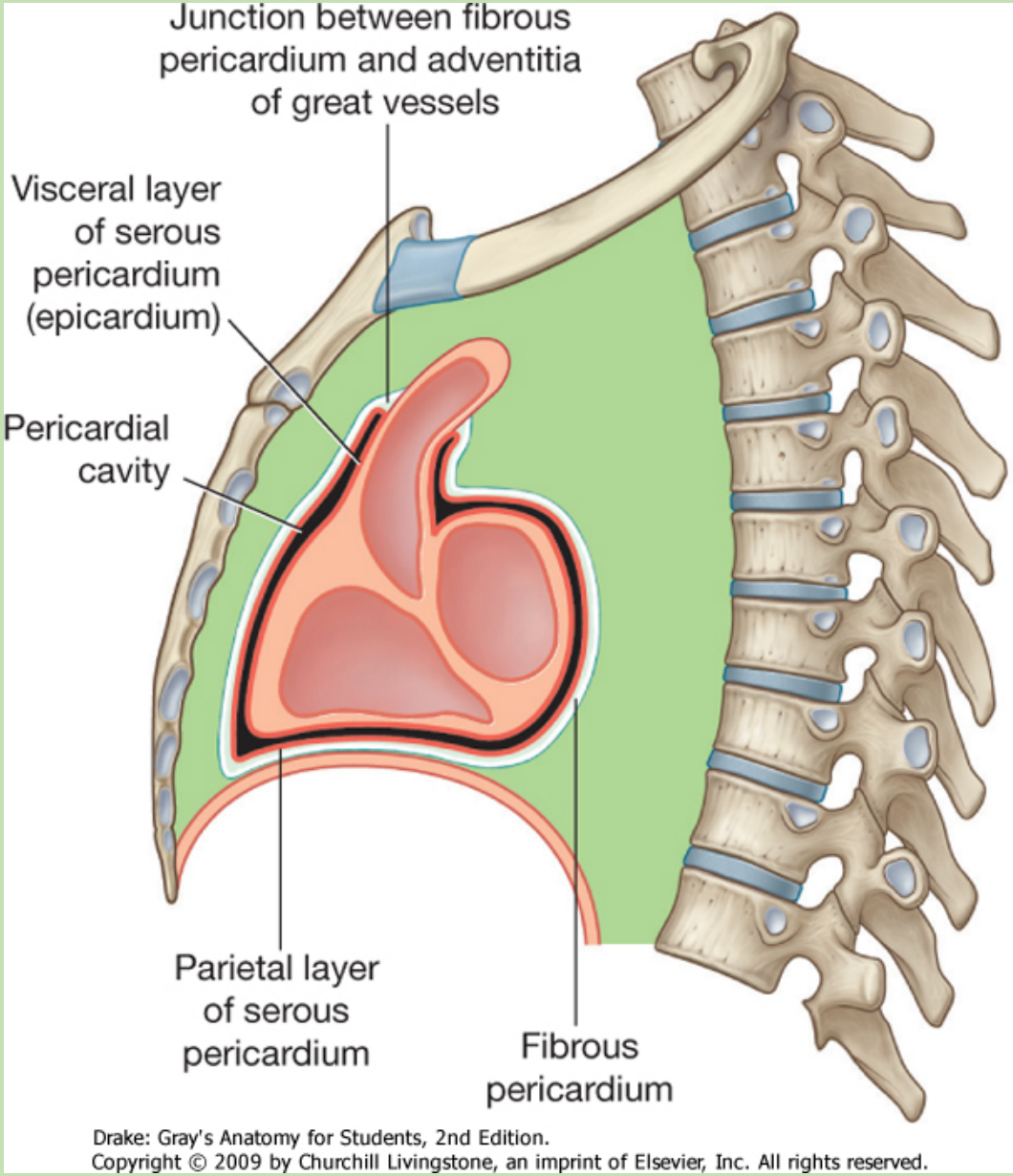
Ventricles:

- Outer oblique
- Middle circular
- Inner longitudinal

Myocardial architecture - layers



Pericardium



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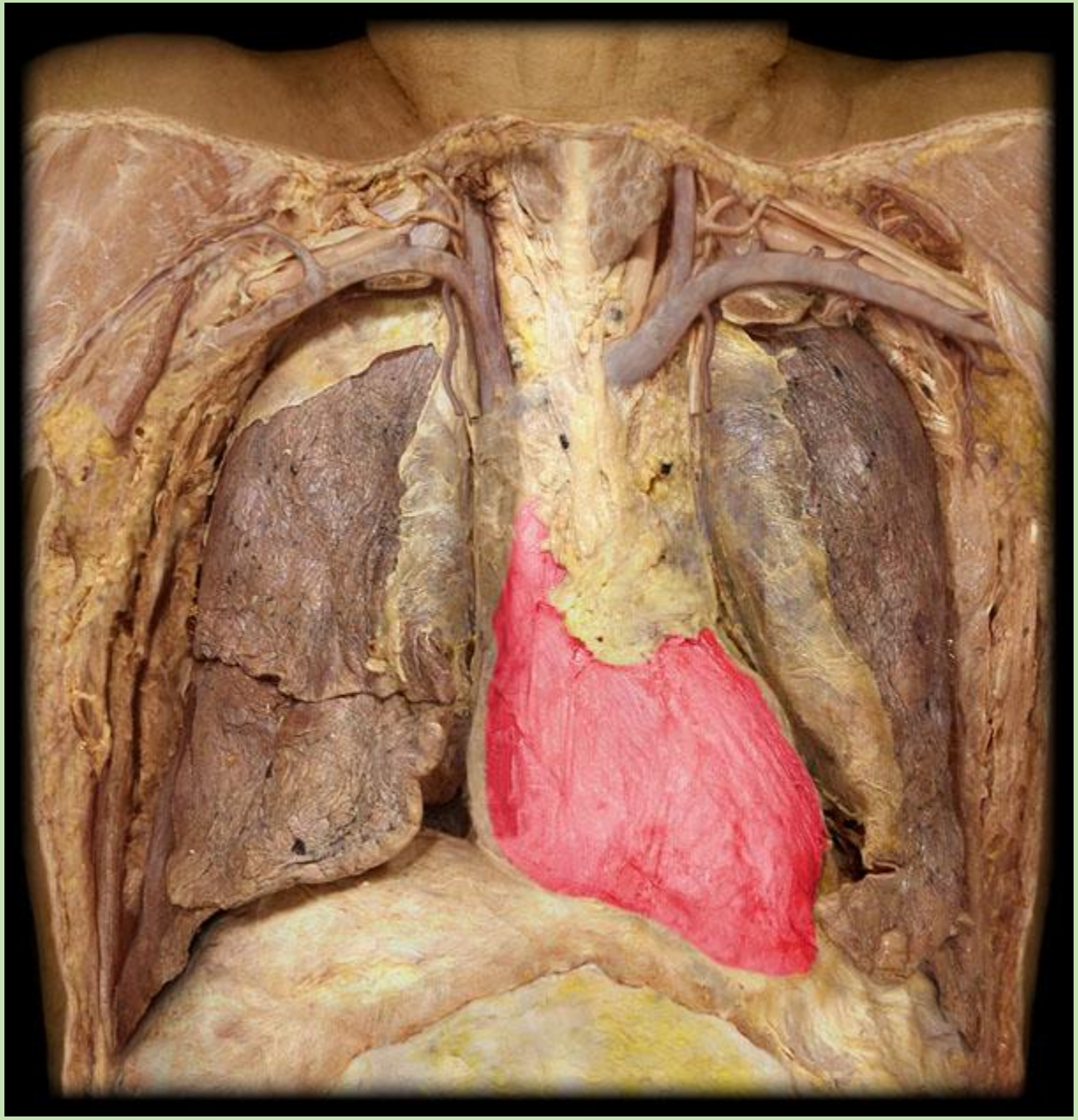
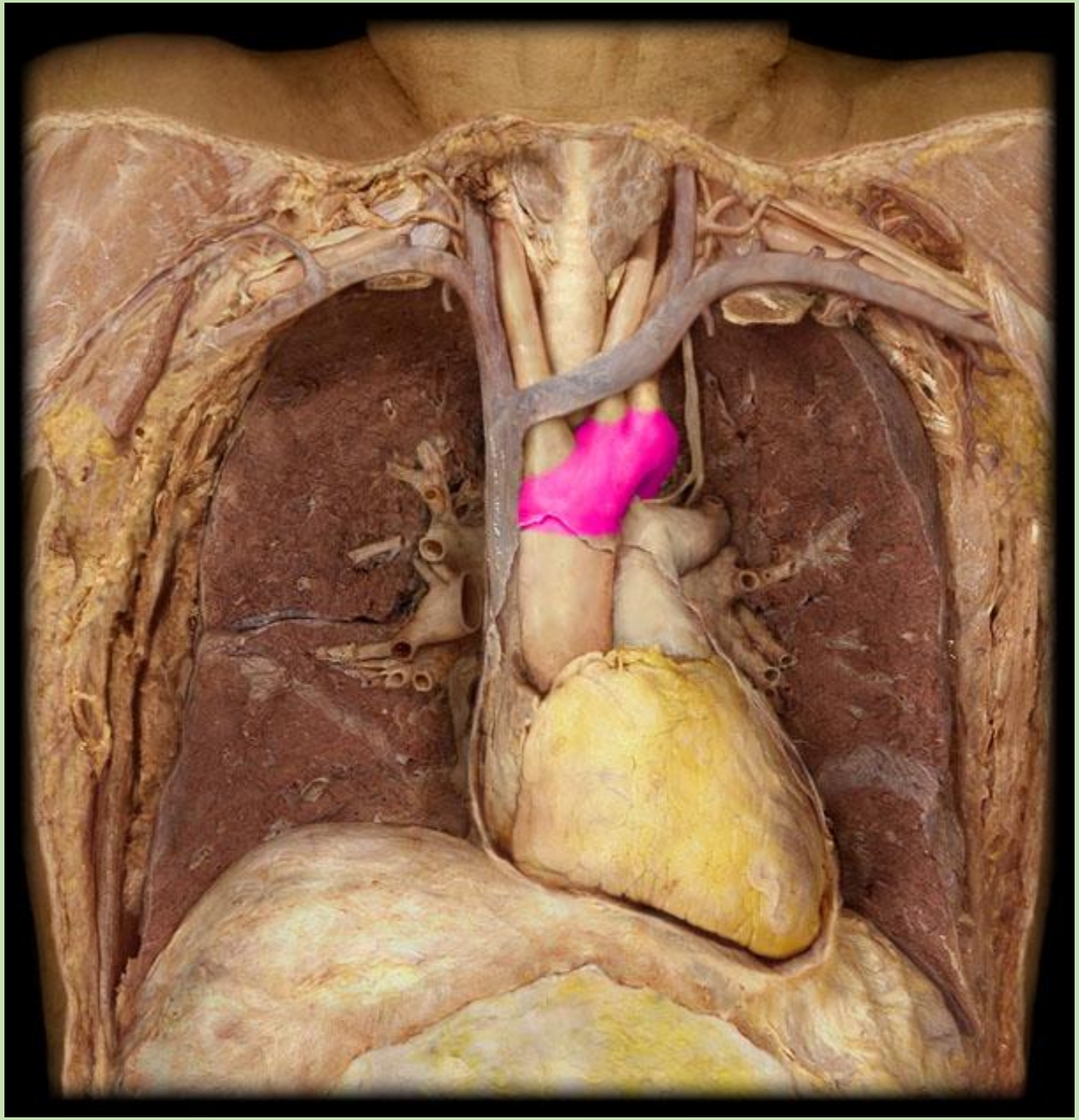
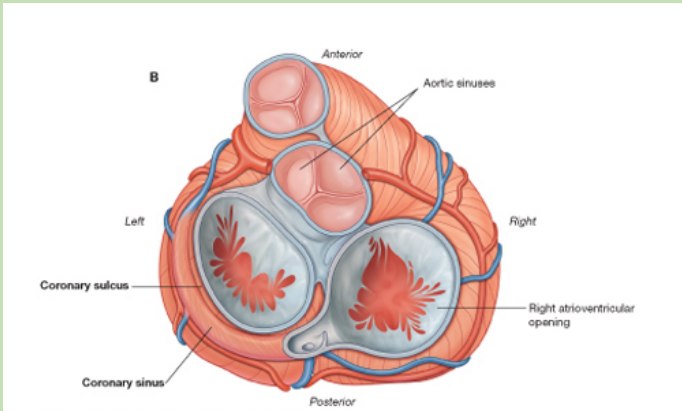


fibrous pericardium



serous pericardium

Left coronary artery



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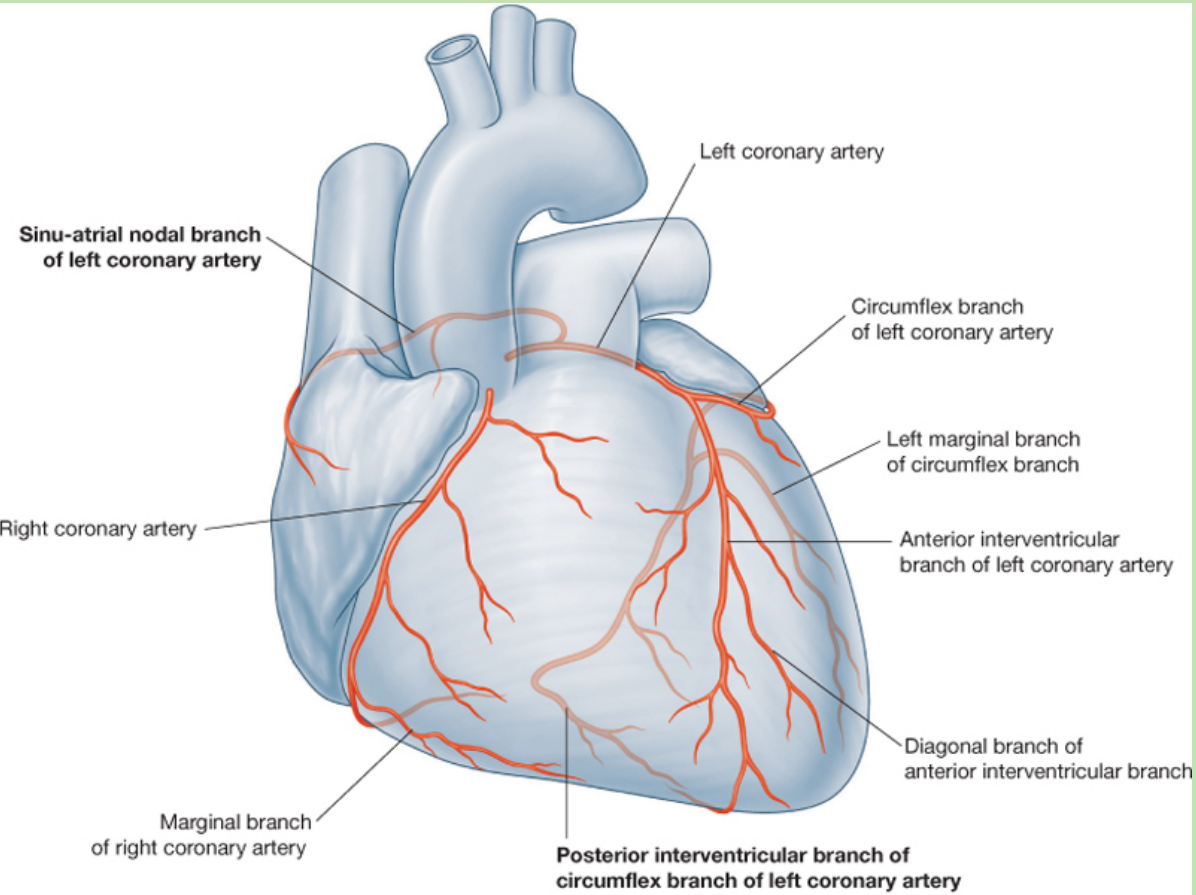

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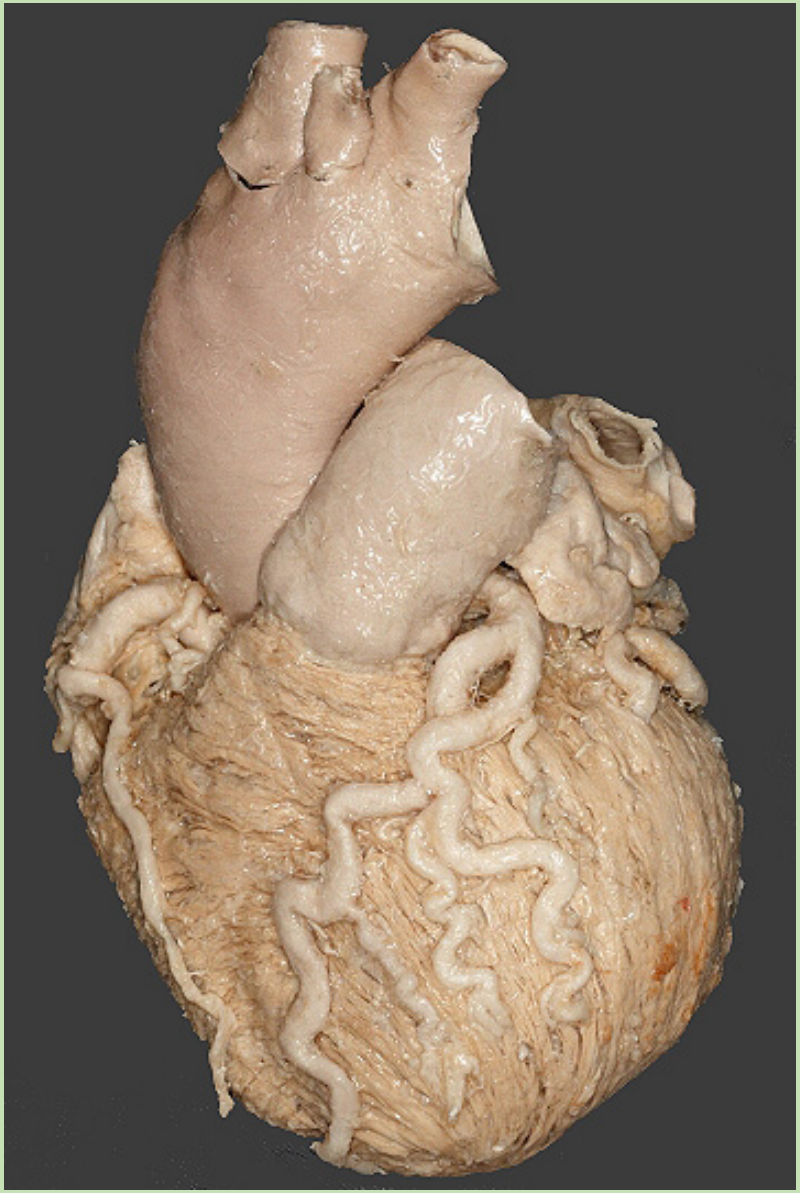
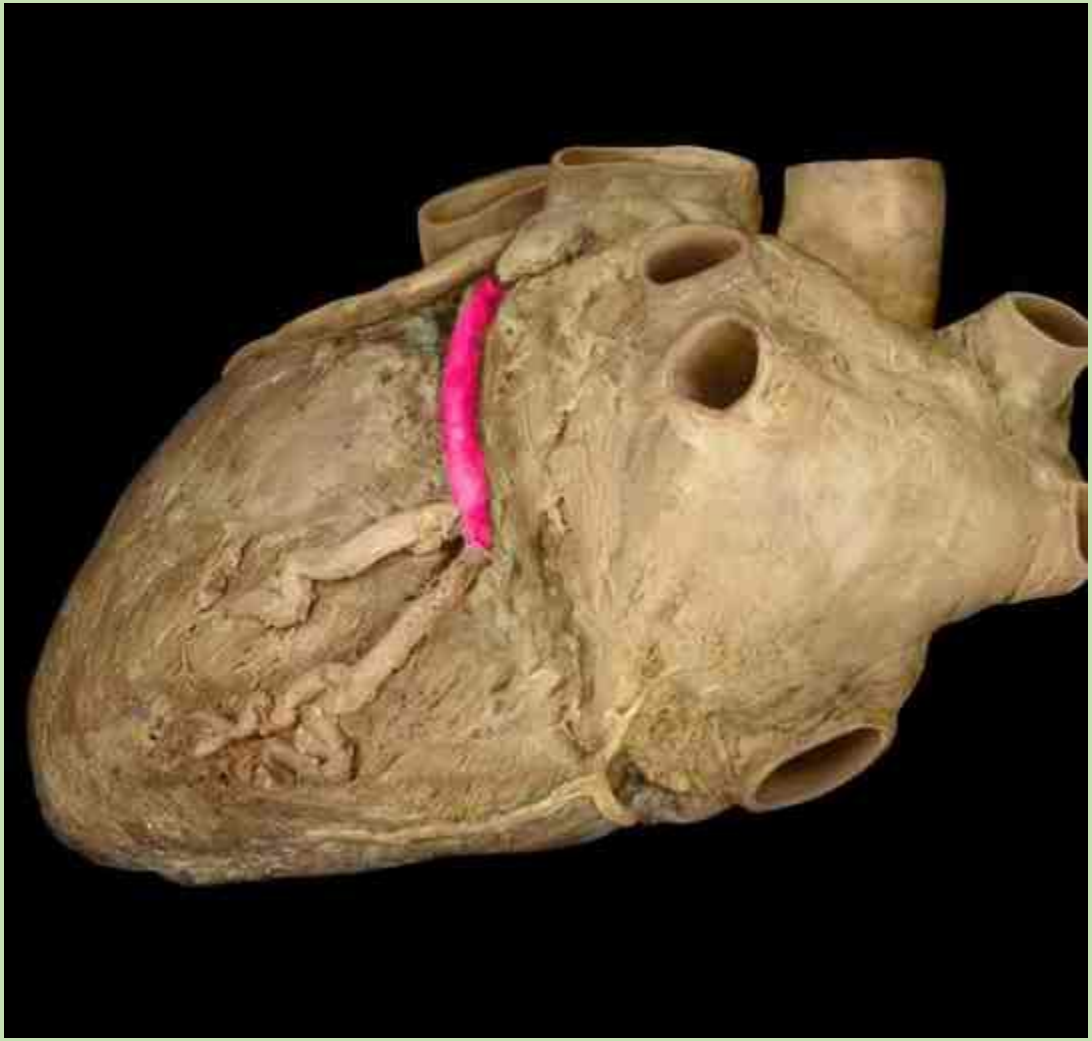
It springs from the left aortic sinus.

Main branches:

- **Anterior interventricular artery**
- **Circumflex branch**
  - left marginal artery

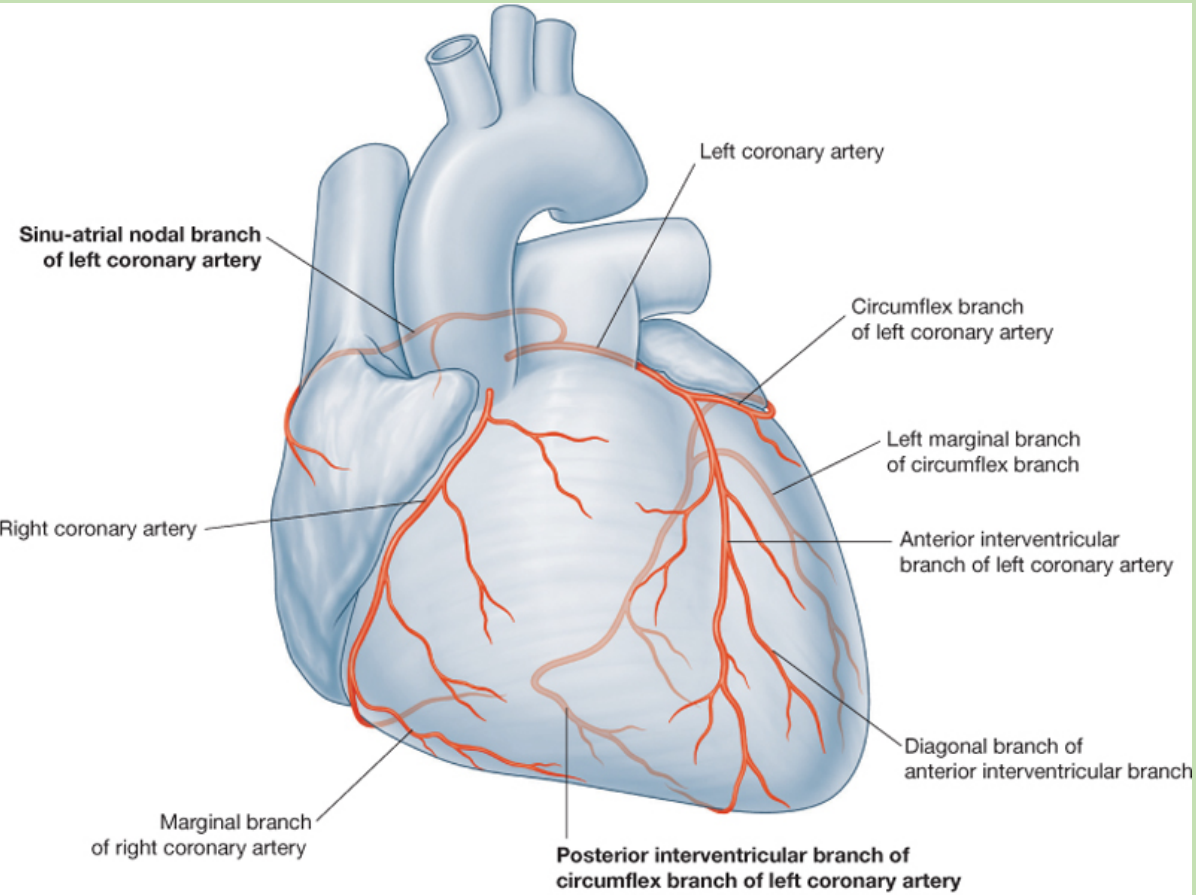


anterior interventricular artery



circumflex branch

Right coronary artery



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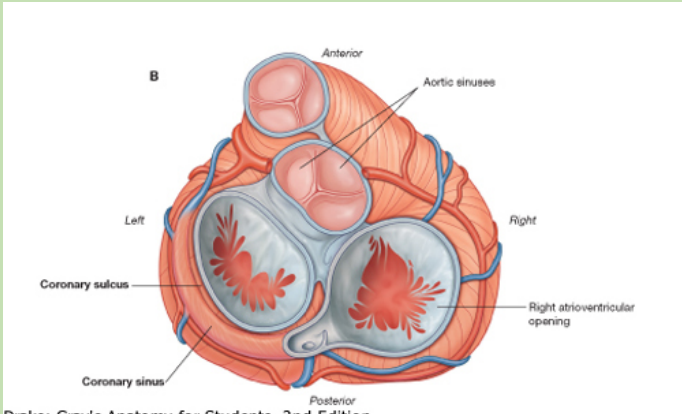

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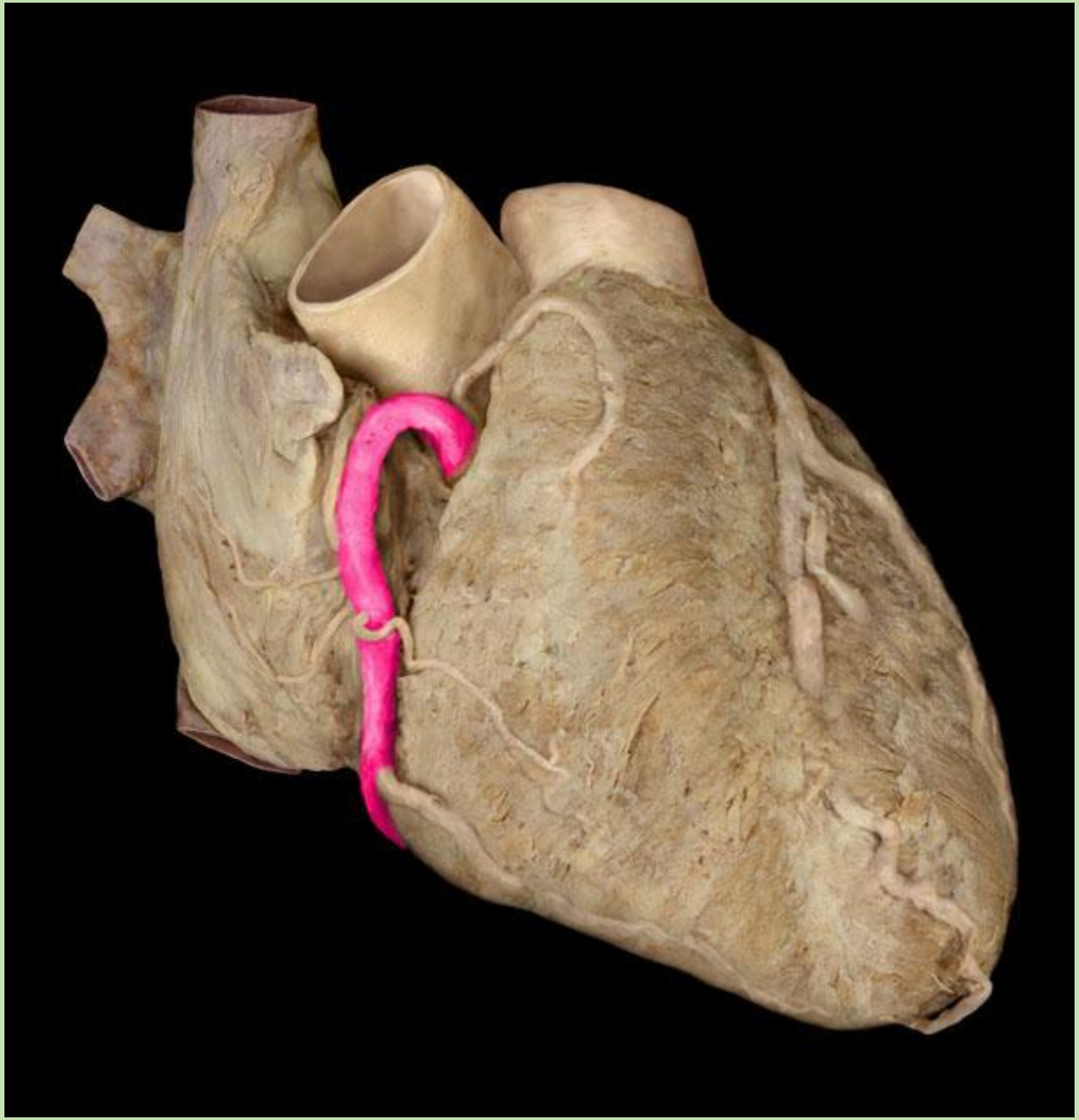
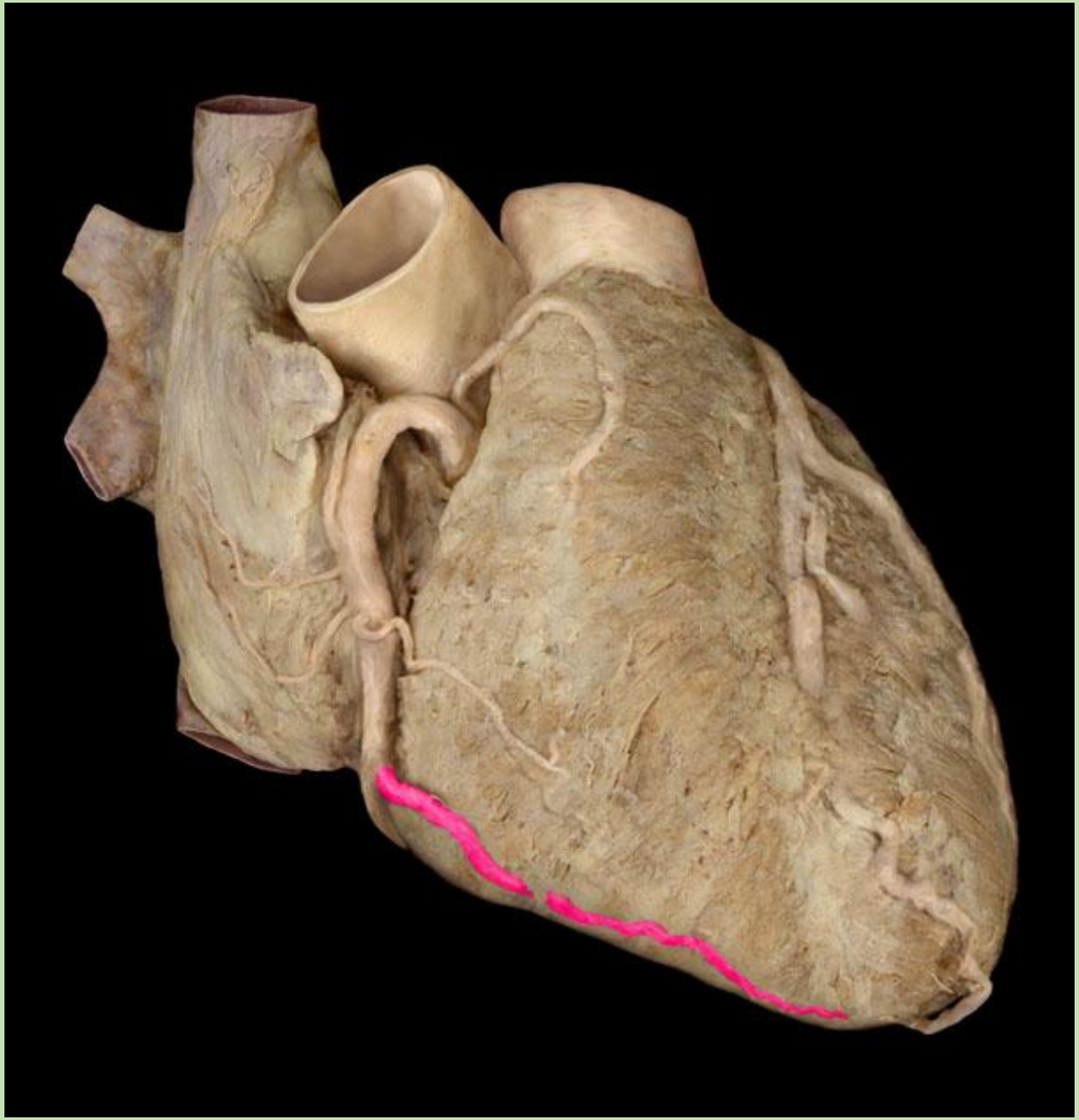
It springs from the right aortic sinus.

Main branches:

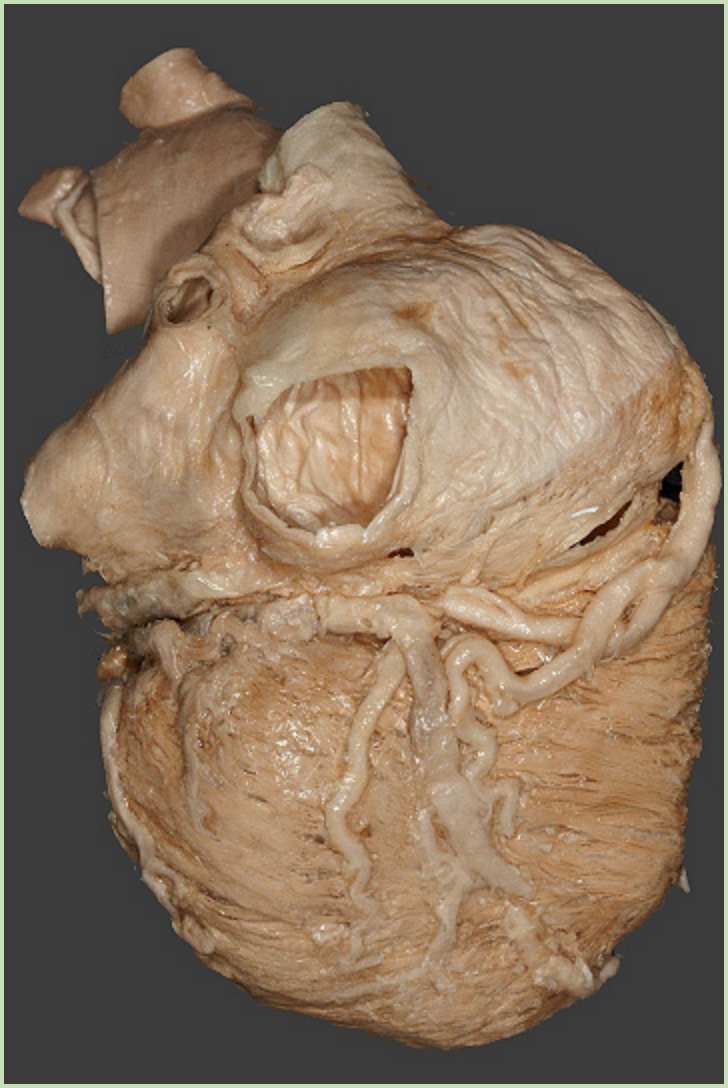
- **Nodal artery**
- **Right marginal artery**
- **Posterior interventricular artery**



right coronary artery

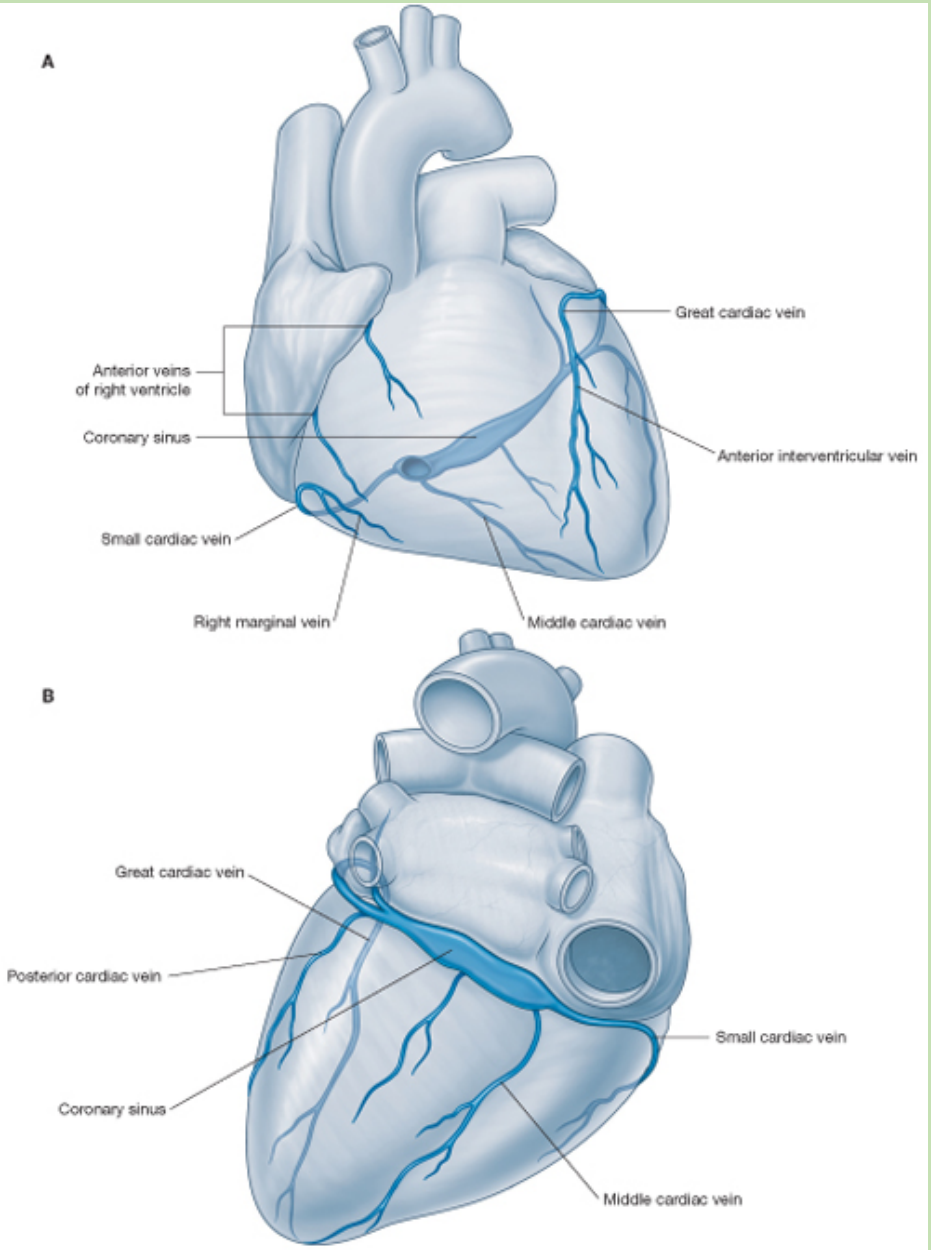


right marginal artery



posterior interventricular artery

Cardiac veins



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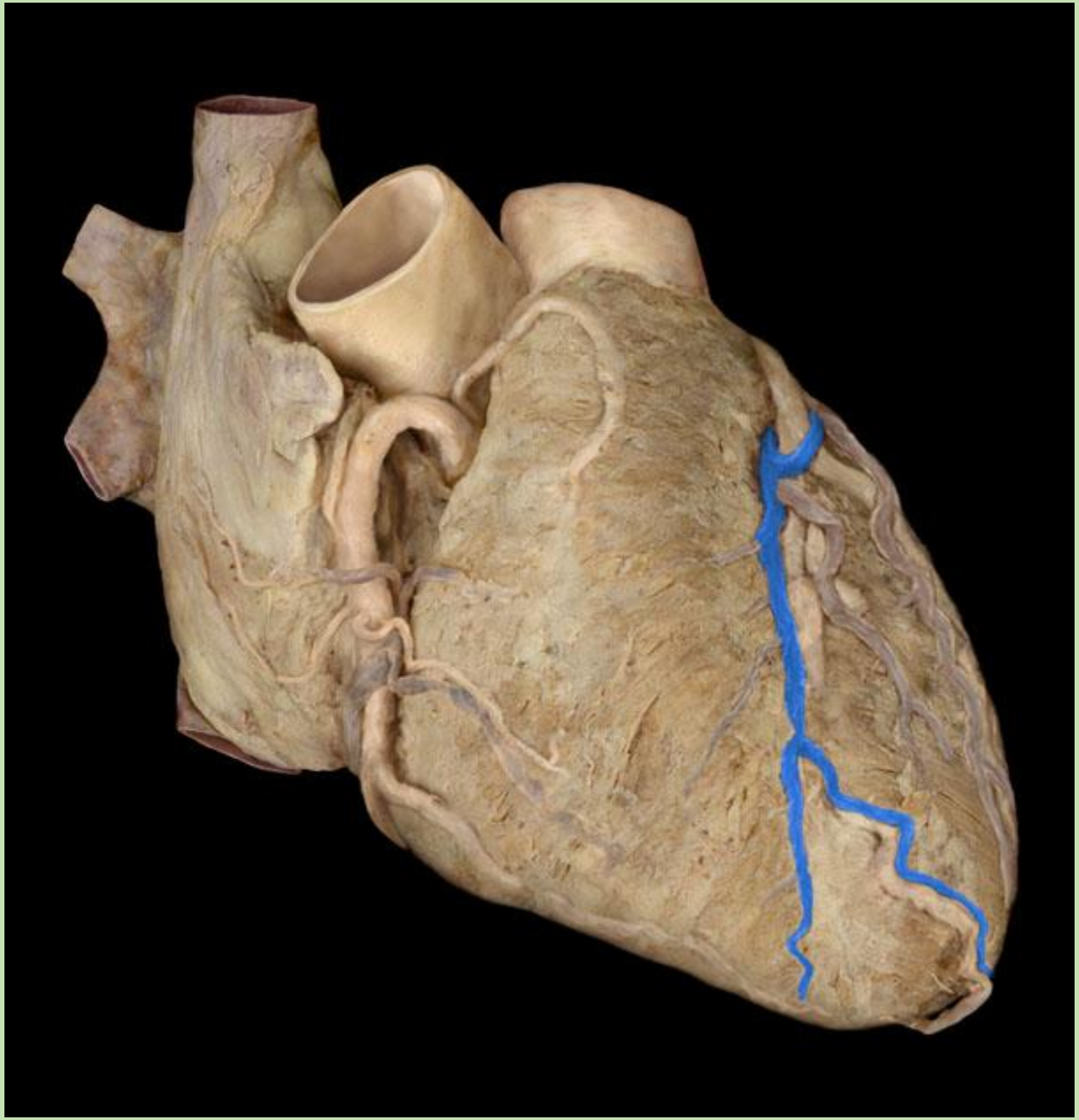
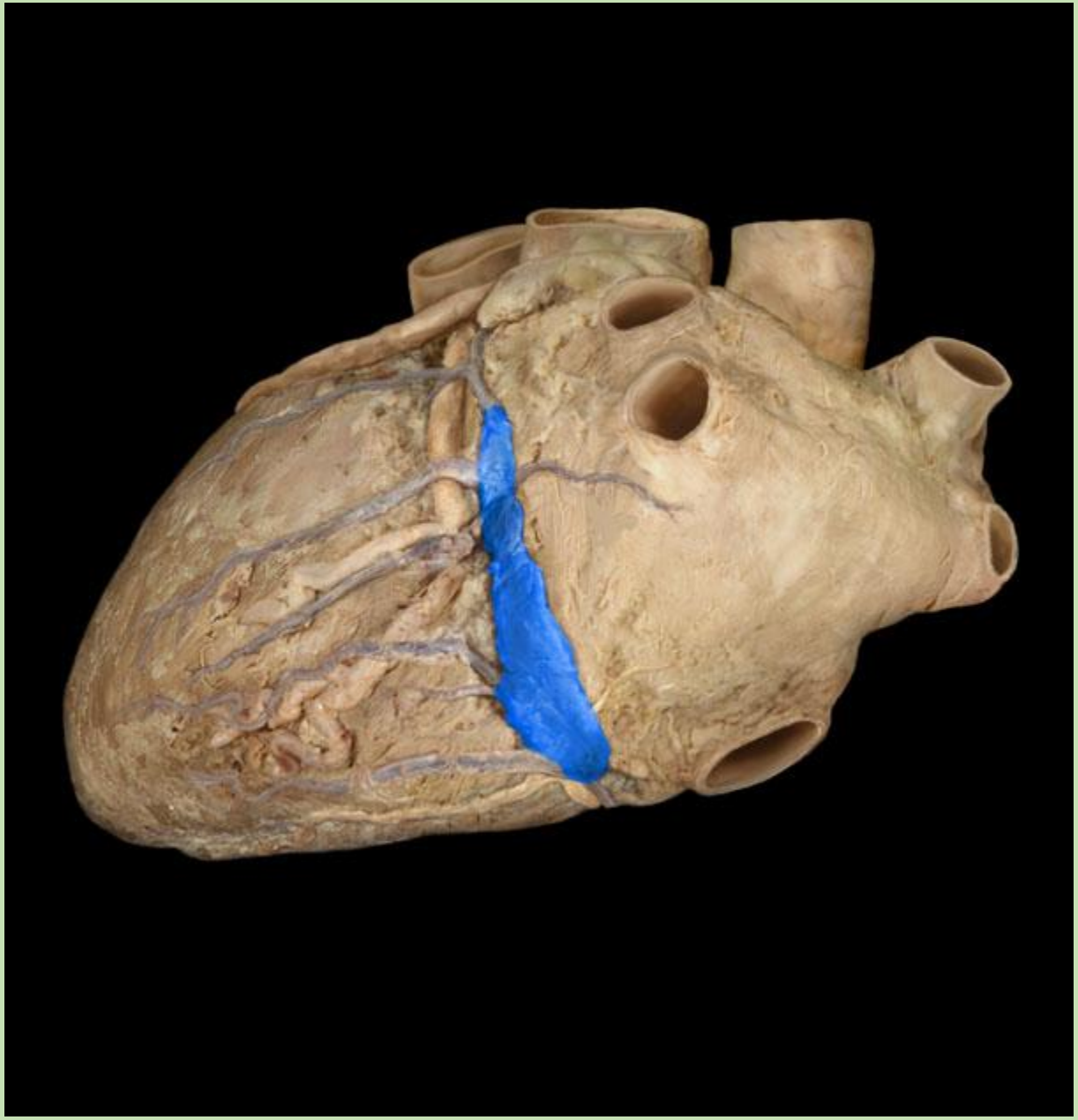
- **Great cardiac vein**
- **Middle cardiac vein**
- **Small cardiac vein**

Coronary sinus

- **Minimal cardiac veins**

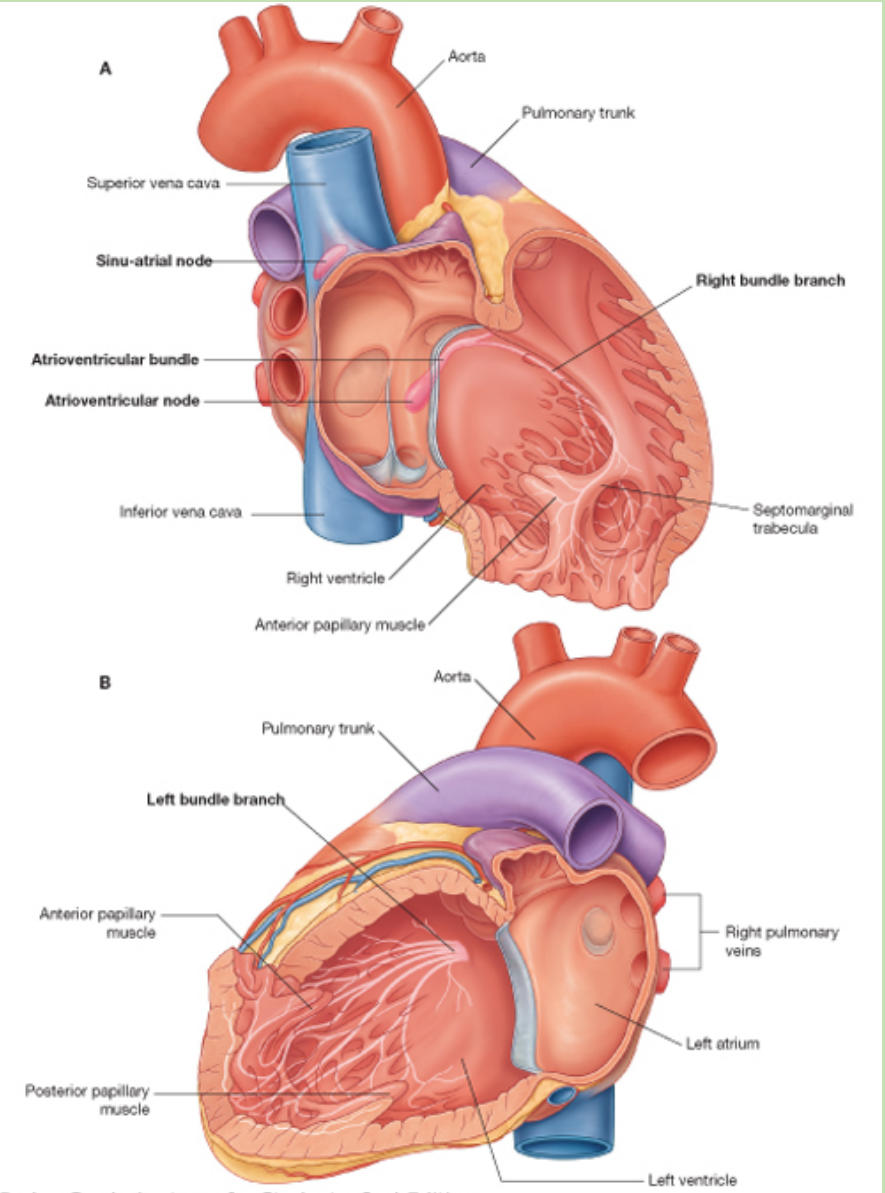


great cardiac vein



coronary sinus

Impulse formation and conduction system



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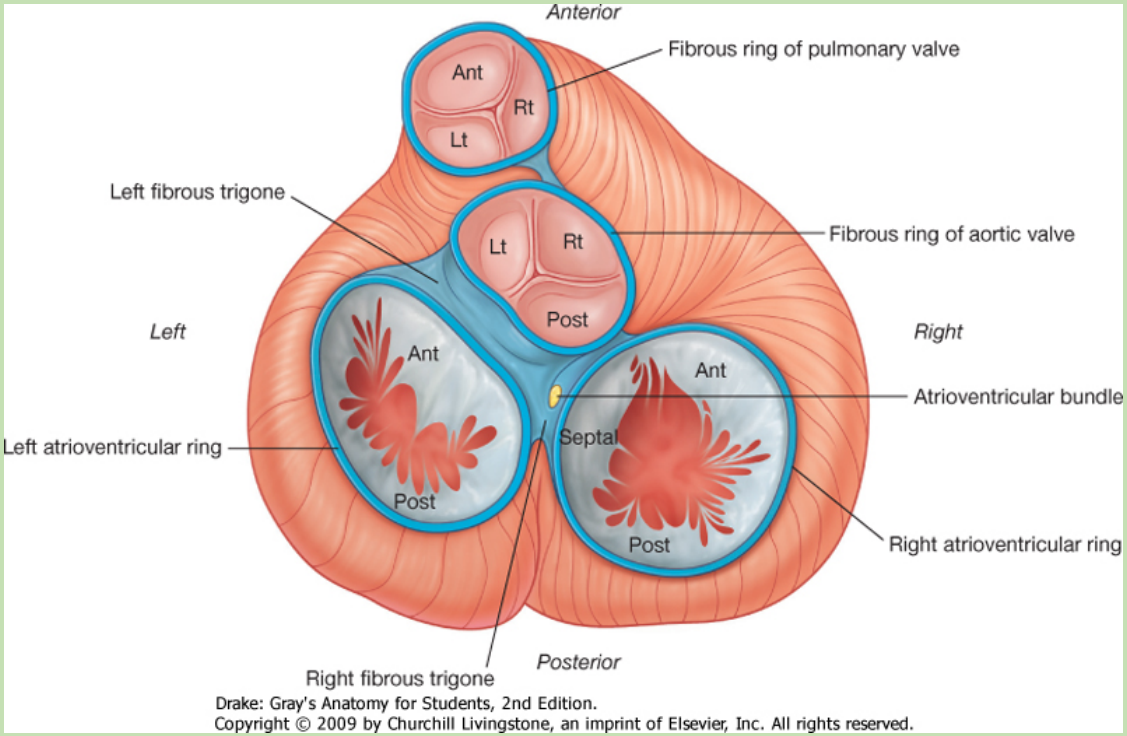
- **Sinuatrial (SA) node:** 60-80 impulses/min
- **Atrioventricular (AV) node:** 40 impulses/min
- **Atrioventricular bundle=bundle of His**
- **Right and left bundle branches=Tawara's bundles**
- **Purkinje's fibers**

Fibrous skeleton of the heart – anuli fibrosi



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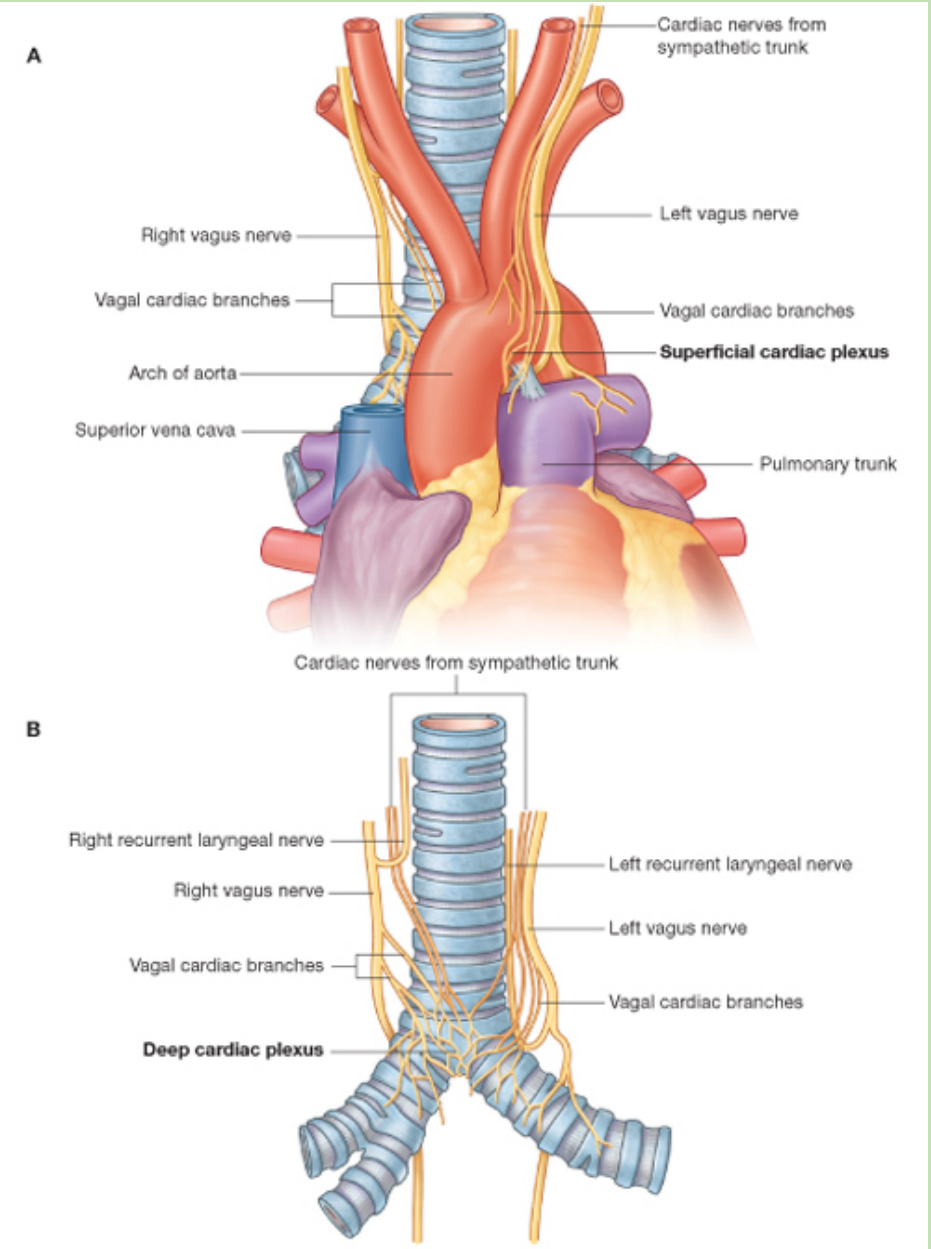
- **Complete separation** of the myocardium from ventricles and atria.
- **Electrical insulation** between atria and ventricles. (right fibrous trigone – bundle of His)
- **Mechanical framework** for the muscle fibers and all cardiac valves.

Autonomic innervation of the heart



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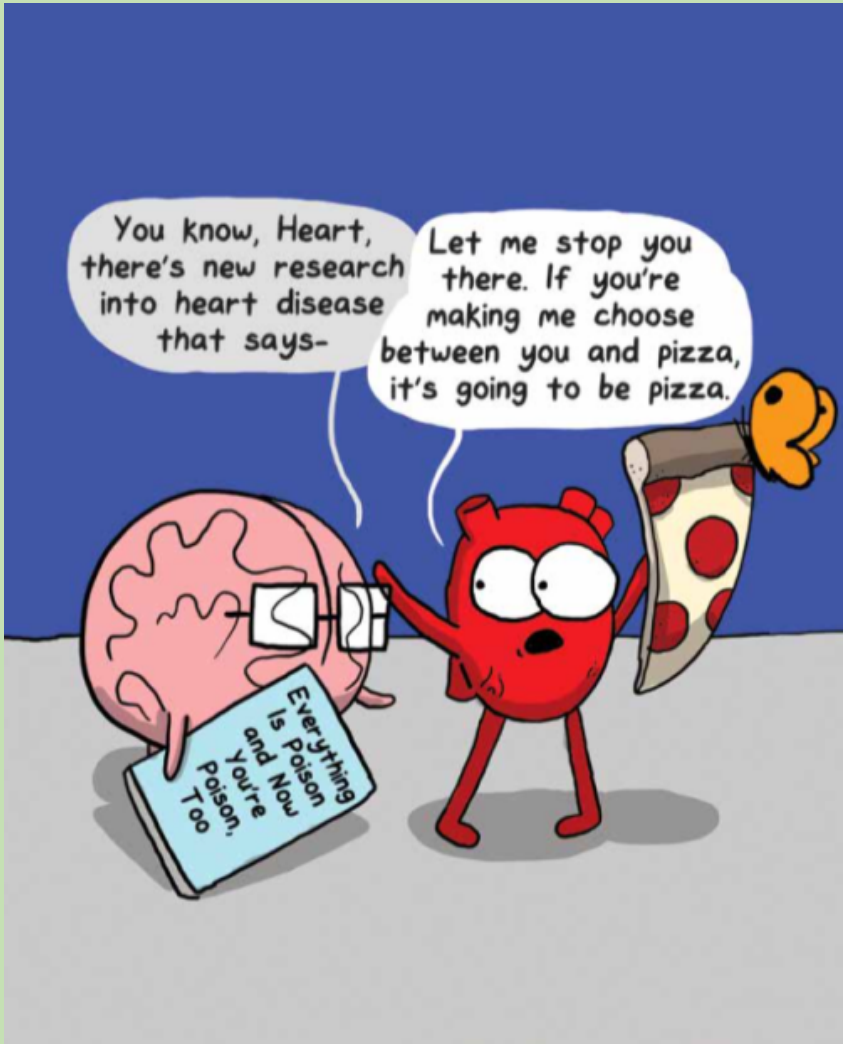
- **Parasympathetic:** Vagus nerve fibers from the dorsal vagal nucleus give off the **superior and inferior cervical cardiac branches** in the neck and the **thoracic cardiac branches** in the chest. (They decrease the heart rate.)

- **Sympathetic:** The three cervical sympathetic ganglia give off the **superior, middle, and inferior cervical cardiac nerves**, and the thoracic ganglia give off the **thoracic cardiac branches**. (They increase the heart rate.)

Thank you for your attention.

References: Drake: Gray's Anatomy for Students, 2nd ed.
Standring: Gray's Anatomy, 39th ed.
Thieme: Atlas of Anatomy, Neck and Internal Organs
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