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# Right coronary artery

- Originates from the right aortic sinus of the ascending aorta.

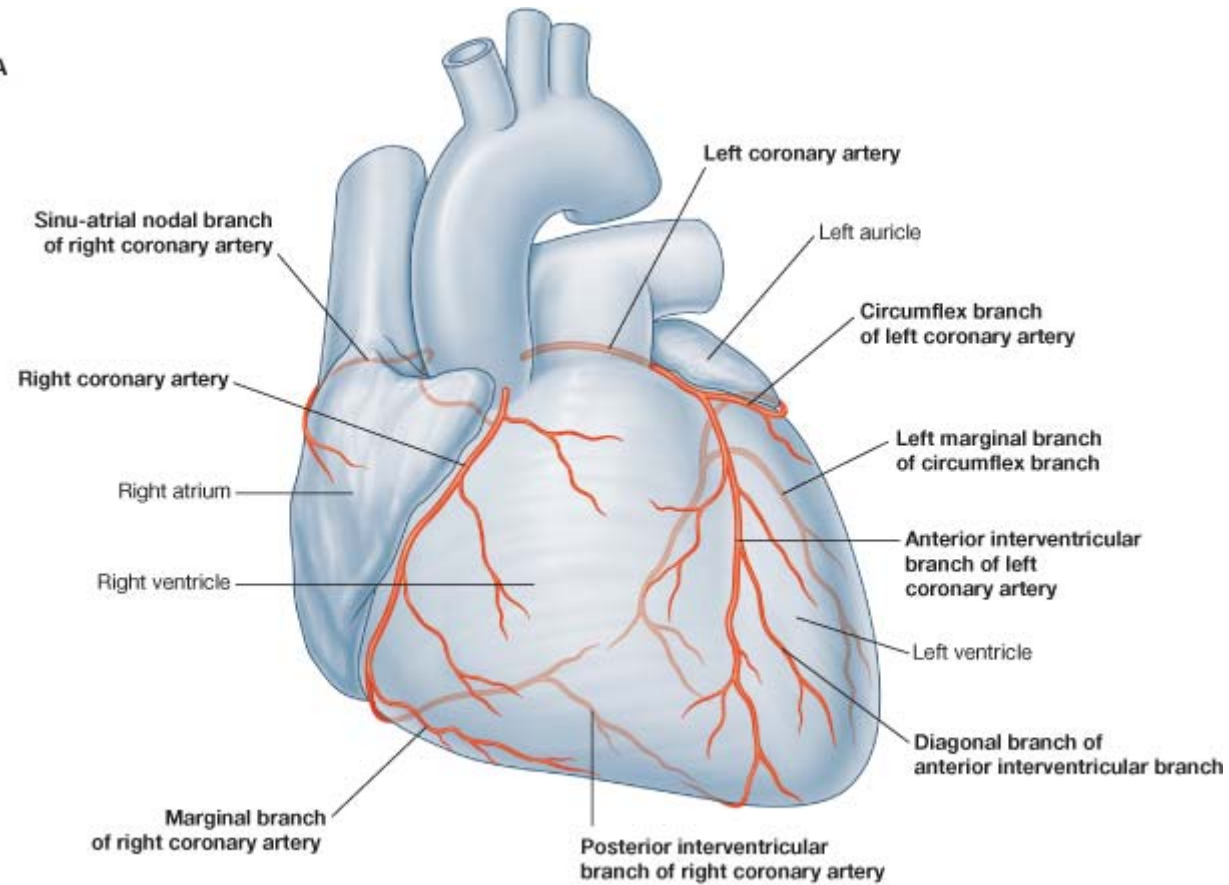
## **Branches:**

- **Atrial branches**            **sinu-atrial nodal branch,**
- **Ventricular branches**
- **Right marginal branch** arises at the inferior margin of the heart and continues along this border toward the apex of the heart;
- **Posterior interventricular branch-** lies in the posterior interventricular sulcus.

The right coronary artery supplies

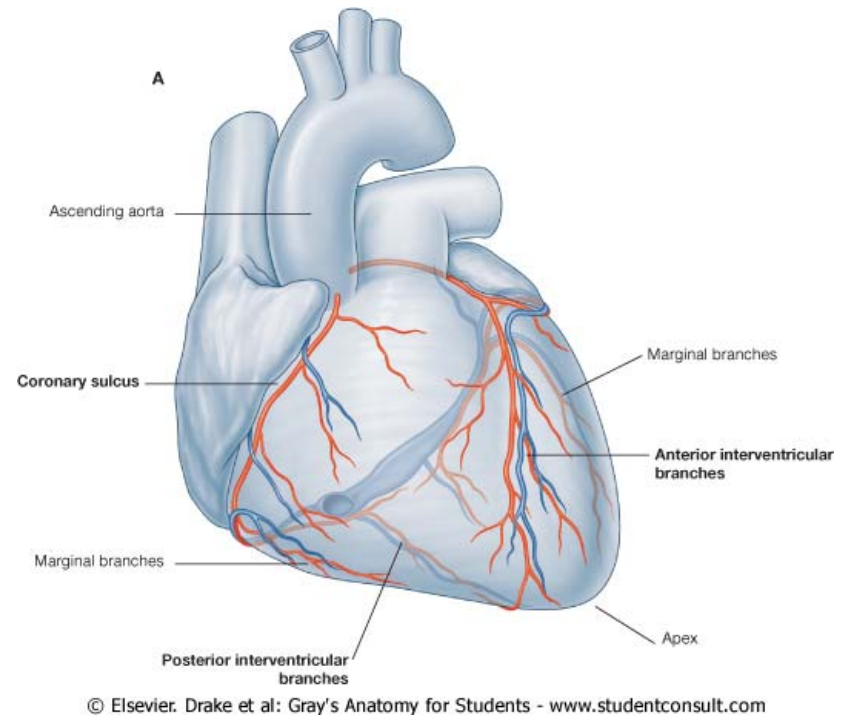
- right atrium and right ventricle,
- sinu-atrial and atrioventricular nodes,
- the interatrial septum,
- a part of the left atrium,
- the posteroinferior one-third of the interventricular septum,
- a part of the posterior part of the left ventricle.

A



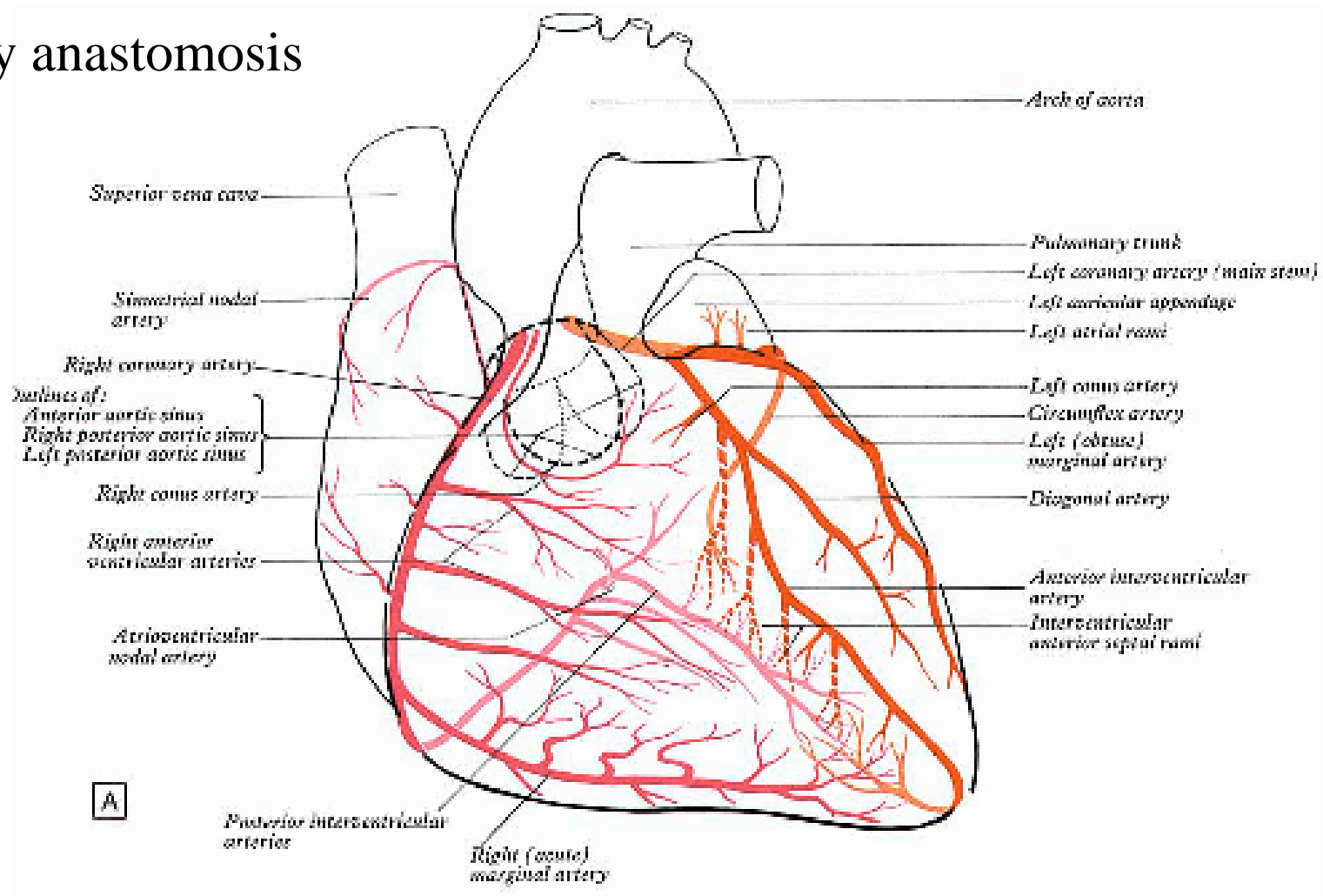
# Left coronary artery

- from the left aortic sinus of the ascending aorta. The artery divides into its two terminal branches:
- **Anterior interventricular branch (left anterior descending artery-LAD)**, descends obliquely toward the apex of the heart in the anterior interventricular sulcus, one or two large **diagonal branches** may arise and descend diagonally across the anterior surface of the left ventricle;
- **Circumflex branch**, which courses in the coronary sulcus and onto the diaphragmatic surface of the heart and usually ends before reaching the posterior interventricular sulcus-a large branch, the **left marginal artery**, usually arises from it and continues across the rounded obtuse margin of the heart.



# Coronary distribution

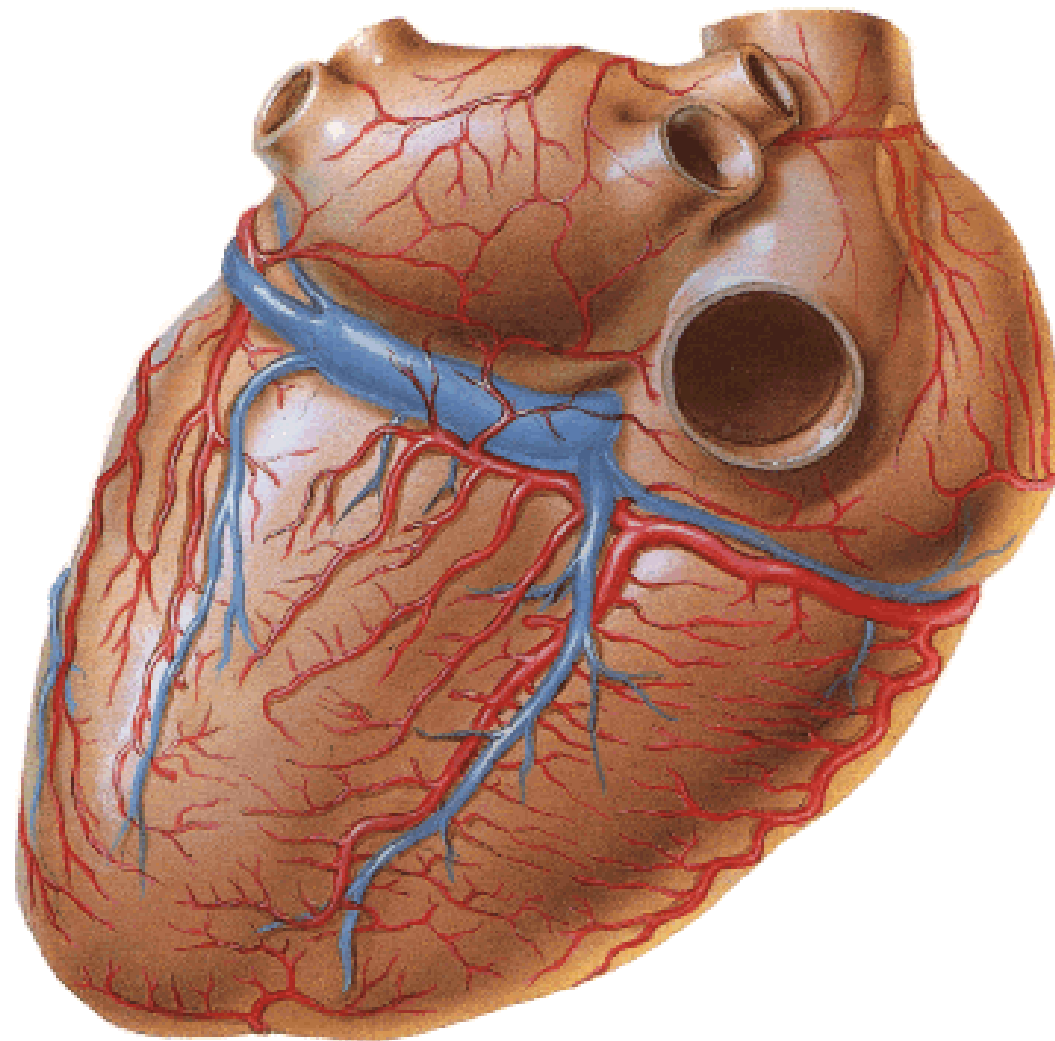
## Coronary anastomosis

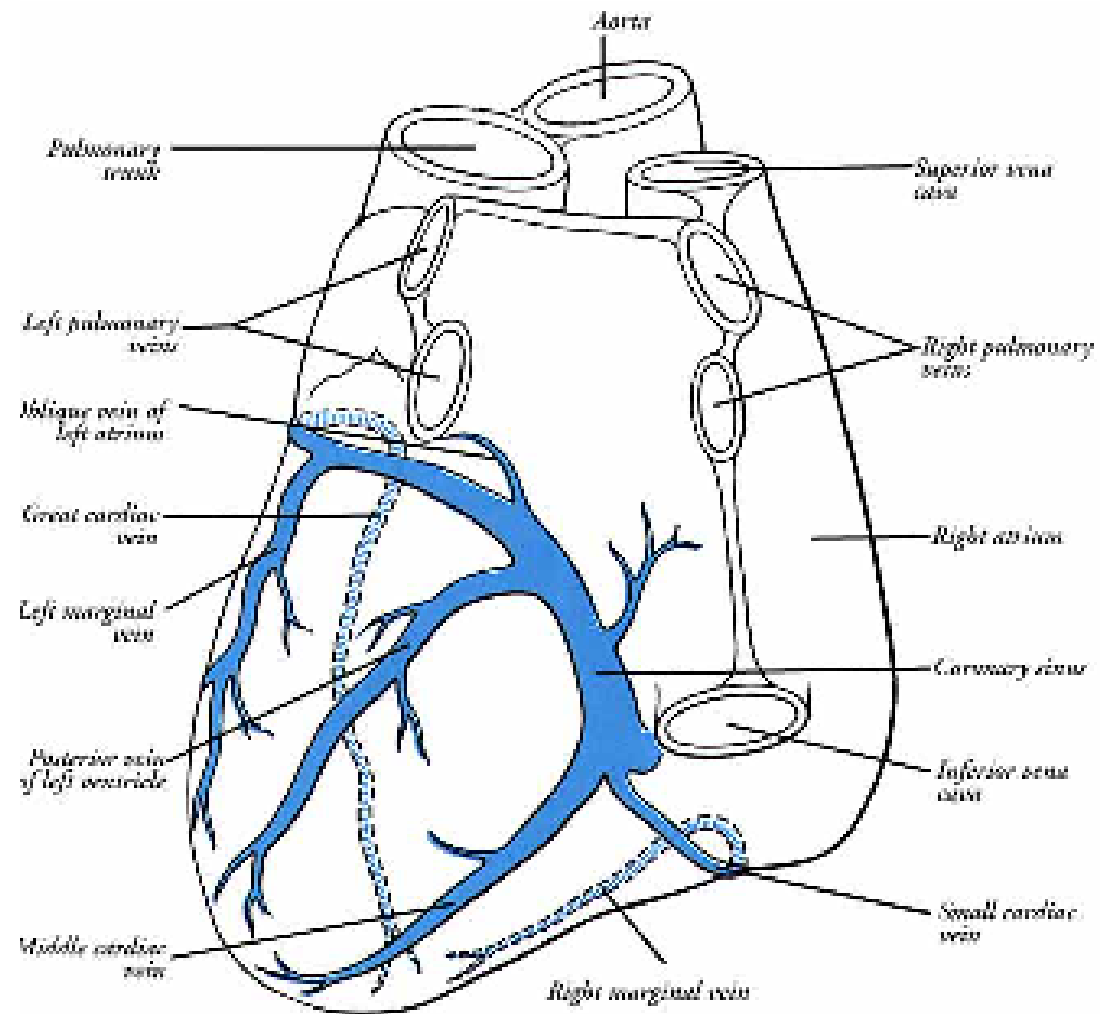


# Applied Anatomy

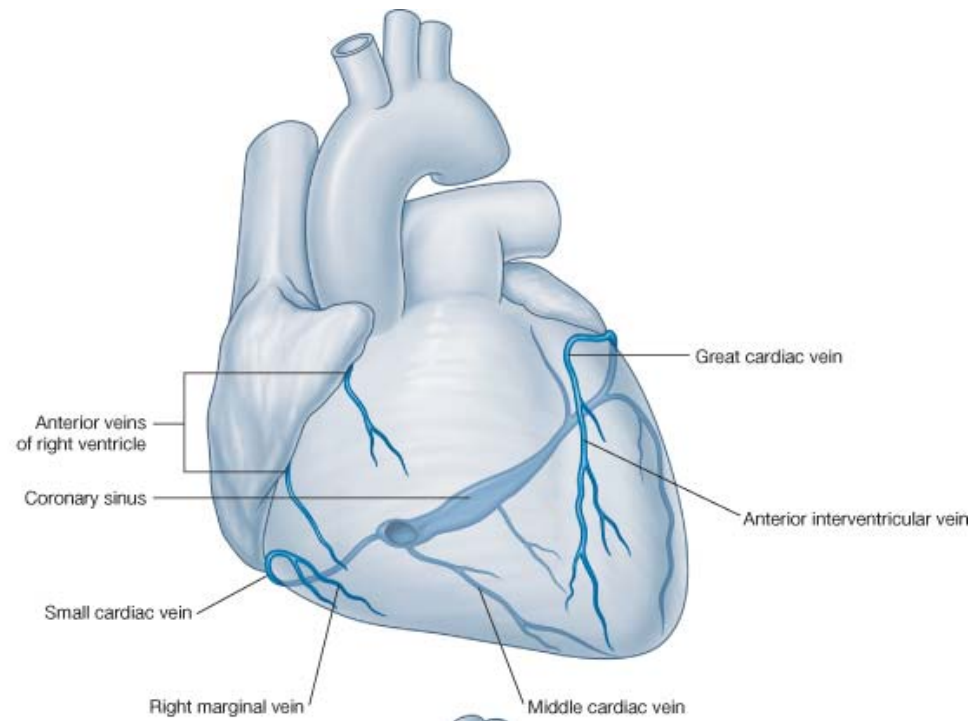
- **Myocardial infarction** Occlusion of a major coronary artery leads to an inadequate oxygenation of an area of myocardium and cell death. The severity depends on:
  - size and location of the artery
  - Complete or partial blockage (angina)
- **Coronary angioplasty**
- **Coronary artery bypass grafting**



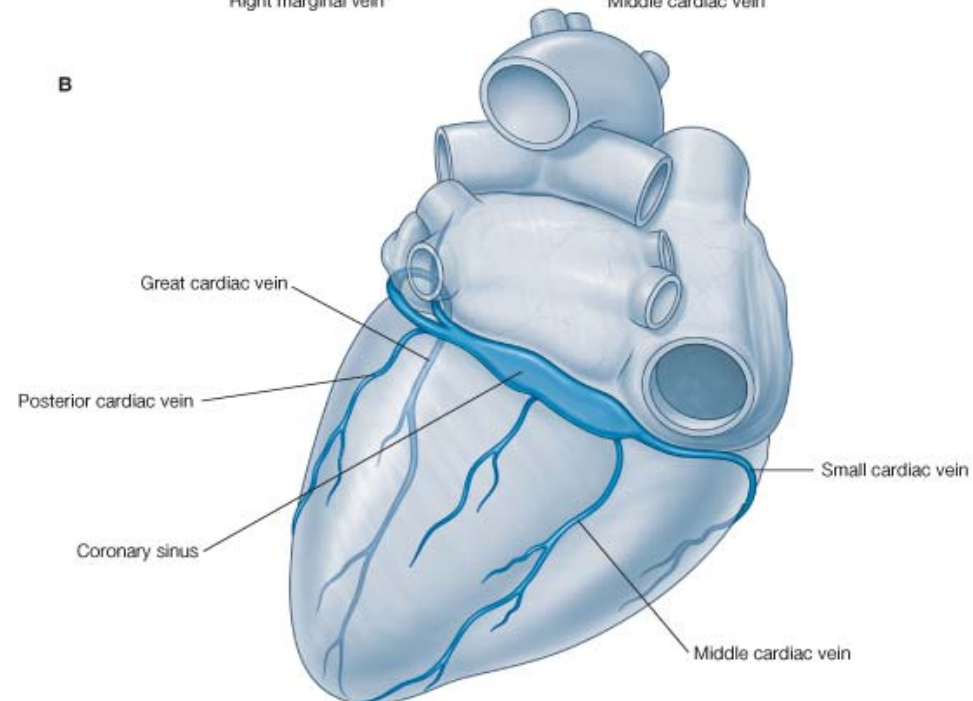




**A**



**B**



# Cardiac veins

The **coronary sinus** receives four major tributaries:

- **Great cardiac vein** begins at the apex of the heart. It ascends in the anterior interventricular sulcus, reaching the coronary sulcus, the great cardiac vein turns to the left and continues onto the base of the heart. Continuing in the coronary sulcus, the great cardiac vein gradually enlarges to form the coronary sinus, which enters the right atrium.
- **Middle cardiac vein (posterior interventricular vein)** begins near the apex of the heart and ascends in the posterior interventricular sulcus toward the coronary sinus. It is associated with the posterior interventricular branch of the right or left coronary artery throughout its course.
- **Small cardiac vein** begins in the lower anterior section of the coronary sulcus between the right atrium and right ventricle. It continues in this groove onto the base of the heart where it enters the coronary sinus at its atrial end. It is a companion of the right coronary artery throughout its course and may receive the **right marginal vein**
- **Posterior cardiac vein** lies on the posterior surface of the left ventricle just to the left of the middle cardiac vein. It either enters the coronary sinus directly or joins the great cardiac vein.

# Cardiac veins (contd.)

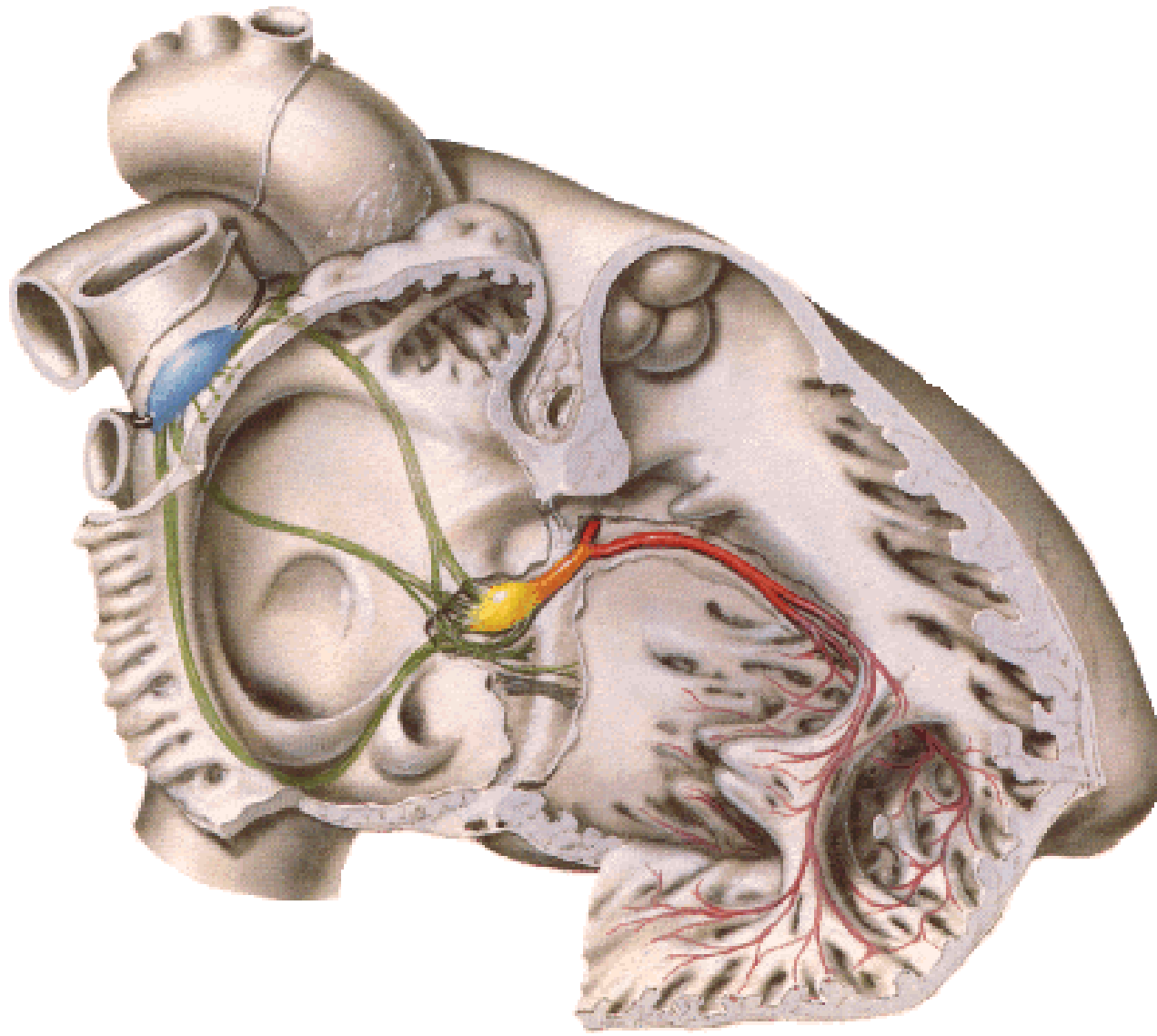
- **Right marginal vein** accompanies the marginal branch of the right coronary artery. If the right marginal vein does not join the small cardiac vein, it enters the right atrium directly.
- **Oblique vein of the left atrium**  
Two additional groups of cardiac veins are also involved in the venous drainage of the heart:
- The **anterior veins of right ventricle (anterior cardiac veins)** are small veins on the anterior surface of the right ventricle, cross the coronary sulcus and enter the anterior wall of the right atrium. They drain the anterior portion of the right ventricle.
- A group of smallest cardiac veins (**venae cordis minimae or veins of Thebesius**): Draining directly into the cardiac chambers, they are numerous in the right atrium and right ventricle, are occasionally associated with the left atrium, and are rarely associated with the left ventricle.

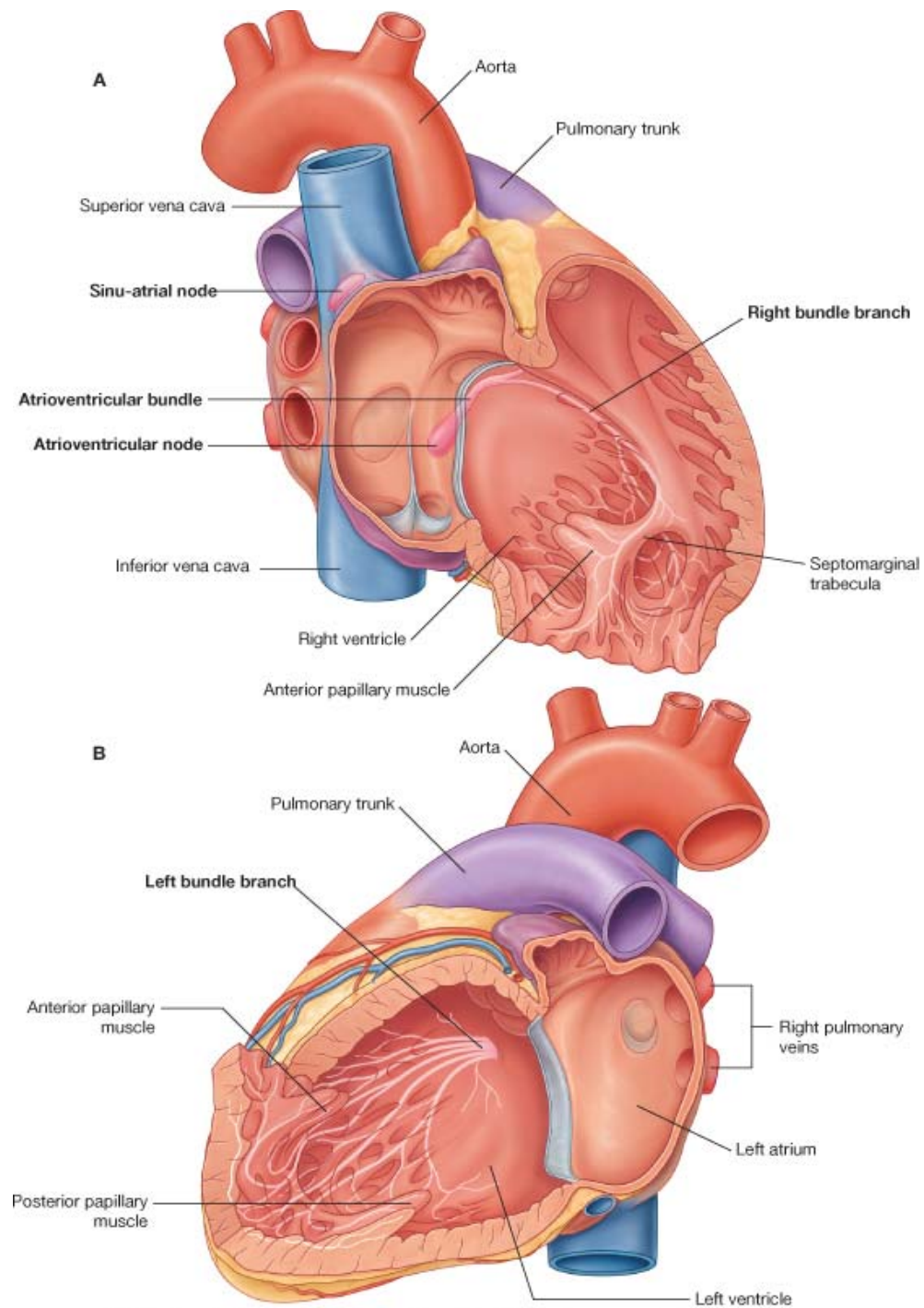
# Coronary lymphatics

The lymphatic vessels of the heart follow the coronary arteries and drain mainly into:

- brachiocephalic nodes, anterior to the brachiocephalic veins; and
- tracheobronchial nodes, at the inferior end of the trachea.

## Conducting system







# conduction system

- Initiates and coordinates contraction. consists of nodes and networks of specialized myocardial cells; organized into four basic components:
- sinu-atrial node;
- atrioventricular node;
- atrioventricular bundle with its right and left bundle branches;
- subendocardial plexus of conduction cells (the Purkinje fibers).

The unique distribution pattern establishes unidirectional pathway of excitation/contraction.

Throughout its course, large branches are insulated from the surrounding myocardium by connective tissue. This tends to decrease inappropriate stimulation and contraction of cardiac muscle fibers.

The number of functional contacts between the conduction pathway and cardiac musculature greatly increases in the subendocardial network.

# conduction system

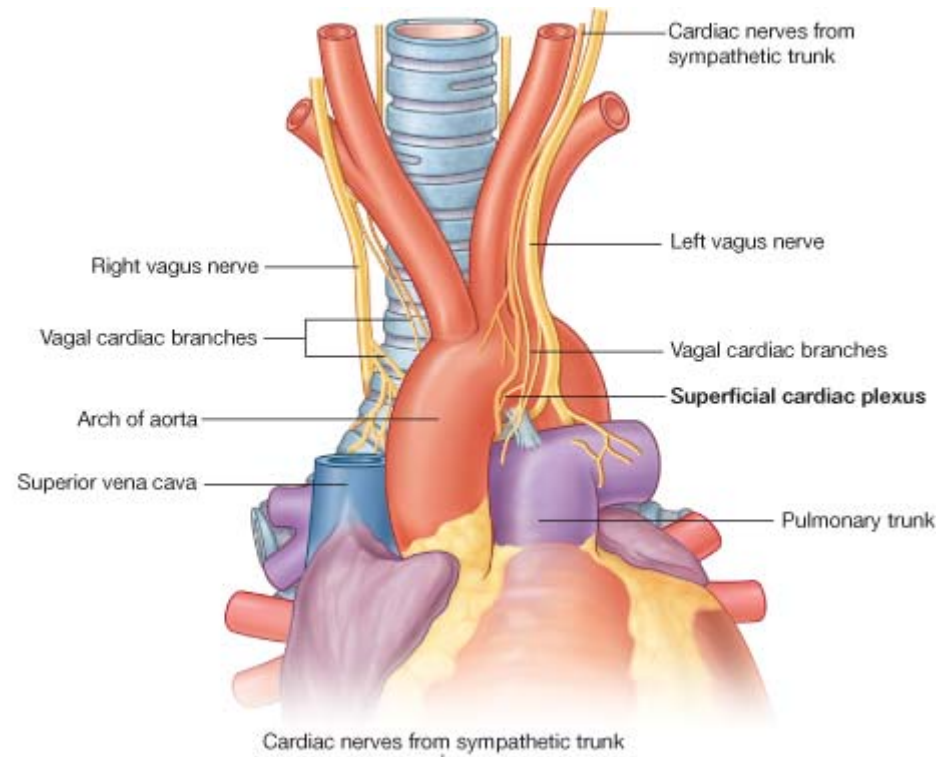
- **Sinu-atrial node:** the cardiac pacemaker. located at the superior end of the crista terminalis at the junction of the superior vena cava and the right atrium. The excitation signals generated by the sinu-atrial node spread across the atria, causing the muscle to contract.
- **Atrioventricular node:** located near the opening of the coronary sinus, close to the attachment of the septal cusp of the tricuspid valve, and within the atrioventricular septum.
- **Atrioventricular bundle :** direct continuation of the AV node. It follows along the lower border of the membranous part of the interventricular septum before splitting into right and left bundles.
- **Right bundle branch** continues on the right side of the IV septum toward the apex of the right ventricle. From the septum it enters the septomarginal trabecula to reach the base of the anterior papillary muscle. It divides and is continuous with the subendocardial plexus of ventricular conduction cells or Purkinje fibers. This network spreads throughout the ventricle to supply ventricular musculature including the papillary muscles.
- **Left bundle branch** passes to the left side of the muscular IVseptum and descends to the apex of the left ventricle. It gives off branches that eventually become continuous with the **subendocardial plexus of conduction cells (Purkinje fibers)** which spreads the excitation impulses throughout the ventricle.

# Cardiac innervation

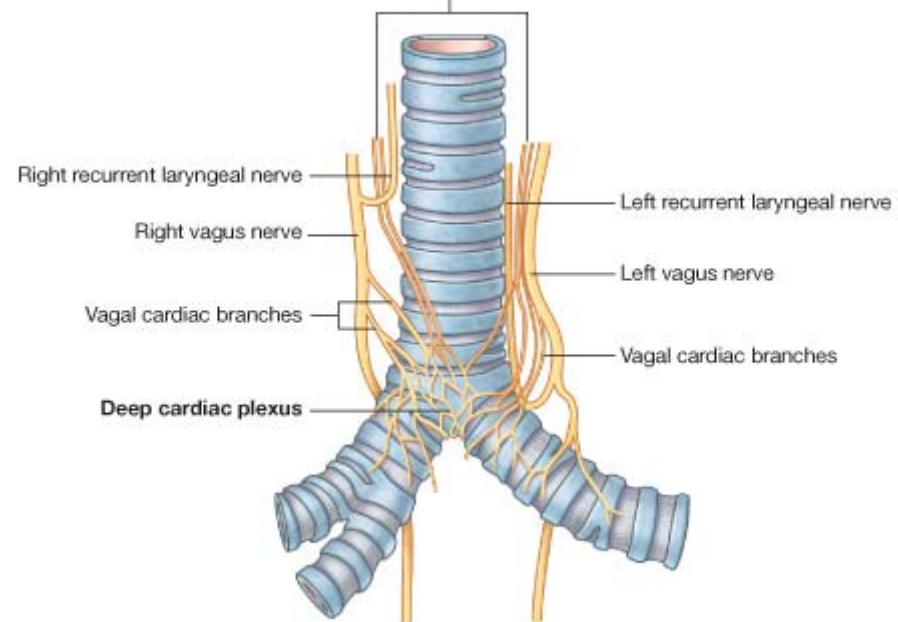
The autonomic division of the PNS is directly responsible for regulating:

- heart rate;
- force of each contraction;
- cardiac output.
- Branches from both the parasympathetic and sympathetic systems contribute to the formation of the **cardiac plexus**. **Superficial part**, inferior to the aortic arch and between it and the pulmonary trunk and a **deep part**, between the aortic arch and the tracheal bifurcation.

**A**



**B**



# Cardiac innervation

## **Parasympathetic innervation**

- decreases heart rate;
- reduces force of contraction;
- constricts the coronary arteries.
- The preganglionic parasympathetic fibers reach the heart as cardiac branches from the right and left vagus nerves. They enter the cardiac plexus and synapse in ganglia located either within the plexus or in the walls of the atria.

## **Sympathetic innervation**

- increases heart rate;
- increases the force of contraction.

# Cardiac innervation

- **Sympathetic fibers** through the cardiac nerves from the sympathetic trunk.  
Preganglionic sympathetic fibers from T1-T5 segments of SC  
Synapse in cervical and upper thoracic sympathetic ganglia,  
Postganglionic fibers proceed as bilateral branches from the sympathetic trunk to the cardiac plexus. From the cardiac plexus small branches, which are mixed nerves containing both sympathetic and parasympathetic fibers, supply the heart.
- **Visceral afferents** -a component of the cardiac plexus.  
They sense alterations in blood pressure and blood chemistry (cardiac reflexes) The afferents return to Vagus/ sympathetic trunk.  
*These afferents conduct pain sensation from the heart, which is detected at the cellular level as tissue-damaging events (i.e. cardiac ischemia). This pain is often 'referred' to cutaneous regions supplied by the same spinal cord levels.*

