Building a Heart

The human heart is an extraordinary machine, and like any machine it has several components enabling it to operate. Let’s take a look at them!
The most basic component of the heart is its role as a four-chambered muscle.

The top two chambers are the atria and the bottom two are the ventricles.

The right atrium receives deoxygenated blood and empties it into the right ventricle; the left atrium empties oxygenated blood into the left ventricle.
In order to pump blood in and out of the chambers, the heart needs doors.

The heart’s **valves** open and shut, regulating the amount of blood that enters and its destination.

At the bases of the pulmonary artery and aorta are the **semilunar valves**, which support one-way flow of blood out of the ventricles. The **aortic valve** regulates blood flow from the left ventricle into the aorta, while the **pulmonary valve** regulates the flow from the right ventricle into the pulmonary trunk.

The **atrioventricular valves** control the blood flow from the right atrium to the right ventricle. They are attached to papillary muscles by fibrous cords called **chordae tendineae**, which prevent the AV valves from prolapsing back into the atria as they close.
The external surface of the heart is also known as **epicardium**, and is covered by fat.

**Factoid:** It is completely normal to have some fat on the surface of the heart. It’s when the fat builds up on the surface or within the arteries that there’s a problem.
The **great vessels** connect the heart to the arteries and veins, which distribute blood throughout the body.

The great vessels are:

- The aorta
- The pulmonary trunk
- The vena cavae
The aorta delivers oxygenated blood from the left ventricle to the rest of the body.

**Factoid:** The aorta is approximately 2-3 cm in diameter, making it thicker than a standard garden hose!
The **pulmonary trunk** delivers deoxygenated blood from the right ventricle to the lungs.

At the aortic arch, the pulmonary trunk splits into the pulmonary arteries, which extend into the lungs.
The **venae cavae** deliver deoxygenated blood from the top and lower halves of the body, respectively, to the right atrium.

**Factoid:** The vena cavae are the largest veins in the entire body.
The heart’s conduction system does exactly what it sounds like: it conducts electricity throughout the heart.

The pulses of electricity motivate the cardiac muscle to contract, or beat.

The pathways of the conduction system are made up of bundles and specialized muscle fibers within the heart. Electrical signals move down these pathways.
Not only does the heart provide blood for the body’s organs and tissues, but also for itself. The **coronary vessels** supply blood to the heart.

The arteries supply the heart with blood, while the veins carry deoxygenated blood from the heart tissue into the right atrium.
Pulmonary vasculature manages the passage of blood between the heart and the lungs, as well as gas exchange.

Pulmonary arteries move deoxygenated blood from the right ventricle to the lungs.

Pulmonary veins move oxygenated blood to the left atrium for distribution.

**Factoid:** The pulmonary arteries are the only arteries in the body that carry venous blood!
Because the heart is super important, it has a protective fibrous sac around it called the **pericardium**.

There are several layers of pericardium: the fibrous pericardium (the outer layer), the serous pericardium (which has two layers of its own, the parietal and visceral layers), and the fluid-filled space between the serous pericardium’s layers.

**Factoid:** The fluid between the parietal and visceral layers reduces friction on the heart as it beats.
**Systemic vasculature** manages blood flow to other organs and tissues throughout the body.

**Factoid:** Everyone has enough vasculature to wrap around the Earth 2.4 times!