The Cardiac Cycle

A.C. 2.2.3 Summarise the cardiac cycle.

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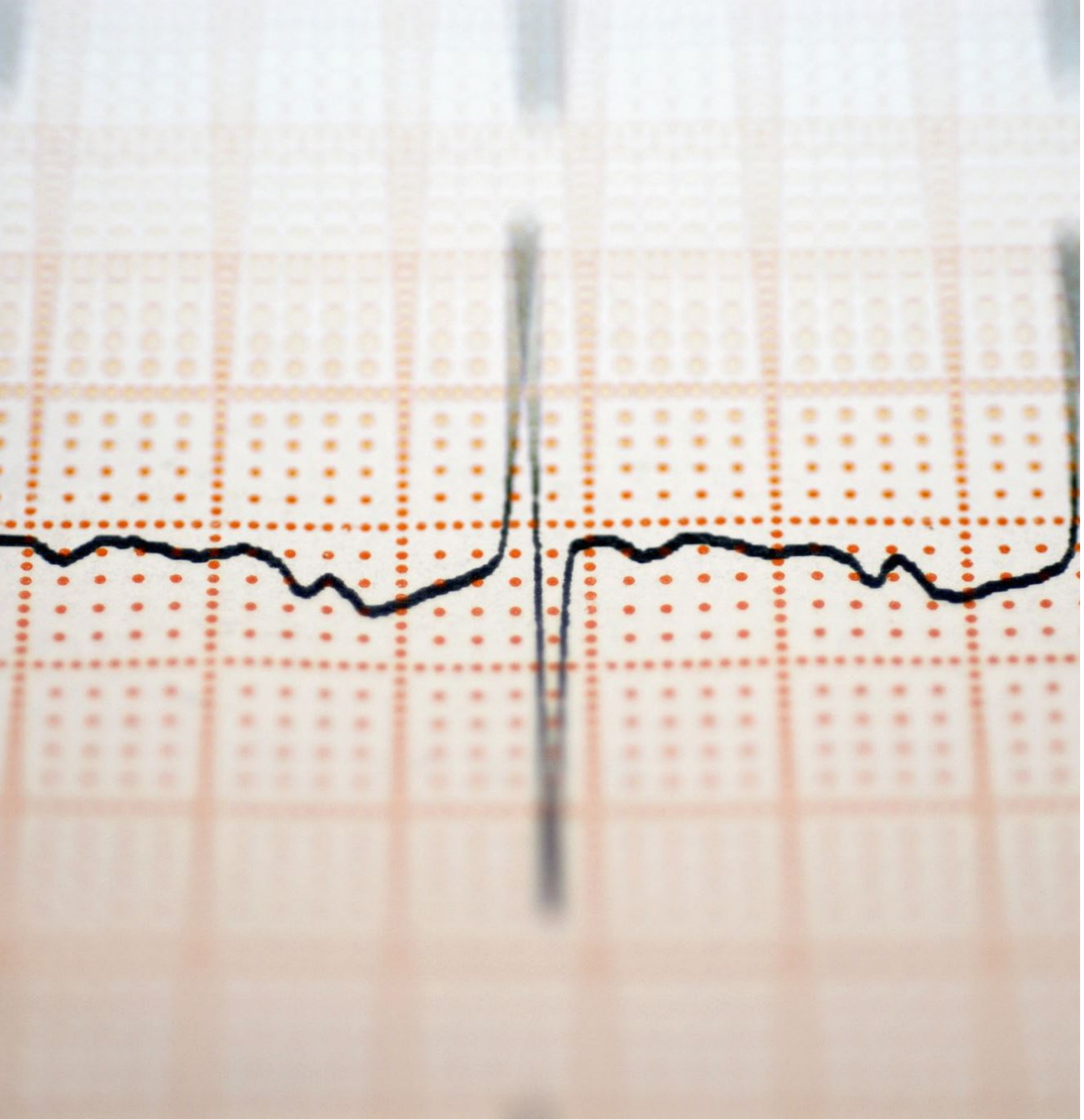
What is the cardiac cycle?

The cardiac cycle is the sequence of events in one heartbeat.

The heart muscle relaxes and fills with blood (diastole) and then contracts to pump blood out to the lungs and the rest of the body (systole).

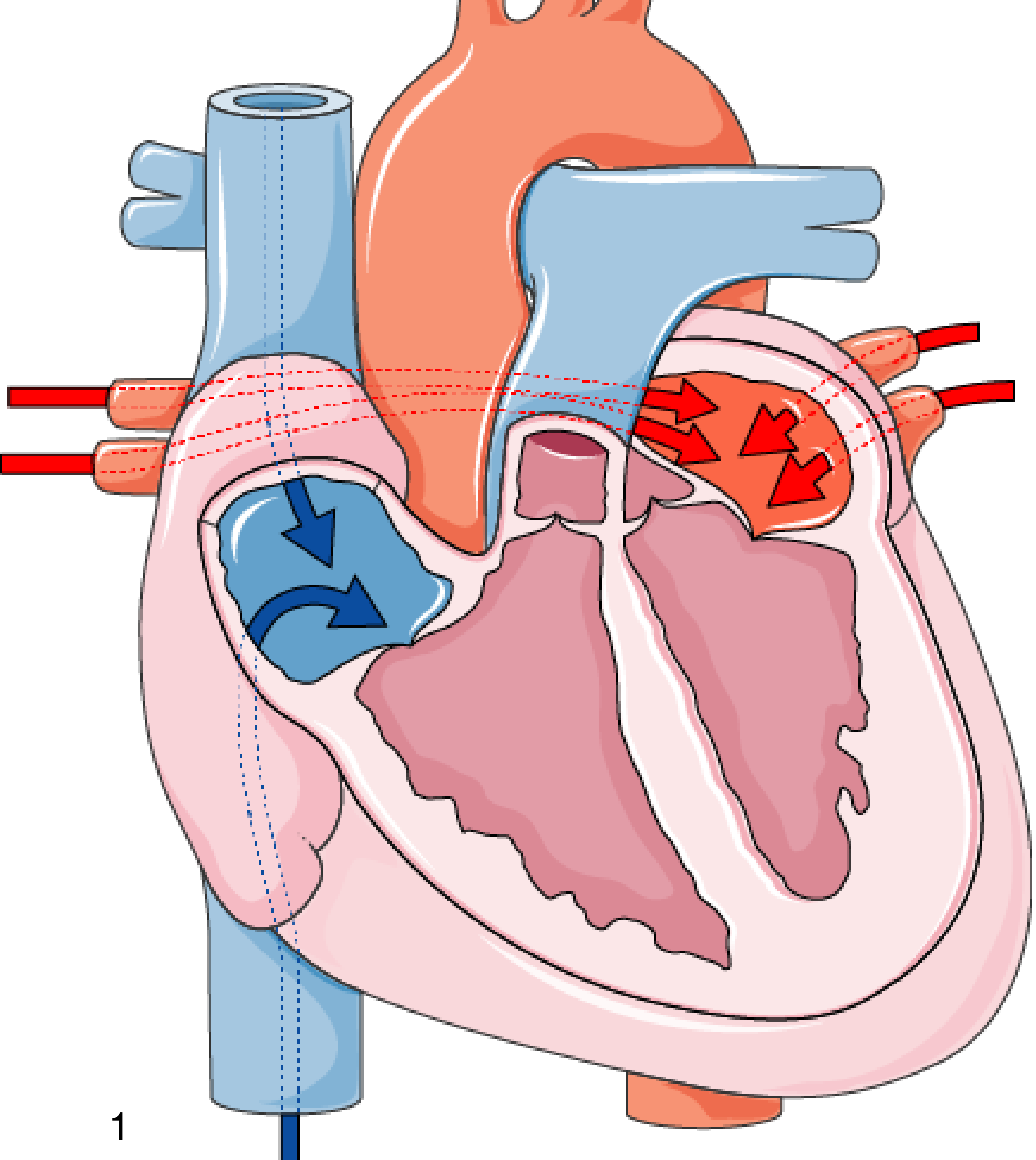
This coordinated pumping maintains blood pressure and ensures oxygen and nutrients are delivered to tissues.



Following the heartbeat...

We'll start with blood entering the atria.

Although as this is a continuous cycle the description can start anywhere.



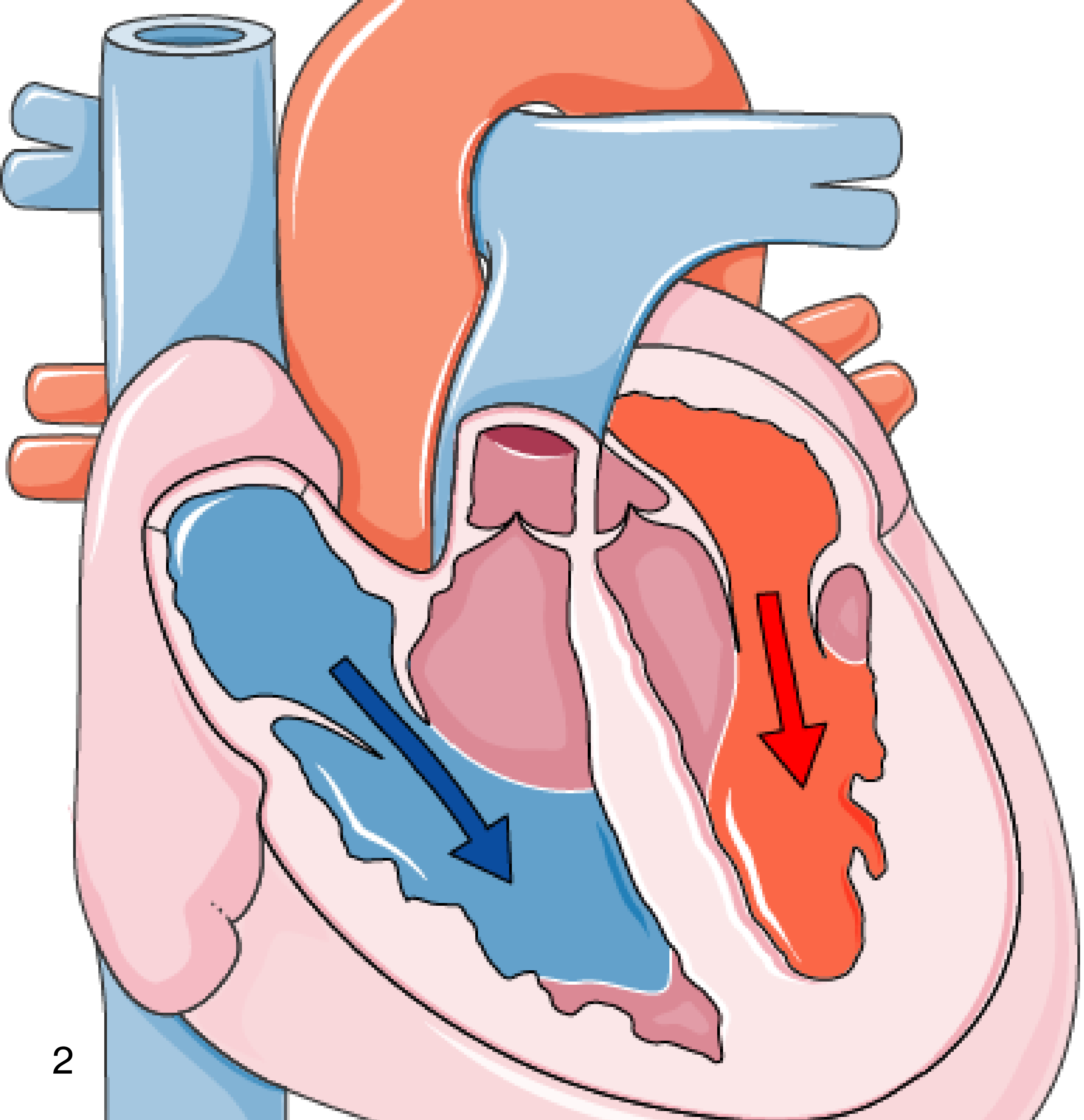
Diastole

The heart is relaxed.

The Red Arrows - Oxygenated blood enters the left atrium from the lungs via the four pulmonary veins.

The blue arrows - Deoxygenated blood enters the right atrium via the superior vena cava from the upper part of the body and the inferior vena cava from the lower part of the body .

The pulmonary veins are exceptions to the rule that veins carry deoxygenated blood.

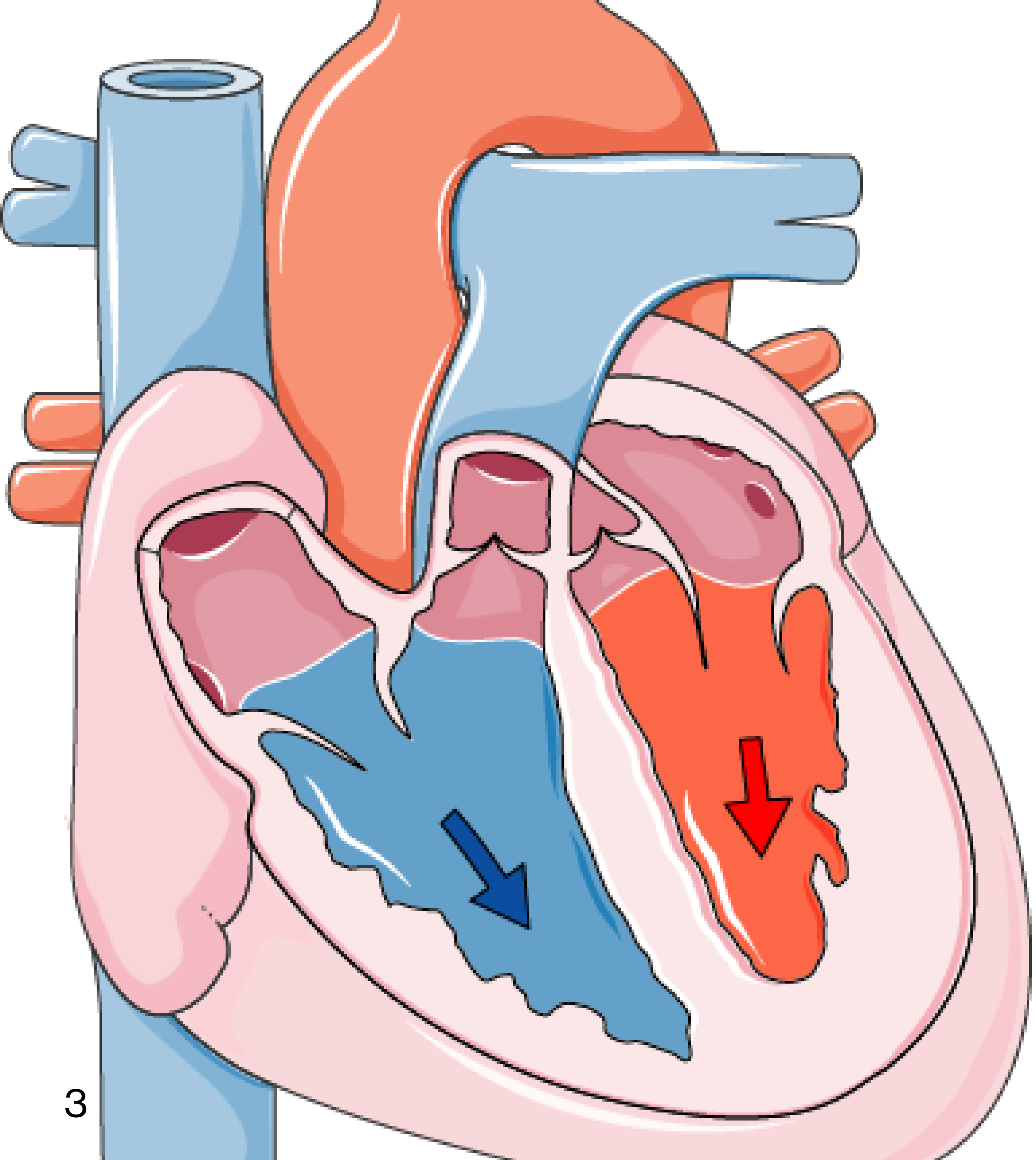


Still Diastole

The valves between the atria and ventricles are open, so, as blood fills the atria it also drains into the ventricles.

The valve between the right atrium and ventricle is the tricuspid valve.

The valve between the left atrium and ventricle is the bicuspid valve. Also known as the mitral valve.



The end of Diastole

At the end of diastole the atria contract and force the last 20% - 30% of blood into the ventricles.

This is sometimes referred to as the atrial kick.

This means the ventricles are at their maximum filled volume (end diastolic volume).

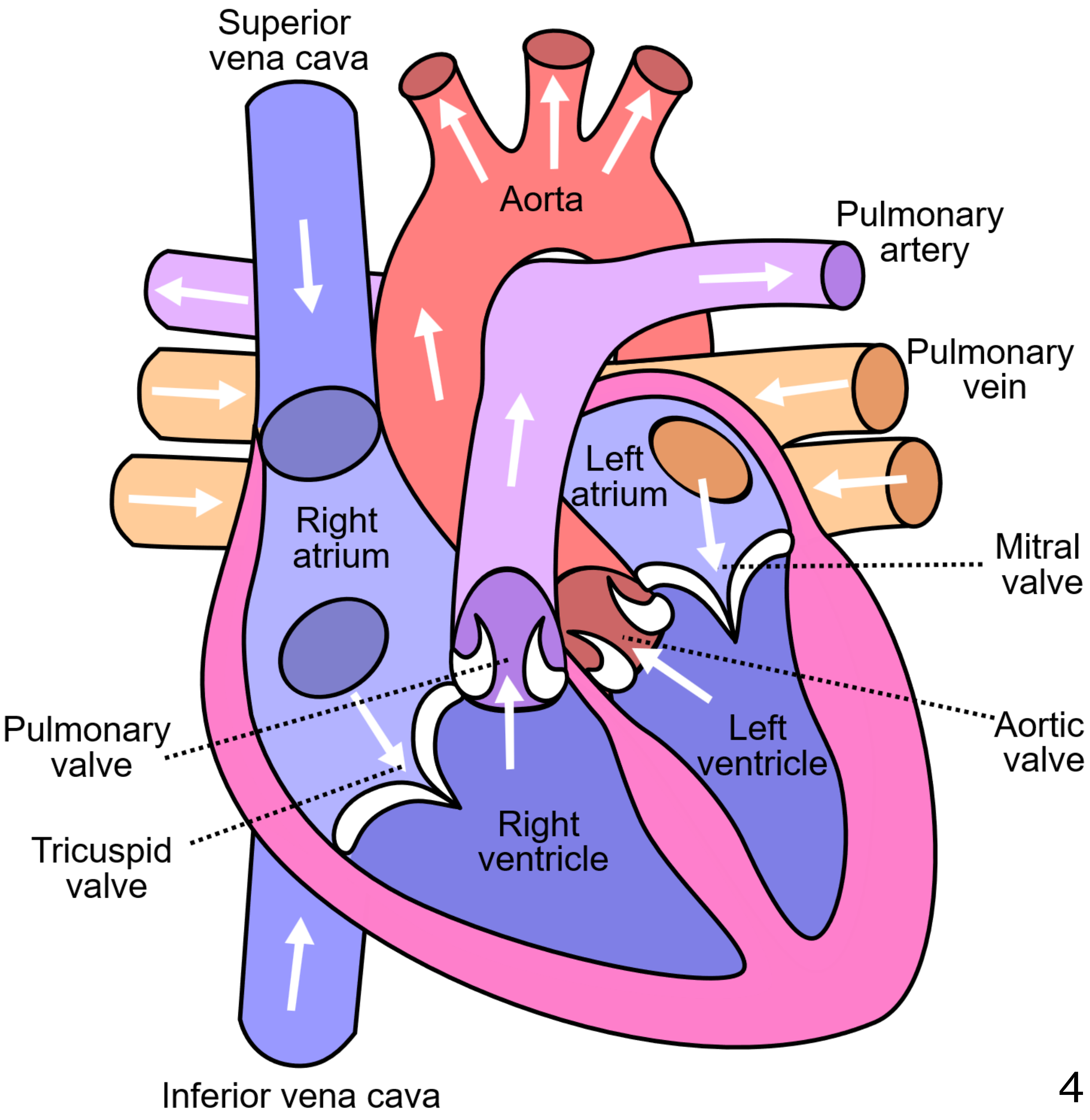
Systole

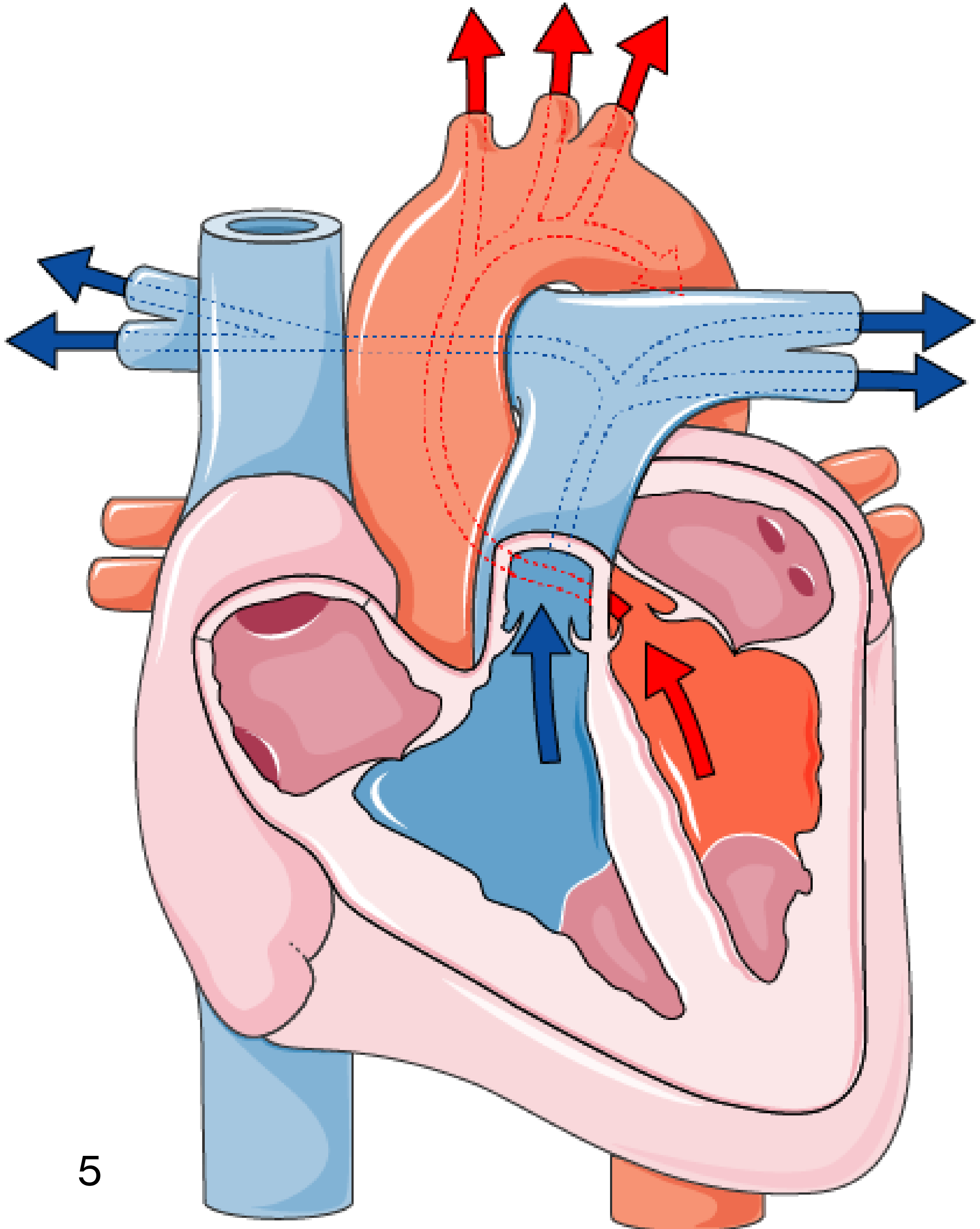
Systole is the stage when the ventricles contract.

As they begin to contact the pressure forces the bicuspid and tricuspid valves to close. This stops blood backflowing into the atria.

This is the ’lub’ sound.

The aortic valve between the left ventricle and aorta opens as does the pulmonary valve between the right ventricle and pulmonary artery.





Still Systole

When the ventricles contract blood is pushed through the open aortic and pulmonary valves.

The blue arrows –Deoxygenated blood travels to the lungs via the pulmonary artery.

The red arrows – Oxygenated blood travels to the rest of the body via the aorta.

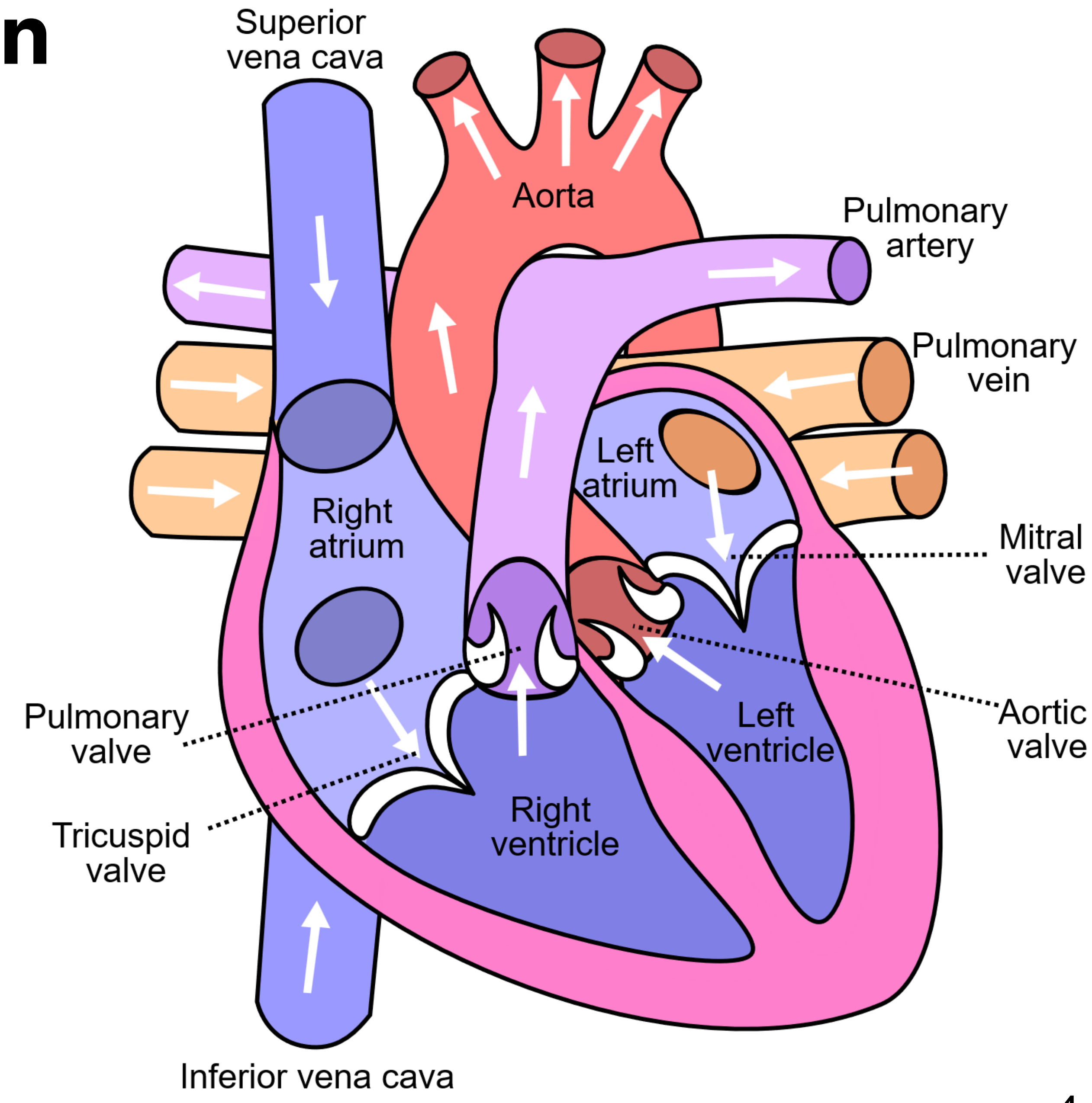
The pulmonary artery is the exception to the rule that arteries carries only oxygenated blood.

The transition between systole and diastole

At the end of systole, the ventricles relax and pressure inside them falls.

When this pressure drops below the pressure in the aorta and pulmonary artery the aortic and pulmonary valves close, creating the “dub” sound, and diastole begins.

One round of the cardiac cycle takes about 0.8 seconds.



Why do I need to know this?

As yoga teachers it helps us understand the cardiac cycle so we can appreciate how breath, movement and relaxation practices influence heart rate and blood pressure.

This helps us to plan and adapt classes and practices to better meet the needs of our students.

Understanding the cardiac cycle helps you pace transitions and recognise when the heart may need more time to adapt to movement.

You are teaching a dynamic sequence of Sun Salutations. A student begins to look flushed and slightly light-headed when moving quickly from standing forward fold to upright.

Knowing about the cardiac cycle helps you understand that rapid changes in posture can briefly affect venous return and therefore blood pressure.

You respond by slowing the transitions, cueing steady breathing and pausing in half lift to allow the heart time to refill effectively between beats.

Effect of Gravity on Venous Return during Diastole.

When moving rapidly from a lying/sitting position to standing, blood pools in the lower extremities due to gravity. This decreases the volume of blood returning to the heart during the diastolic -filling- phase.

With less blood filling the heart during diastole, the heart has less blood to pump during the subsequent systolic – contraction – phase i.e. a reduced stroke volume. This leads to a brief temporary drop in arterial blood pressure.

In most people, baroreceptors quickly detect this change. Heart rate increases and vasoconstriction occurs, restoring blood pressure.

However, in some people this compensation is delayed or insufficient, leading to orthostatic hypotension, which may cause dizziness or fainting.

Knowledge of the cardiac cycle helps you recognise when breath control and muscular tension may increase cardiovascular load.

You are holding Virabhadrasana II (Warrior II) for an extended period. Several students begin to visibly strain and hold their breath.

Understanding that during systole the heart is pumping blood against pressure in the arteries helps you recognise that breath-holding can increase intra-abdominal and intra-thoracic pressure and may increase cardiovascular strain.

You cue smooth exhalation and encourage softening through the jaw and ribcage, helping maintain steady venous return and avoiding unnecessary spikes in blood pressure.

Systole, Arterial Pressure and Holding Your Breath

During systole, the left ventricle contracts and pumps blood into the aorta to supply the body. To do this, it must generate enough pressure to exceed the pressure already present in the aorta -normally around 80 mmHg at rest.

When we hold our breath, particularly after a deep inhalation, intra-thoracic and intra-abdominal pressure increase.

Because the heart is already working against arterial pressure during systole, changes in thoracic pressure can alter venous return and stroke volume.

Sustained breath holding may temporarily reduce the amount of blood returning to the heart and increase cardiovascular strain.

References

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