# The Moving Artery Phantom

**Illnesses related to the heart and blood vessels are a common cause of death in the world. A relatively new discovery is that the arterial wall moves back and forth along with the blood flow. To understand if this motion is related to these illnesses, researchers like to know its origin. We have designed and fabricated phantoms to be used in investigating if varying the pressure of the flow can give rise to this motion.**

Many people suffer and die from illnesses related to the heart and blood vessels. To understand whom is in the risk group researchers try to learn all about these organs. **Arteries** are the blood vessels transporting blood from the heart out to the body. The arteries are elastic and they move when the heart is pumping.

The arteries widen due to the incoming blood, but the arterial wall also moves along the blood flow back and forth. This second movement has only been known for a little more than a decade. The reason for the movement is not yet known.

We want to see if varying the pressure can give rise to a motion. The pressure acts at a 90 degrees angle to the wall, widening the vessel by pushing it out. But if the vessels diameter becomes narrower the pressure could act along the direction of flow. We want to investigate if the pressure can drive the motion.

Inside the human body there are so many variables that can affect the motion of the vessels. It is impossible to design a test that investigates how just one of all of these parameters affect it. Therefore we have designed and fabricated models, also called **phantoms** to investigate the movement in a much simpler system.

The phantom is fabricated in two parts. One part is representing the moving artery and the second part the surrounding tissue. These two elastic, slightly slimy, parts are assembled under water and viewed with an **ultrasound** equipment. Ultrasound is a high frequency sound and an image is created from the echoes. It is frequently used in medical diagnosis, for example on babies before they are born.

To cast the phantom we use **3D-printed** molds. The printer prints from the bottom up, one layer at the time. Each print is drawn in a computer program, and it takes approximately three hours from the printer starting until the plastic part is in our hands.

We compare three different geometries. One straight, one with an abrupt diameter change, making the phantom vessel narrower and one with a more gradual diameter change, also making the vessel narrower.

The assembled phantoms are connected to a tube from the **pump**. The pump is taking the place of the heart, but instead of using blood we pump water into the phantom. The pressure is varied. By using the ultrasound equipment the movement of the vessel phantom could be seen and later analyzed.

The results show that the straight vessel did not move much along the vessel wall but both of the vessels with changing diameter move!