C6.1 Stable bones – Tracking down technology

In the experiment, you learned that human bones have solid material only on the outside. Inside, the bones consist of cavities that make the bones relatively lightweight, yet very stable.

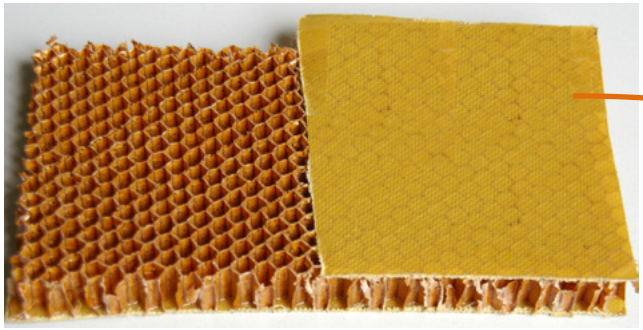
Below you will learn about three examples from technology where the principle of "stability with cavities" is applied.

Incidentally, if people copy a principle from nature and apply it to technology, this is called "bionics". Perhaps you recognize that this term is made up of the two words "biology" and "mechanics".

Corrugated cardboard

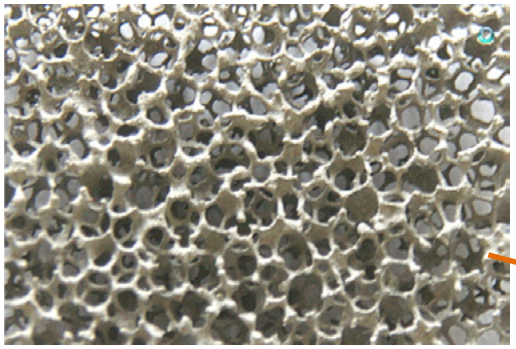
At the left you see two layers of corrugated cardboard between two pieces of heavy-duty paper. The corrugated cardboard doesn't weigh much, but it still has high resistance to bending and impact.
Corrugated cardboard is used to make packing boxes (right) for fragile goods such as glassware. Corrugated cardboard has been around since 1856. Today, nearly 70 percent of all goods are packaged using corrugated cardboard.

Hexagonal honeycomb structure in aircraft construction



The picture at the left comes from aircraft construction, but maybe you have seen something similar: Bees, wasps, and hornets build their nests in this pattern. They use a papery material that they make themselves. The combs are very stable and don't weigh much.
The same principle is used in aircraft construction. For example, a similar hollow hexagonal structure is glued between the inner and outer walls of an aircraft wing. With this combination, the wings have extremely high bending resistance and tensile strength with the least possible weight.
Incidentally, the inside of most apartment doors today also consists of a similar honeycomb structure made from lightweight cardboard.

Aluminum foam



When modern cars are manufactured, hollow tubes, such as those built into the floor of the car, are filled with metal foam. This kind of foam is pictured at the left (this picture shows aluminum foam, but the foam could also be made from steel). These foam-filled tubes can be used to achieve the same strength as with tubes that are made completely from metal (known as solid tubes). However, these foam-filled tubes save a lot of weight. Another advantage is that in the event of traffic accidents, the metal foam absorbs energy, that is, it absorbs the impact, and reduces the deformation of the car's passenger compartment. It thus protects the people who are sitting in the car.