

# Alphacam

## 3D printing – a versatile technology with a promising future

What do teeth, toys, furniture, spare parts, jewelry and chocolate figures have in common? All of these can be produced with 3D printers.

**The first patent** for a 3D printer was registered in 1984 by inventor Chuck Hull from the US.

### Which materials can be used for 3D printing?

3D printing creates three-dimensional objects by applying the base material layer by layer from the bottom up. This works with base materials that become soft and malleable when heated, such as thermoplastics and metals – but also materials such as ceramics, concrete, wax, living cells or chocolate are also possible.

### How do 3D printers know what to print?

With an ordinary inkjet printer, an image or text file tells the printer where to apply the ink to the paper, creating whole words and images. Similarly, for a 3D printer to print an object, a file that tells the printer where to apply the base material is needed. Therefore, in order to print a three-dimensional object, the desired model must first be created on a computer using a special 3D program.

### How is an object created in the 3D printer?

The solid base material is pressed through a heated nozzle in the 3D printer's print head, causing it to become liquid and come out as a thin, soft filament. This filament is used to apply a layer of the object. In the process, the print head moves along predetermined coordinates. Once the material has solidified, the print head moves up one layer and begins to apply the next one. This is repeated until the object is completed.

### Additive and subtractive manufacturing

The layer-by-layer construction of an object in the 3D printer is referred to as additive manufacturing. Even complex shapes can be created fully automatically at low cost and with low material consumption. This type of manufacturing differs from subtractive manufacturing, in which material is removed from solid blocks or rods by milling, cutting, sawing and drilling, for example, to produce an item.

### Sprechblase S.1

Filament is the thread-like material from which a 3D printer forms objects. Filament is usually rolled up on rolls like wire.

### Task

3D-Models made on the computer can be saved in a STL format. Also the skull from the box is available in this format. You can find the file to download on the website [www.schule.at/lernwelt/plastik](http://www.schule.at/lernwelt/plastik).

You can open the file in programs such as Microsoft Paint 3D. To look at the 3D model from all sides, set the view to 3D and move the model around with your mouse.

## **3D printing in medicine**

3D printing has opened up entirely new possibilities in medicine. For example, complex implants and prostheses can be manufactured cost-effectively perfectly adapted to the dimensions of different patients.

### **Realistic models**

Today 3D printers can print models of human organs that look like real organs and feel lifelike. This is achieved by using rigid and flexible plastics that replicate the hard bones on the one hand and the soft tissue on the other. These models enable doctors to practice surgeries and better understand possible complications. Precise preparation saves patients unnecessary time under anesthesia, which also makes a significant contribution to the success of the surgery. But it is not only medical professionals who can use the 3D models to better prepare for an operation, it can also be used to clearly explain a surgical technique to patients before their procedure.

### **Skull bone**

3D models, like the skull bone in the teaching aid box, are needed in hospitals when dealing with, for example, fractures of the skull or facial bones. And it works like this:

1. first, pictures are taken of the patient's injured skull. These can be X-rays, MRIs or CT scans. Then a 3D model is created on a computer from these images.
2. this digital model is then printed from a special material using a 3D printer.
3. on the 3D model, the fractures of the sick person are perfectly visible. Therefore, even before the surgery, the required implant can be adapted seamlessly to the patient. This ensures that the implant fits one hundred percent and saves anesthesia and surgery time.