3D Printers and printing - Thursday 22nd September, 2022

An Adstock Science Club Talk - Presented by Mr Phil Ealey

Our talk in September was given by one of our members Mr Phil Ealey, who discussed the ins and outs of 3D printers.

The first documented mention of 3D printing can be traced back to the early 1980s in Japan. In 1981, **Hideo Kodama** was trying to find a way to develop a rapid prototyping system. He came up with a layer-by-layer approach for manufacturing, using a photosensitive resin that was polymerized or hardened by UV light. Here's an article giving some insight into the beginnings of 3D printing

[When Was 3D Printing Invented? The History of 3D Printing - (bcn3d.com)](#)

And here's an interesting video about the same thing but also contains a number of very interesting videos of other aspects of 3D printing

[History of 3D Printing - A History of 3D Printing from 1980 to Now - Introduction to 3D Printing - YouTube](#)

There are around 8 different types of technology used for 3D printing. Phil in his talk discussed the 3 most popular types currently on the market -

1) **FDM or Fused Deposition Modelling** – uses a fine filament of plastic, the printing material, to be melted, traced and deposited in layers onto a flat printing stage through a movable print head. This is a bottom up process. The filament is automatically fed through a heated nozzle from above, similar but much finer than that of a glue gun, with the 3D object being built up layer by layer. These are one of the most popular, cheapest and easiest printers to use. However the layers can be seen, and this process is not suitable for really fine definition models.

2) **SLS or Selective Laser Sintering** – is the process of building up a model, bottom up, using a plastic powder which is deposited in fine layers. A laser is traced across the surface which melts the powder into a solid form. The model is then moved down a fraction and a new layer of powder is deposited on top and the process repeats till completion.

3) **DLP or Digital Light Processing** – Creates a model within a light sensitive liquid polymer contained within a tank using, usually Ultra-Violet light to cause the polymer to harden. Once again the model is created layer by layer, but not traced out as in the case of FDM but as a complete layer. The light is made using a matrix of UV LEDs under the tank and is a top down process. Following each layer being constructed the model is moved up fractionally and a new layer is formed underneath it.

As mentioned there are many different types of 3D printer and printer technologies which can be used for a vast variety of purposes. From building small models and prototypes to large car parts, body work, dash board, gas turbine blades, houses and now, even things like biological structures.

Below is a picture of a large 3D printer, by a company called Modex, capable of making parts up to 5m tall.

Phil also brought over one of his own personal 3D printers, a FDM type, and demonstrated it constructing a particular object. As with all good "Live" demonstrations his first attempt ended up being a rather sorry fragmented blob. The main reason for this was the base layer of plastic did not fully stick to the stage as the heater for the stage was not working for some reason. It usually heats up to around 100°C, but not this time. Anyway with the help of some special PritStick his second attempt worked much better. Phil also described some of the more common uses for using 3D printing.

Obviously a 3D printer needs to have the information for whatever it will be printing and sent to it from a computer program. He showed us the particular software he uses to create his 3D models and some of the shortcuts used to make life easier. He also told us about the "**Thingiverse**" website that contains hundreds of preprogramed shapes and 3D objects that can be downloaded and fed directly to your 3D printer. Here's a link -

Thingiverse - Digital Designs for Physical Objects

Lastly Phil showed us how to create a smooth finish on the final model even when using FDM printing. This can be done by placing the model in an enclosed tank and dropping an acetone soaked piece of tissue paper in for a short period. The acetone vapour basically melts the outer layer of plastic, giving it a smooth finish.

If you are considering buying a 3D printer it is probably worthwhile for you to spend some time investigating the subject in more detail. One way is to trawl through some of the 3D printer videos on YouTube. There are hundreds to choose from so this may get a bit overwhelming. Here's just a couple to get you started -

Which 3D Printer Should You Get? A COMPLETE Beginner's Guide - YouTube
15 Tips in 15 Minutes: Quick & Easy 3D Printing Tips - YouTube

If you have Netflix, there is a documentary on some of the company's involved with the early development of personal 3D printers. Search for "Print the Legend". And lastly here's link I think you may find interesting, using drones to 3D print large objects -

https://youtu.be/pDKNEO0gDuE

I hope this proves useful to you especially if you are thinking about getting into 3D printing.

Be canny, safe and have fun!

Marius Stuart