THE HISTORY of 3D PRINTING

Chronological development of 3D Printing

Technology Development Phase

Year	Person	Description
1981	Dr. Hideo Kodama	......Invented the technology
1985	Le Méhauté	......First applied the technology
1988	SLA-Charles Hull	......Inventor of SLA technology
1988	SLS-Carl Deckard	......Inventor of SLS technology
1989	FDM-Scott Crump	......Inventor of FDM technology
1991	LOM	......Invention of LOM technology
1996	MJ	......Invention of MJ technology

Chronological development of 3D Printing

Applications Phase

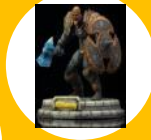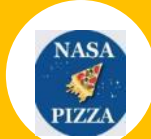| Year	Item	Description
2004	REPRAP	......Invention of REPRAP
2005	Spectrum Z510	.....first high-definition color 3D printer
2008	Prosthetic leg	.....first person with a 3D-printed prosthetic leg walked.
2009	3D printed vessel	....the first 3D printed blood vessel.
2010	Urbee	....the first 3D printed car
2011	NASA PiZZA	....3-d printer pizza machine
2012	Jaw	...The first prosthetic jaw

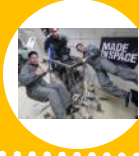**Chronological development of 3D Printing**

2013 — Obama Speech — ...Obama speech about 3-d Printer

**2014** — Nasa 3-d printer — ...Nasa use 3-d printer in space

2016 — 3D print bone — ...First 3-d printed bone

The history of 3D printing begins in 1981 with Dr. Hideo Kodama's patent application for a rapid prototyping device. As far as we're aware, Dr. Kodama is the first person ever to apply for a patent in which laser beam resin curing system is described (Later called 'Stereolithography Apparatus – SLA).

Unfortunately, the Japanese doctor's application never went through. Due to issues with funding, he was unable to complete the process before the one-year deadline.

Hideo Kodama
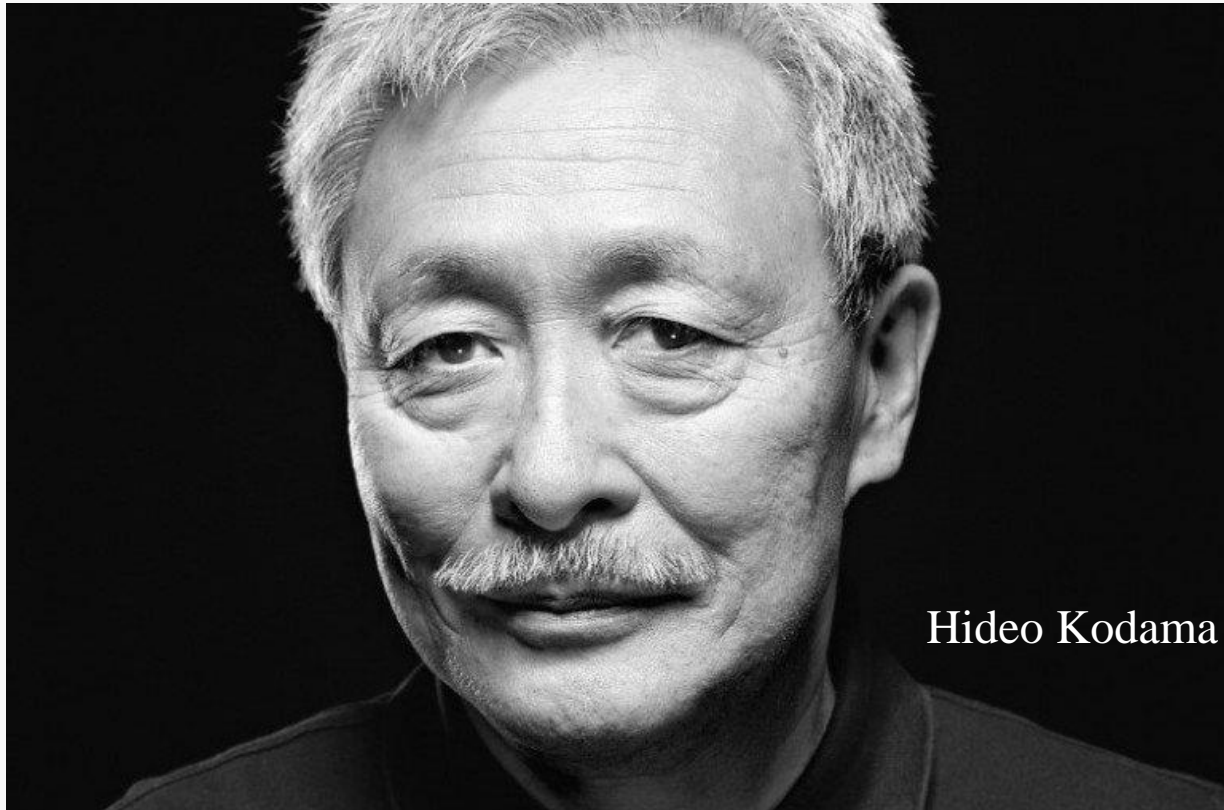
Source: www.sculpteo.com

Four years later, Le Méhauté also tried to take patent of the SLA.
Le Méhauté was working at fractal geometry parts and he would like to produce a fractal construction to show the people.Therefore he started thinking about how to produce such complex parts. He produce this geometry with SLA system and he appeal to have a patent of this system but CNRS (National Center for Scientific Research) didn't take their idea seriously and Le Méhauté couldnt take the patent.

Le Méhauté

Fractal Geometry

Source:www.letudiant.fr

In the same time, Charles Hull was also interested in the technology and deposited a first patent for stereolithography (SLA)in 1986.He founded the 3D Systems Corporation and a year later, released the SLA-1. Additionally, Chuck also developed the STL file, format which is used by the majority of 3D printing software on the market.

They released their first commercial product, the SLA-1, in 1988.

Charles Hull

Charles Hull– Inventor of SLA

First commercial product, the SLA-1

Source:www.ntboxmag.com

The same year that the SLA-1 was introduced, another 3D printing technology was invented. This time, it was selective laser sintering(SLS), the patent for which was filed by Carl Deckard, Deckard's machine, the first SLS 3D printer, was called Betsy. It was able to produce only simple chunks of plastic. However, as the main purpose of the printer was to test the idea for the SLS, object details and print quality weren't the highest priorities.

Carl Deckard– Inventor of SLS

Source:www.kierahintze.wordpress.com

Scott Crump, along with his wife and fellow inventor Lisa Crump, invents and patents a new additive manufacturing method called FDM. This technique involves melting a polymer filament and depositing it onto a substrate, layer by layer, to create a 3D object.

The idea for this new technology came to Crump a year earlier, in 1988, when he attempted to create a toy frog for his daughter using a hot glue gun loaded wit ha mixture of polyethylene and candle wax. After struggling to do it manually, he envisioned a way to automate the process and build the shape by creating a series of thin layers stacked on top of each other.
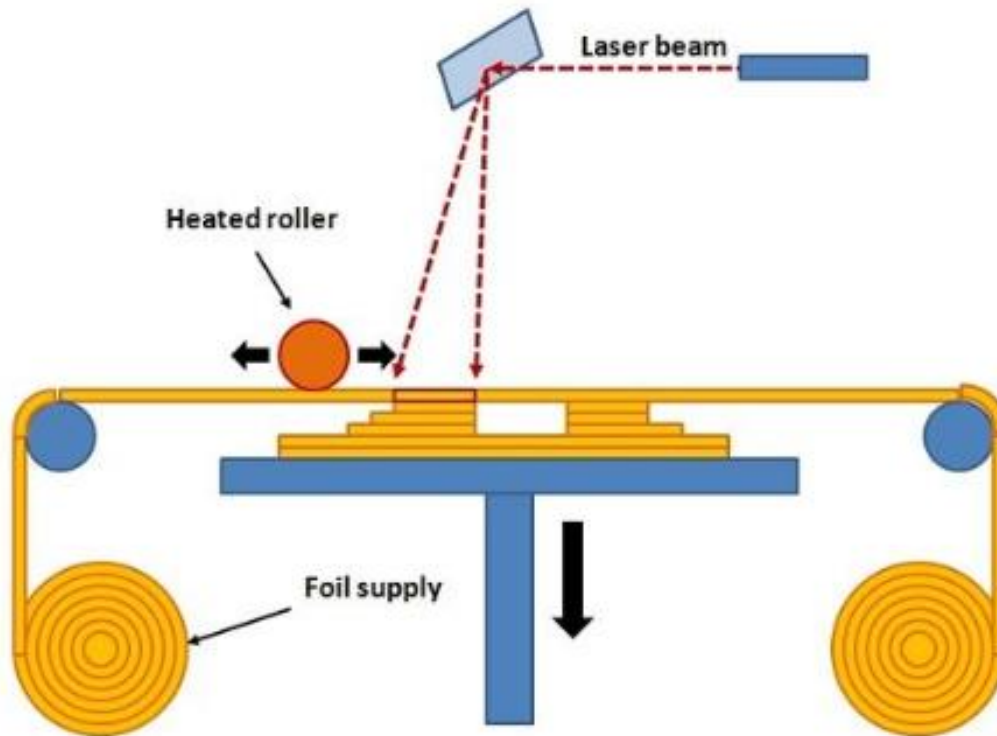

Scott Crump – Inventor of Fused Deposition Modelling

LOM is a method of 3D printing. It was developed by the California-based Helisys.

During the LOM process, layers of plastic or paper are fused — or laminated — together using heat and pressure, and then cut into the desired shape with a computer-controlled laser or blade.

Laser beam

Heated roller

Foil supply

Source:www.sciencedirect.com

In 1996 3D Systems introduced its first material jetting platform, the Actua 2100, which used an inkjet mechanism to directly print only wax materials.
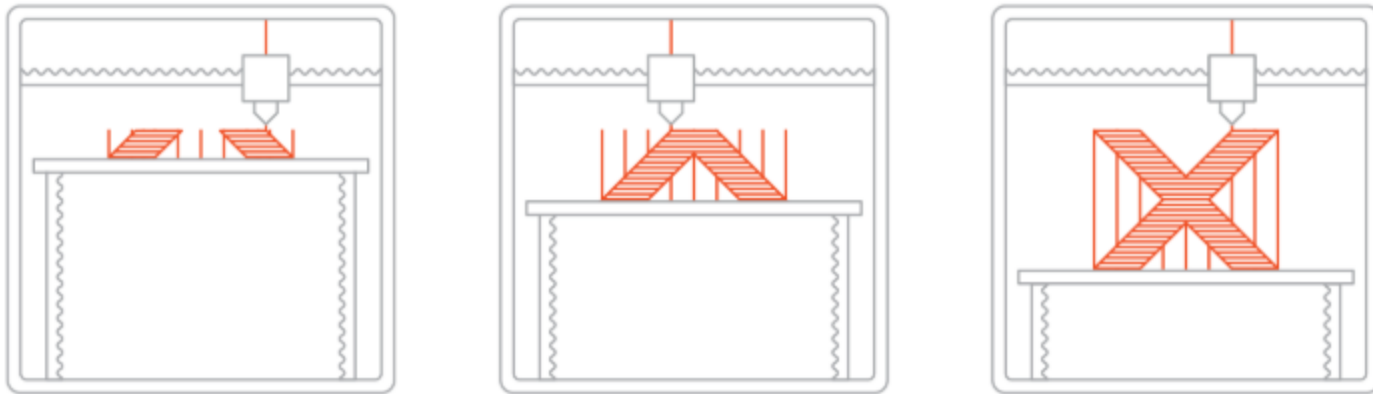
Source:www.3dhubs.com

Adrian Bowyer, a senior lecturer in mechanical engineering at the U.K.'s University of Bath founds the RepRap project, an open-source project which aims to build a 3D printer that can print most of its own components.

The idea is that this will democratize 3D printing, by expanding to technology to people all around the world — since friends will be able to print 3D printers for their friends.
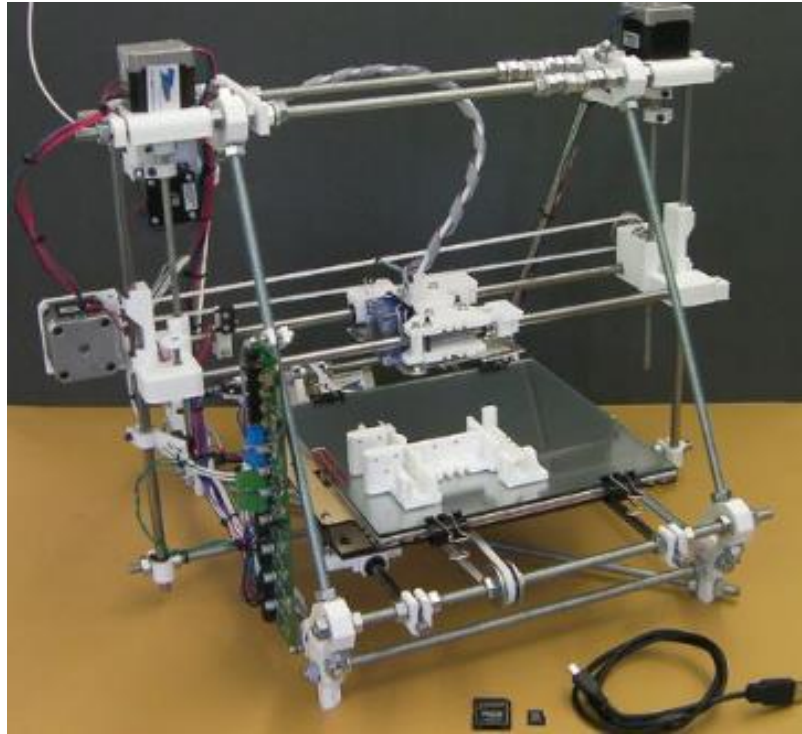
Source:www.3dhubs.com

In 2005, Z Corporation announced the introduction of the Spectrum Z510 3D Printing System, the first high-definition color 3D printer.

To begin the 3D printing process, the printer first spreads a layer of powder in the same thickness as the cross-section to be printed. The print heads then apply a binder solution to the powder causing the powder particles to bind to one another and to the printed cross-section one level below. The feed piston comes up one layer and the build piston drops one layer. The printer then spreads a new layer of powder and repeats the process, and in a short time the entire part is printed.

Source: www.matterhackers.com

In 2008, the first person with a 3D-printed prosthetic leg walked. All parts of the leg, knee, foot and socket were printed in the same complex structure without any assembly needed.
The 3D Printed prosthetic for Natasha was printed on 3D System's PolyJet 7000 SLA 3D printer. It took the team just 17 days from an idea to a finished (prototype) product.

Source: www.tractus3d.com

2009 was the year in which the FDM patents fell into the public domain, opening the way to a wide wave of innovation in FDM 3D printers, a drop of the desktop 3D printers price, and consequently, since the technology was more accessible, an increased visibility.

2009: Organovo produces the first 3D printed blood vessel.

Source:www. guardianlv.com

In 2010, Urbee was the first 3D printed prototype car. Its body was fully 3D printed using Fortus 900mc (FDM) . Now, the 3D printed car is much more a dream than a reality but in the manufacturing process, many actors are considering it as a good alternative to traditional methods.

Source: www.popularmechanics.com

2012: The first prosthetic jaw is printed and implanted

Source: www.aestheticaskin.com

2013: "3D printing" in Obama's State of the Union speech

Source:www.biography.com

In 2014, NASA brought a 3D printer in space to make the first 3D printed object off of the earth.

Source:www.nasa.gov

2016: Daniel Kelly's lab announces being able to 3D print bone

Source:www.reactor.com