The dawn of the first practical self-replicating machines

by Vik & Suz Olliver

http://diamondage.co.nz
Obligatory “When I Were a Lad”

Or

“How pounamu made me a 3D junkie.”
The Most Successful Bird On The Planet
Additive Fabrication – Fancy Layer Cake

- Additive fabrication puts less stress on the moving parts.
- Watertight - Heat from the nozzle fuses the layers of polymer together.
First Meccano Prototype, May 2005
The First Hint of Replication

Early testbed

13 September 2006
The First “Darwin” February 2007

Adrian & Ed, University of Bath
Replication Announced 1\textsuperscript{st} June 2008

Dr. Adrian Bowyer

Some weird longhair
About 1 year later...

“Mendel” Appeared
RepRap Wins Popularity Contest

Which printers (which manufacturer) have you used?

Great, But Would You Make One?

Make

- Evil Vendor Lock-in
- Certification Costs
- Poverty
- Environmental Concern
- Political Constraints

Buy

- Time is money
- Insurance
- Encourage local makers
- Maintenance Contracts
- Standardized Unit
- Evil Vendor Lock-in

Or
Grow Your Own Plastic

Ferment

Lactide

Catalyst + Heat

Polylactide
Lotsa Colours
“Whisper Down The Lane”

By Bronwyn Holloway-Smith
Wellington City Gallery

http://bronwyn.co.nz/projects/whisper-down-the-lane/
Slow to Change Design Philosophy

Given fabulous 3D manufacturing, people still do it the wrong way:

- Design for minimum production cost.
- Still over-using nuts & bolts.
- Increasing complexity.
- Higher barriers for entry to the club.

Why not use bamboo instead of threaded rods? Clips instead of nuts, bolts and washers?
Makers of The Thingiverse

Started by RepRap core team member Zach Hoeken.

Hosts working, Open, 3D models in various formats, 24 new ones each day.

(and a good way to avoid having to design 3D objects yourself...)

http://thingiverse.com
People Making and Thinking
Plastic Can Get Boring...
Everyone Loves Chocolate!
But if there are leftovers

http://richrap.blogspot.co.nz
Inkjet Head

For printing with colours, organic semiconductors, cell cultures, making powder printers etc.

Print a layer - then colour it...
New Uses for 3D Printing

In the same way that TVs are made before the code is ready to ship, we could send a ship to, say, Mars, without all the design work finished.

Printing 3D vascular networks and other body parts (right) in sugar glass.

Any cool new concepts from the audience?

Credit: Jordan S. Miller
The Very Big ...
... And The Very Small
And then what?

Is there a Doctor in the house?
Future Directions

Forking is inevitable. Suck it up:

Delta Bots
Multiple heads
Multiple Materials
Metal
Concurrent print heads

Specialisation is for insects.

http://reprap.org/wiki/Rostock
Project RE_ - a 3D Mixtape

Combining 3D printing with the Maker upcycling movement.

http://project-re.blogspot.co.nz/
How Far Can You Go?

RepRap is not just any particular machine, but an evolving concept.

How small can we make it?

We are already creating the smallest pieces of matter that it is possible to optically see.
100,000 DPI

And so here is a picture of the highest possible resolution, ever.

50x50 micron area.

Wavelength of light: 0.5 micron

Pixels 0.25 micron

Source: Agency for Science, Technology and Research (A*STAR) in Singapore
Once we hit atomic resolution:

Cheap, plentiful carbon.

Atomic-scale RepRaps would find diamond a useful building material.

We enter “The Diamond Age”

Thingiverse.com gets even more awesome.

(See Neal Stephenson's Book of the same title, which we cribbed off Eric Drexler)
WE HAVE 3D PRINTERS TOO

EXPECT US
How Will RepRaps Change Society?

Banning hardware by law won't work anymore.

RepRap'd devices will work like users want them to:

- No DRM
- No Spyware
- No compulsory upgrades
Don't Like Society? Print a New One.

Wealth without money.
Online Forums & Groups

http://reprap.org
IRC #reprap on freenode.net
http://thingiverse.com
http://diamondage.co.nz

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