

Fabricating Fabricators

The dawn of the first practical self-replicating machines

by Vik & Suz Olliver

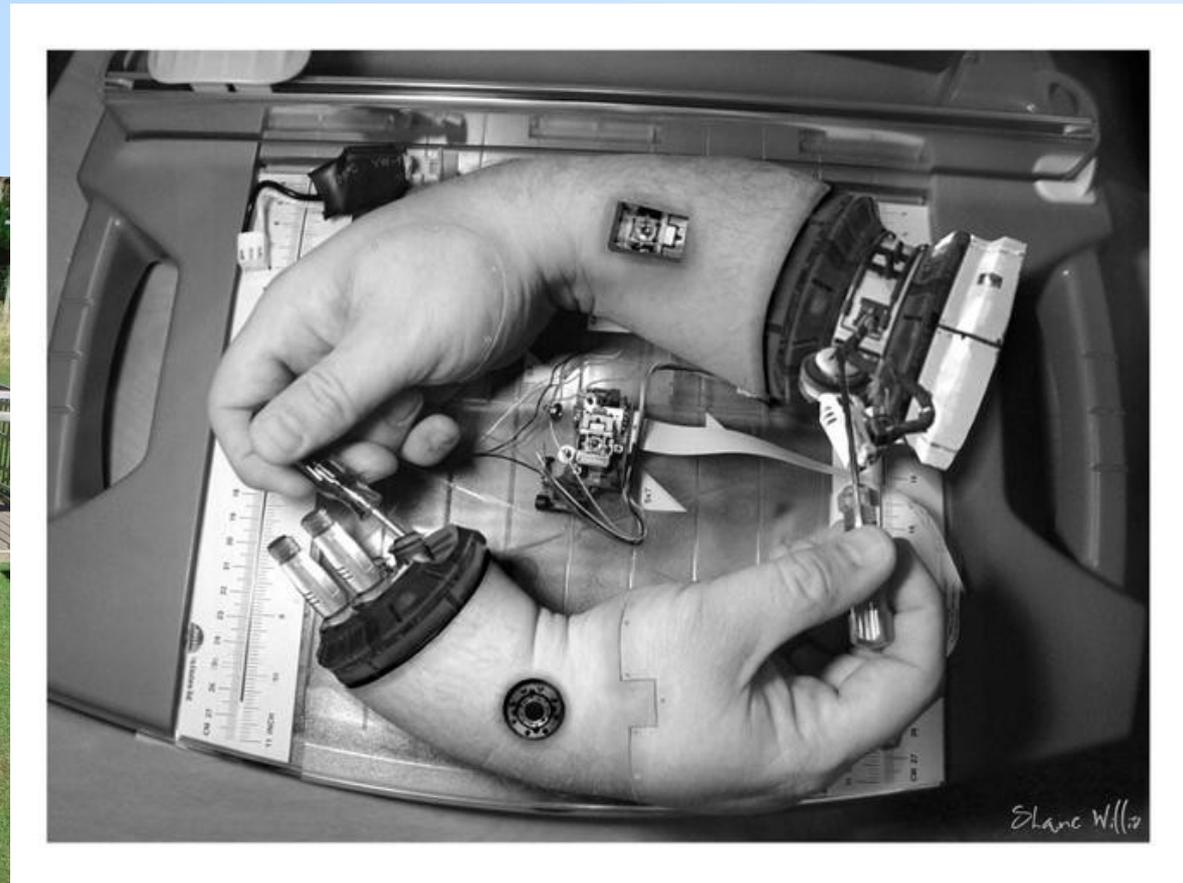
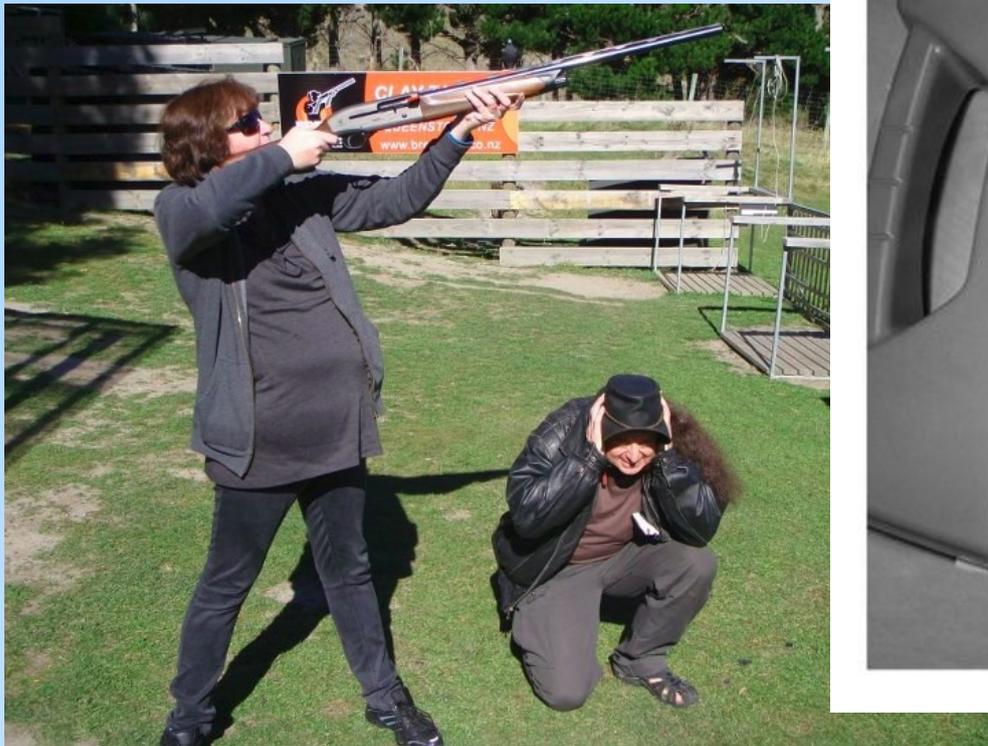


Image (c) Shane Willis

<http://diamondage.co.nz>

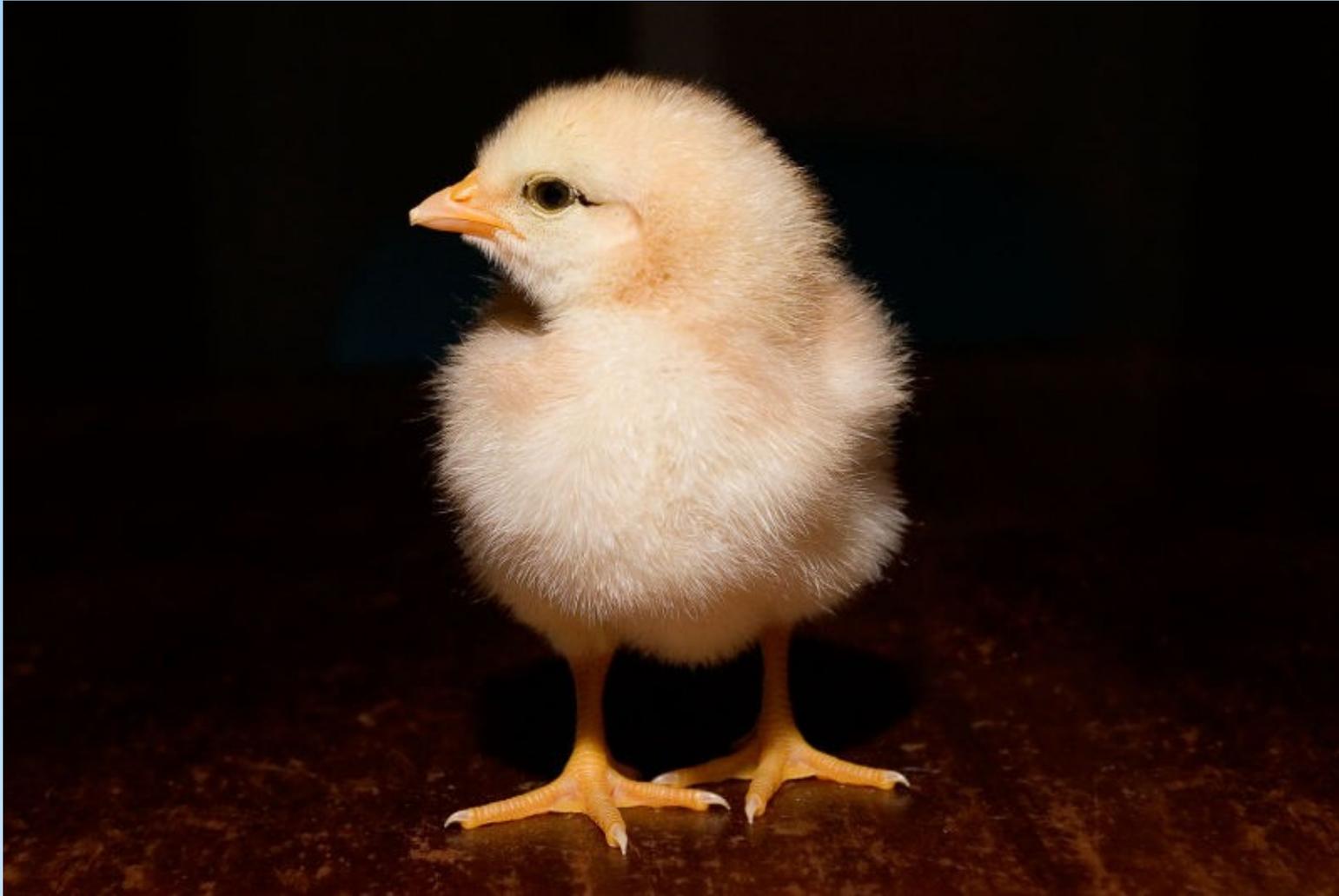
Obligatory “When I Were a Lad”

Or

***“How pounamu made
me a 3D junkie.”***



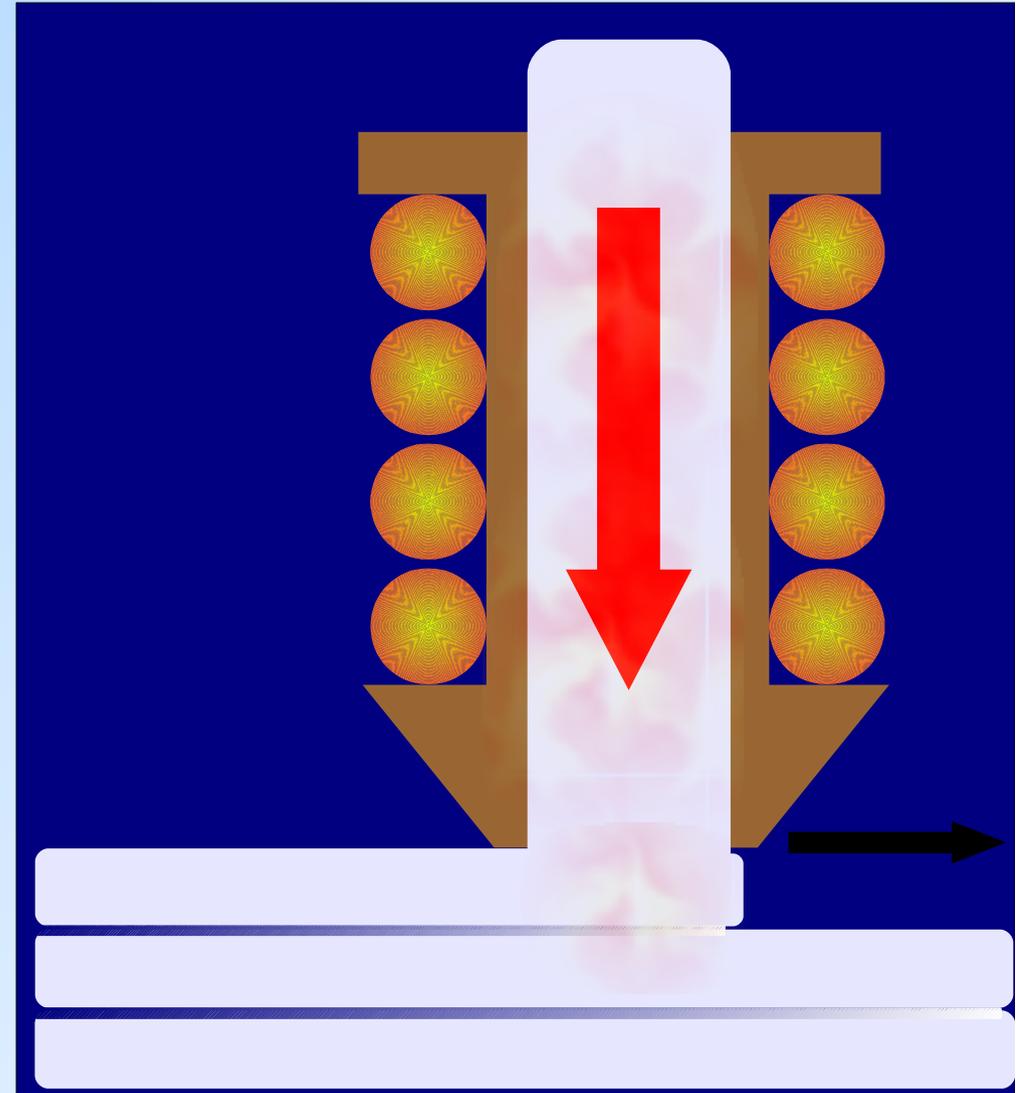
The Most Successful Bird On The Planet



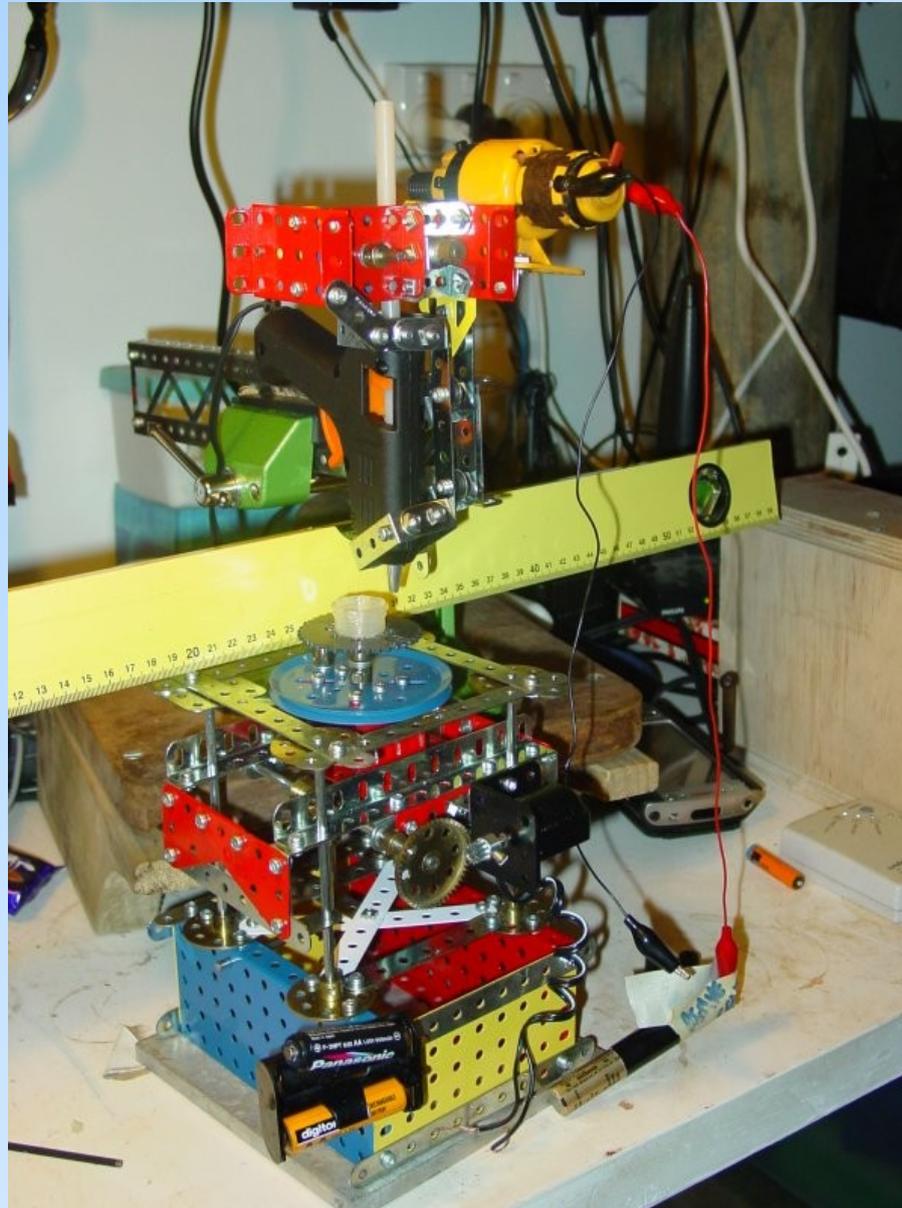
Additive Fabrication – Fancy Layer Cake



- 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

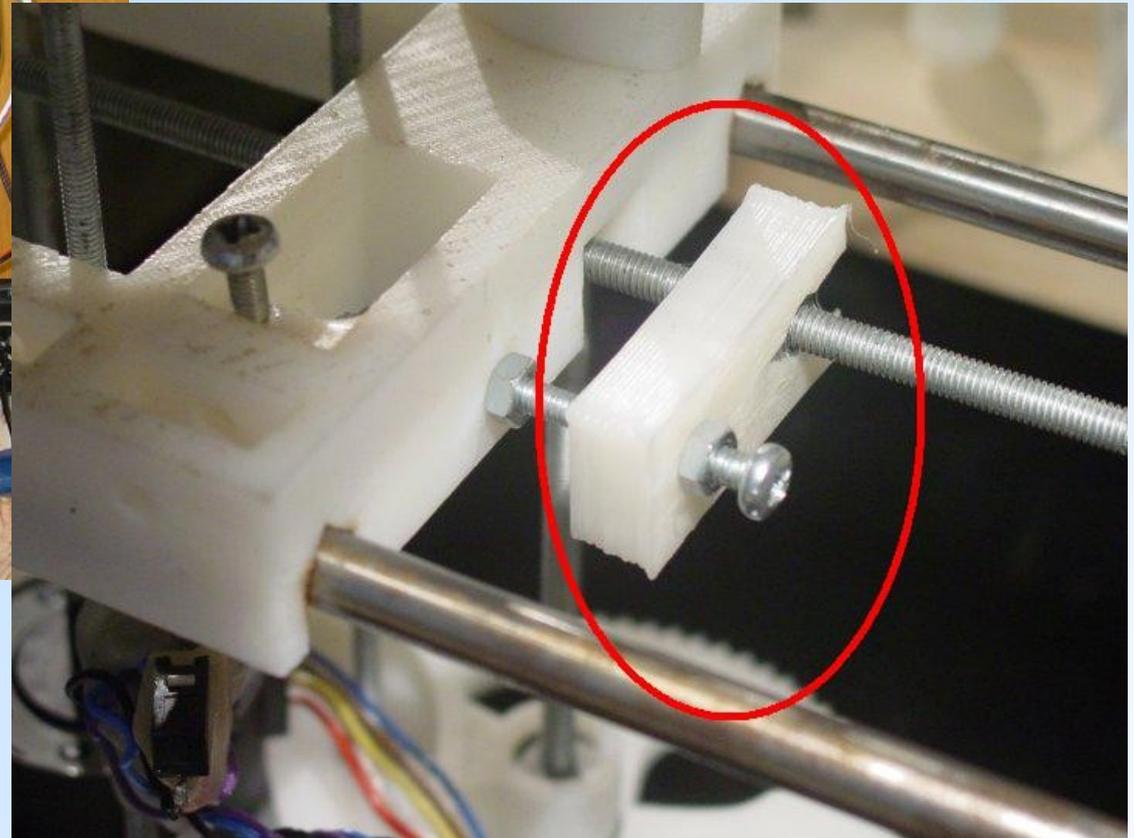




The First Hint of Replication

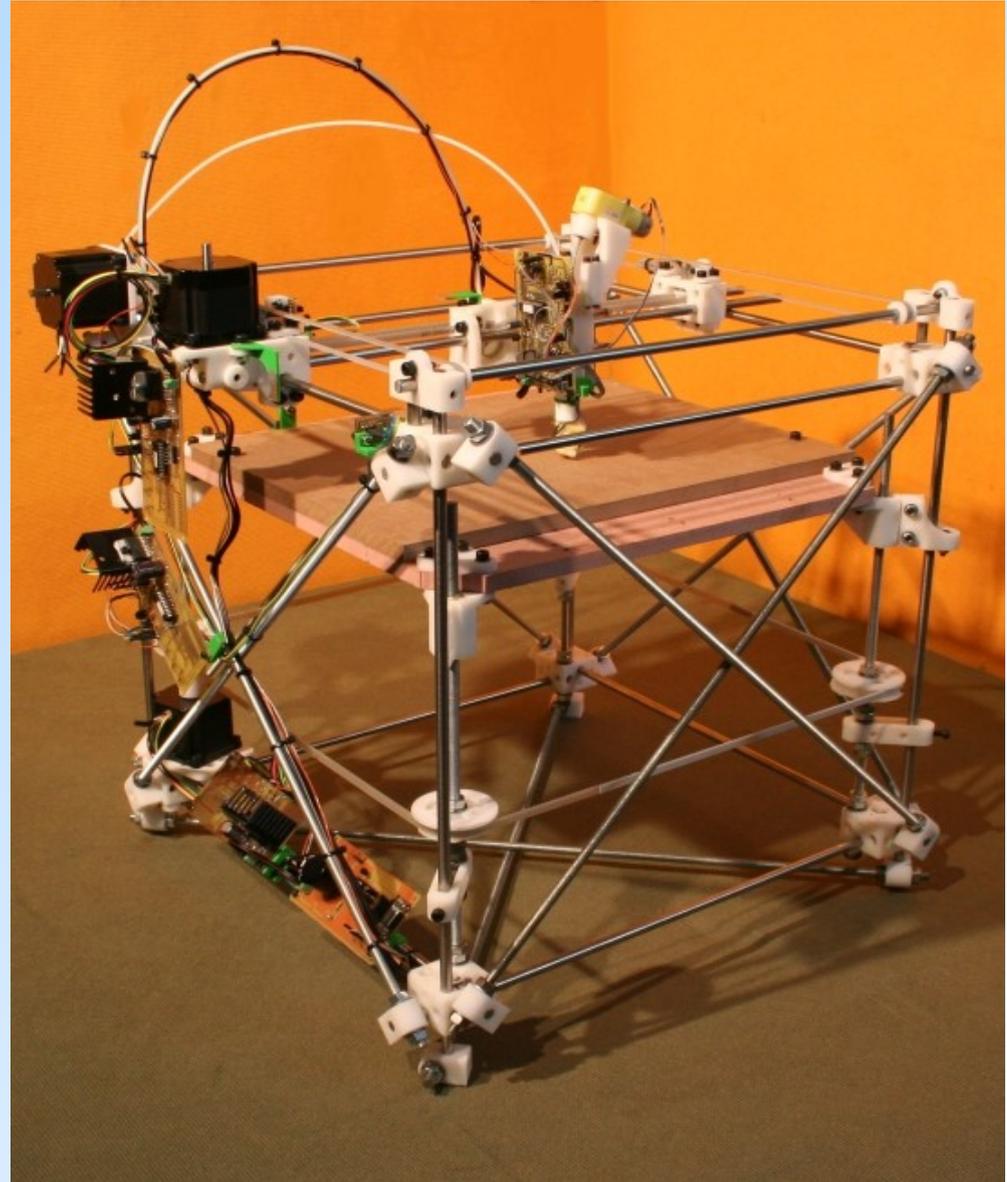


Early testbed



13 September 2006

The First “Darwin” February 2007

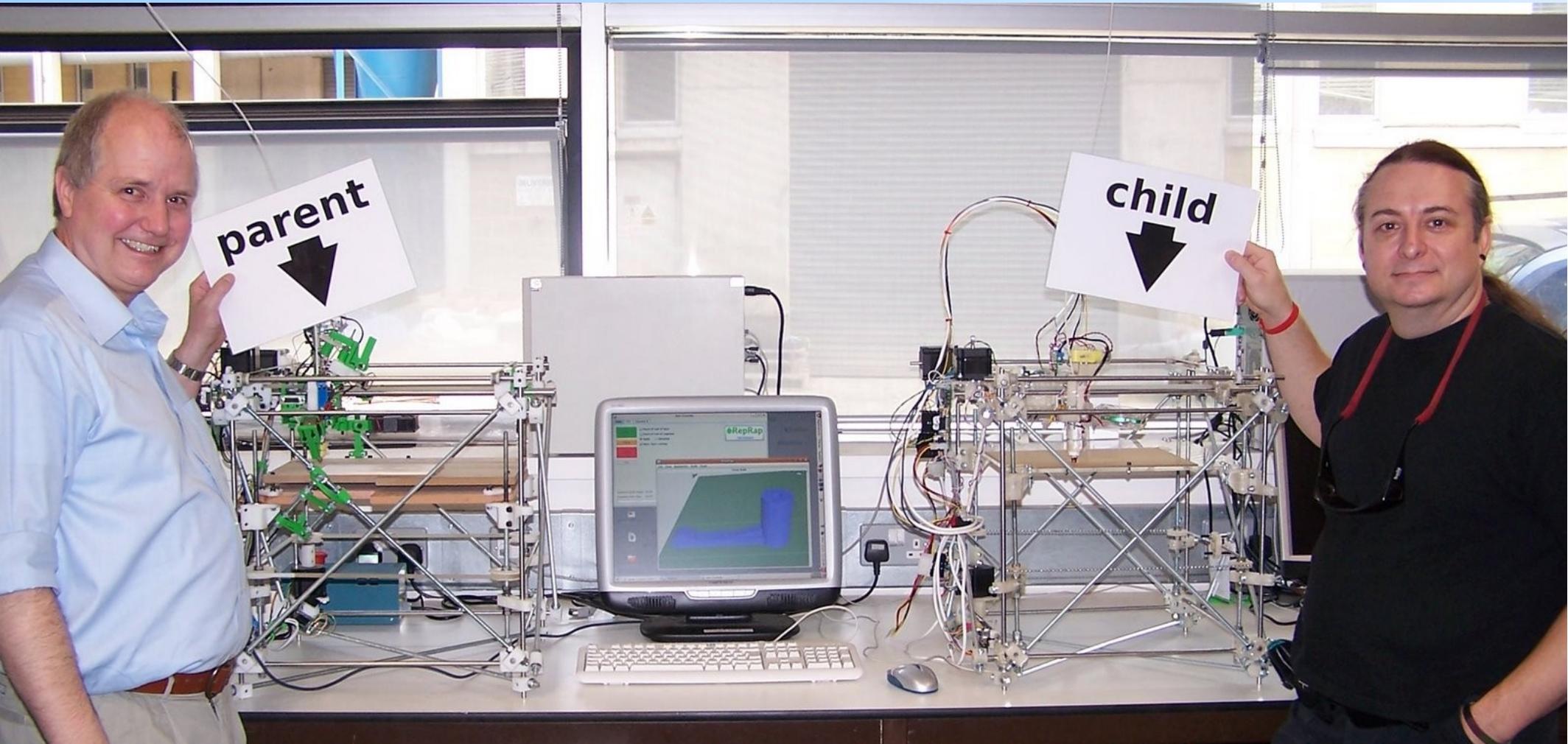


Adrian & Ed, University of Bath



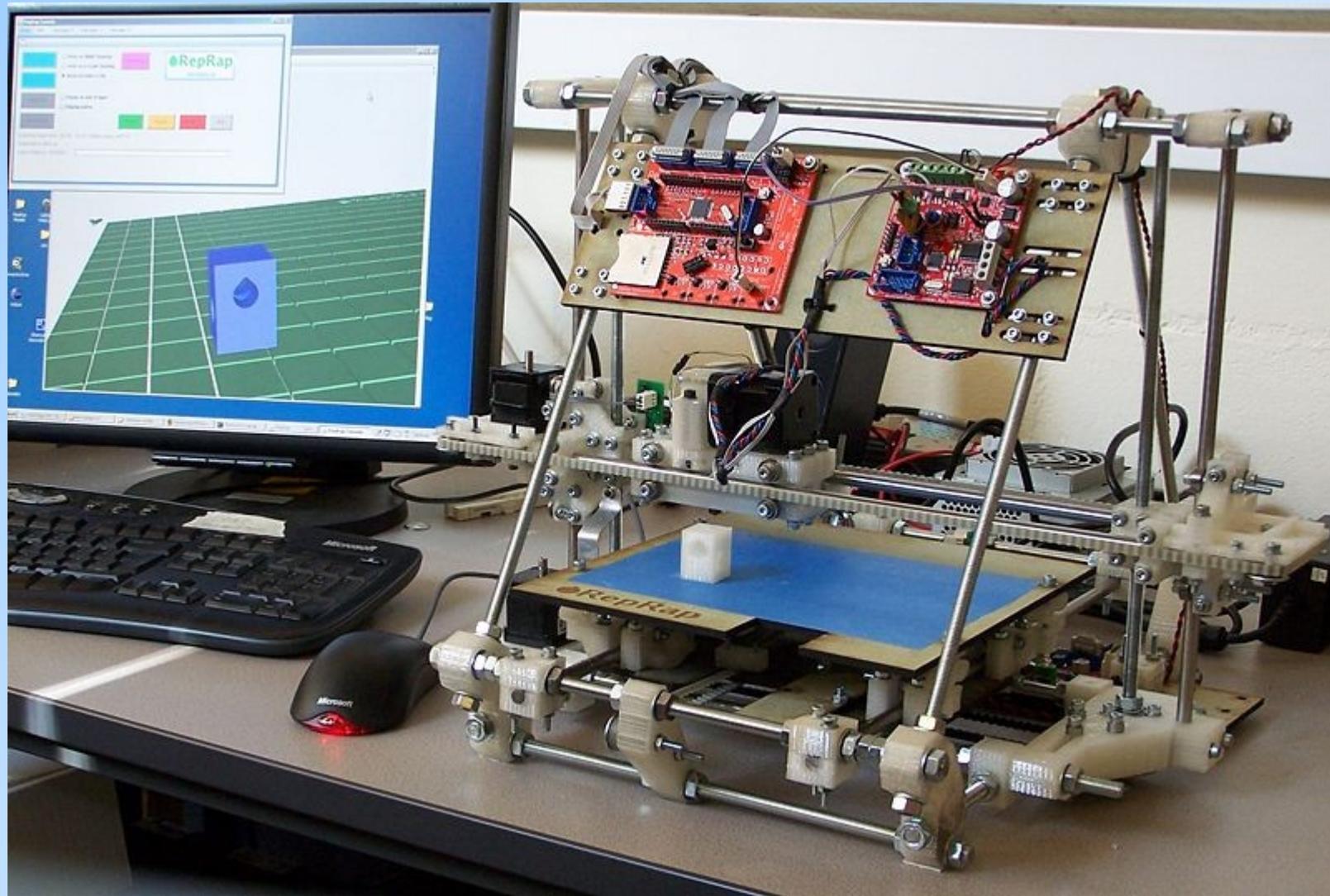
Replication Announced 1st June 2008

Dr. Adrian Bowyer



Some weird longhair

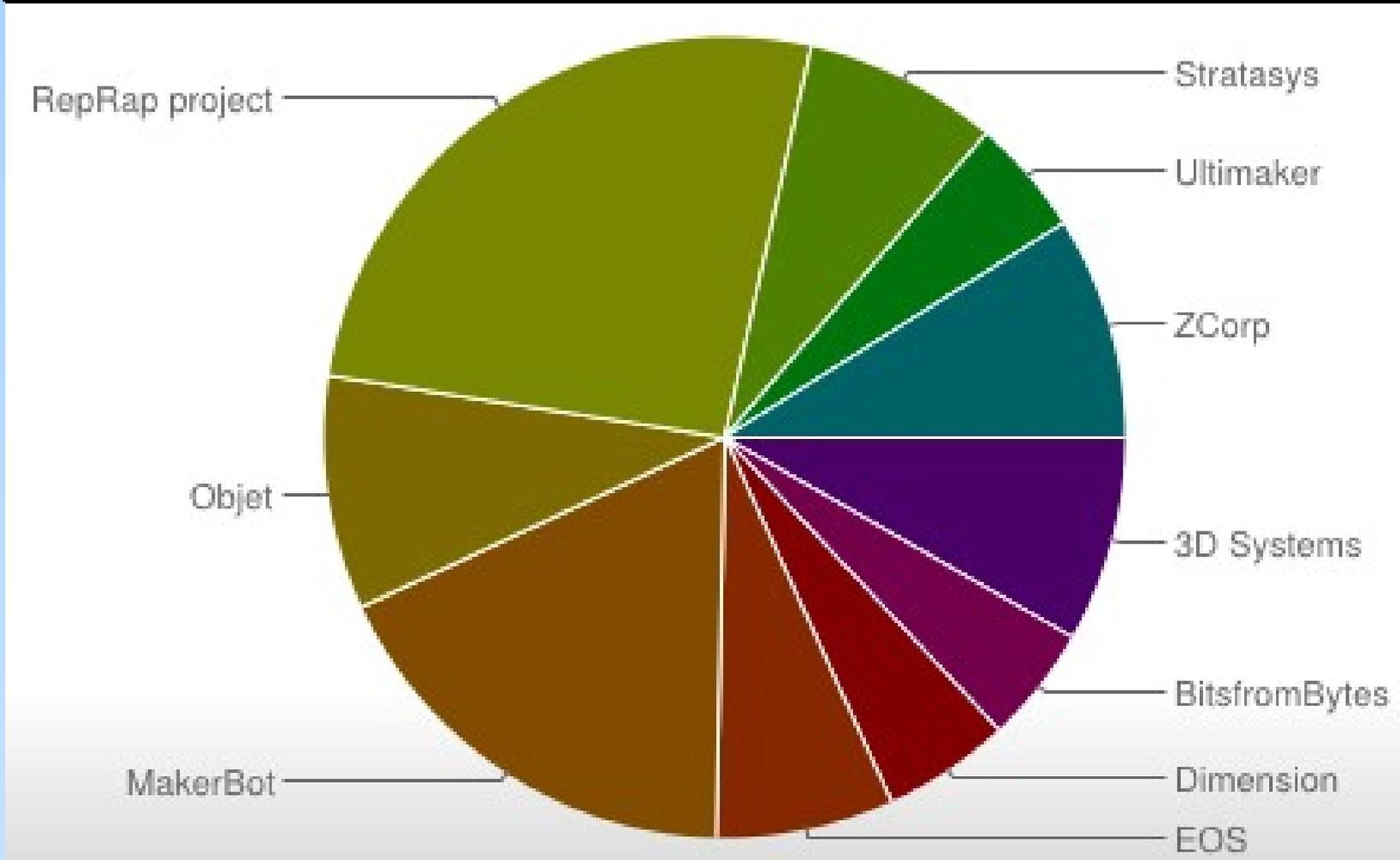
About 1 year later...



“Mendel” Appeared

RepRap Wins Popularity Contest

Which printers (which manufacturer) have you used?



Source: Manufacturing in motion: first survey on the 3D printing community, Statistical Studies of Peer Production. May 2012

Great, But Would You Make One?

Make

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

Or

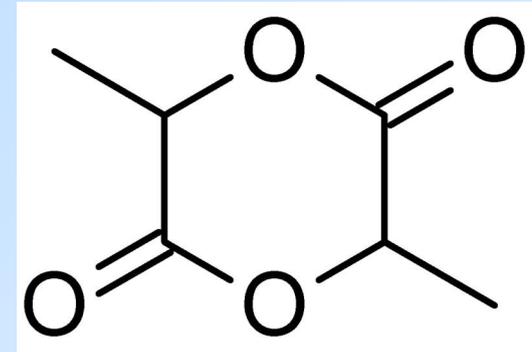
Buy

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

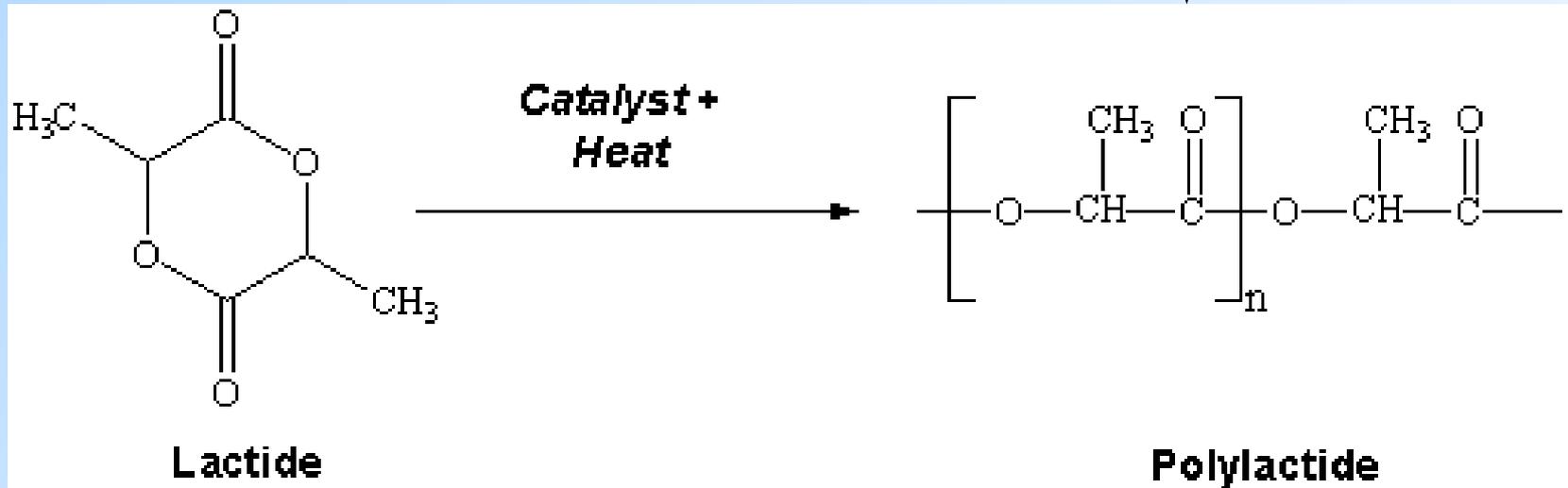
Grow Your Own Plastic



Ferment



Lactide



Lotsa Colours



RepRap Art in NZ

“Whisper Down The Lane”



By Bronwyn Holloway-Smith
Wellington City Gallery

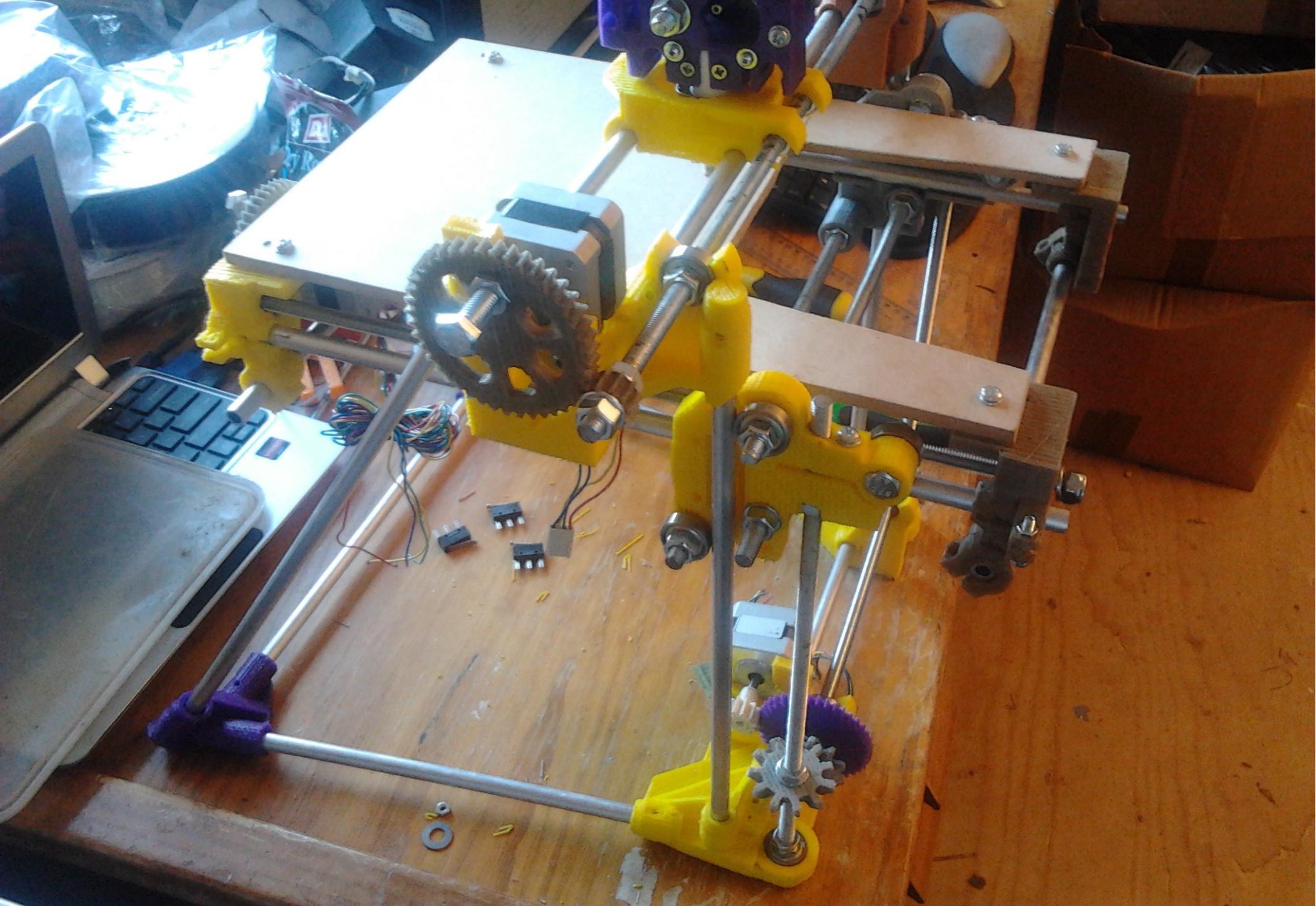
<http://bronwyn.co.nz/projects/whisper-down-the-lane/>

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.

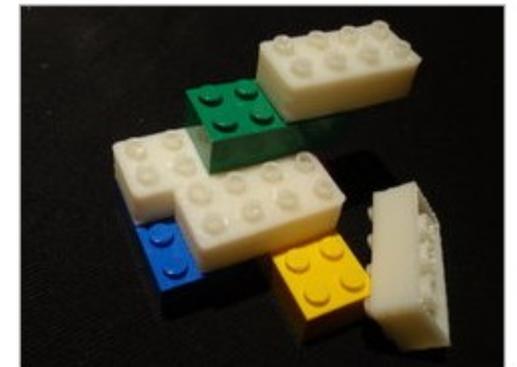
Hosts working, Open, 3D models in various formats, 24 new ones each day.

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



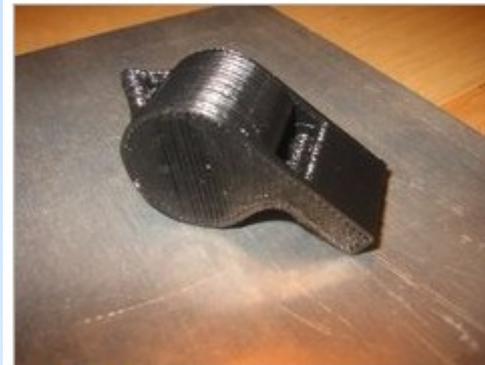
[Planetary gear calling](#)

By: [phooky](#) 1 year ago



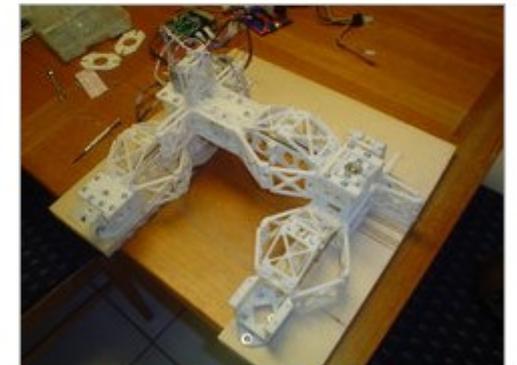
[Parametrized Lego Bricks](#)

By: [wizard23](#) 8 months ago



[Whistle](#)

By: [Zaggo](#) 4 months ago

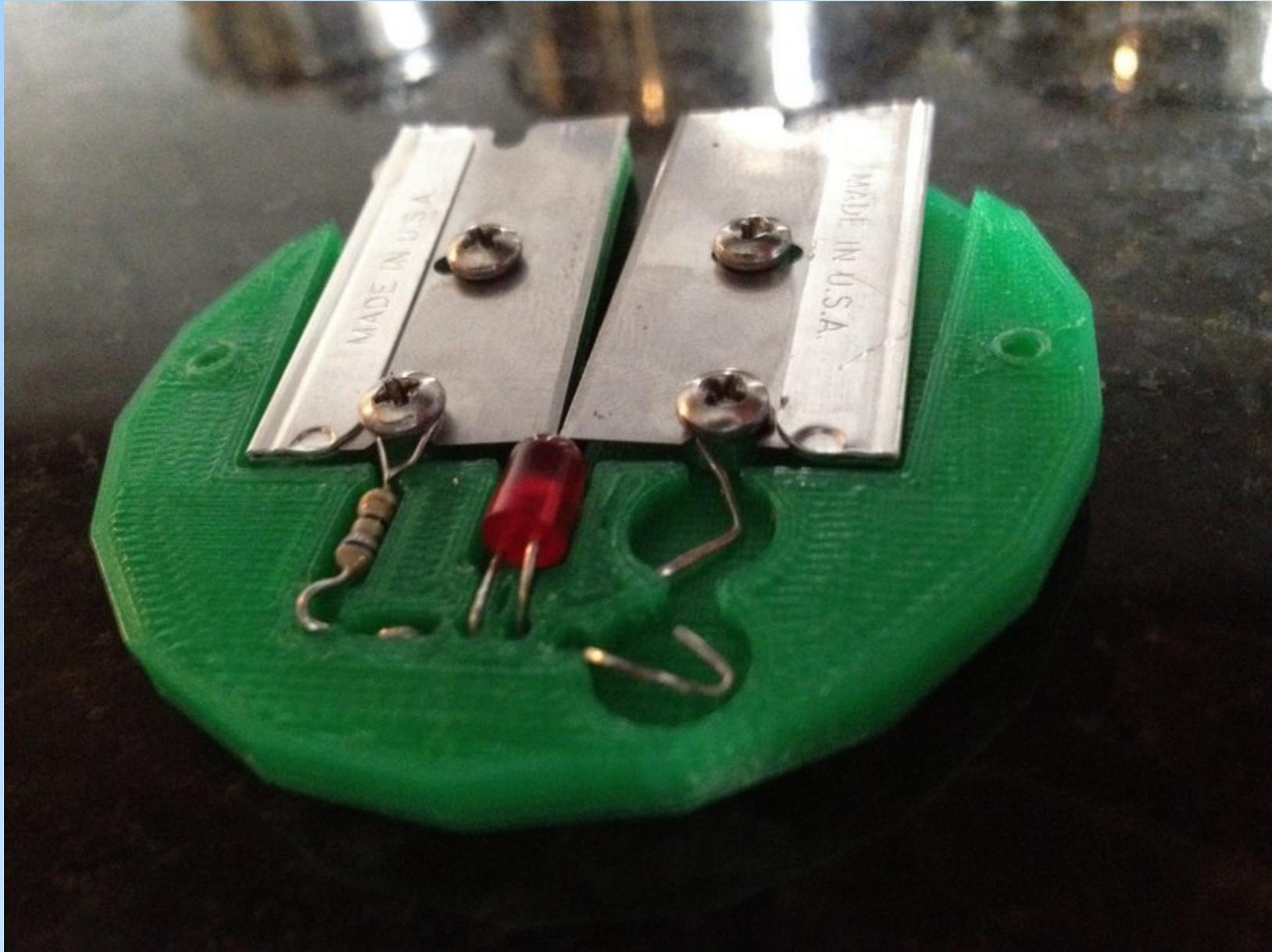


[Sarrus Linkage Mark III](#)

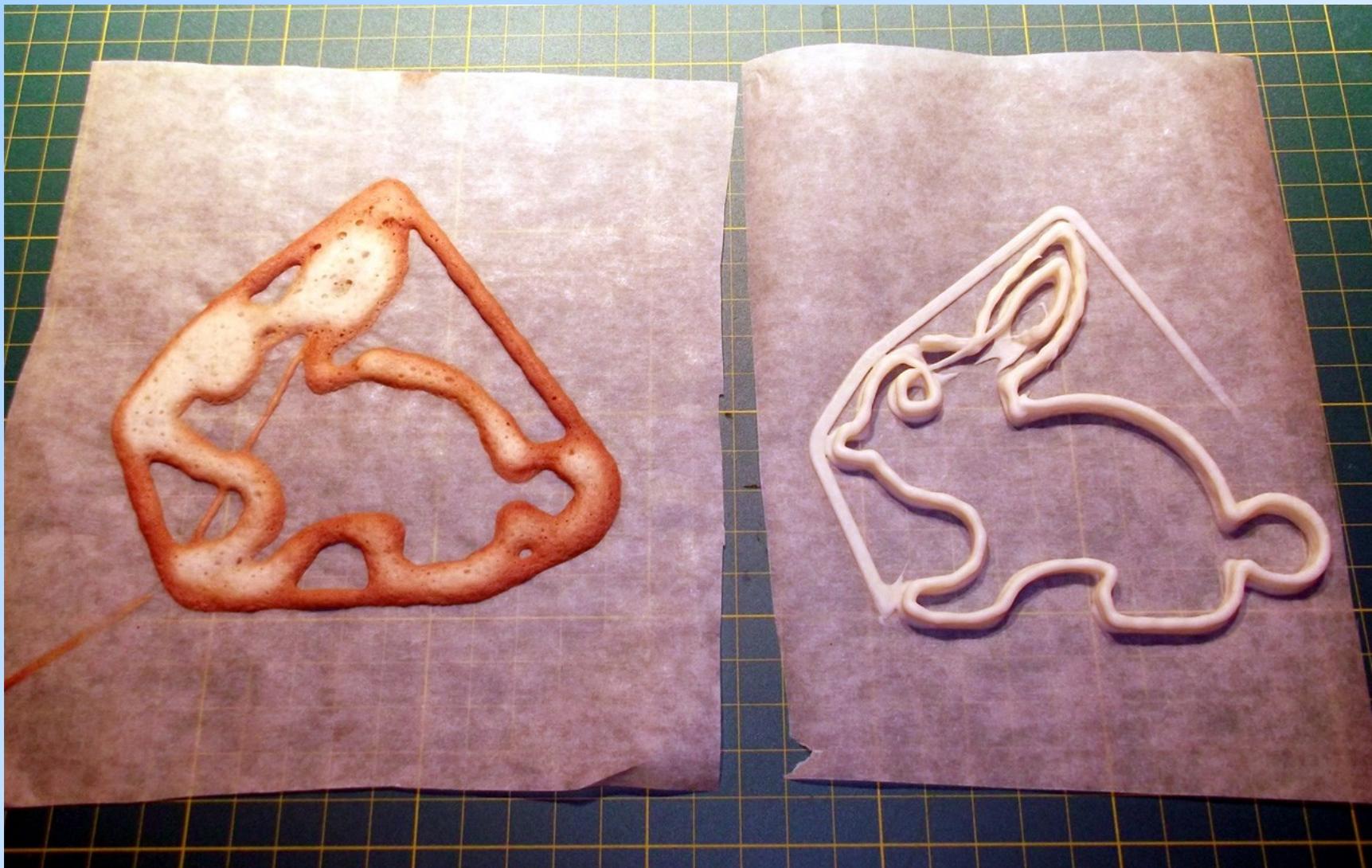
By: [fdavies](#) 1 month ago

<http://thingiverse.com>

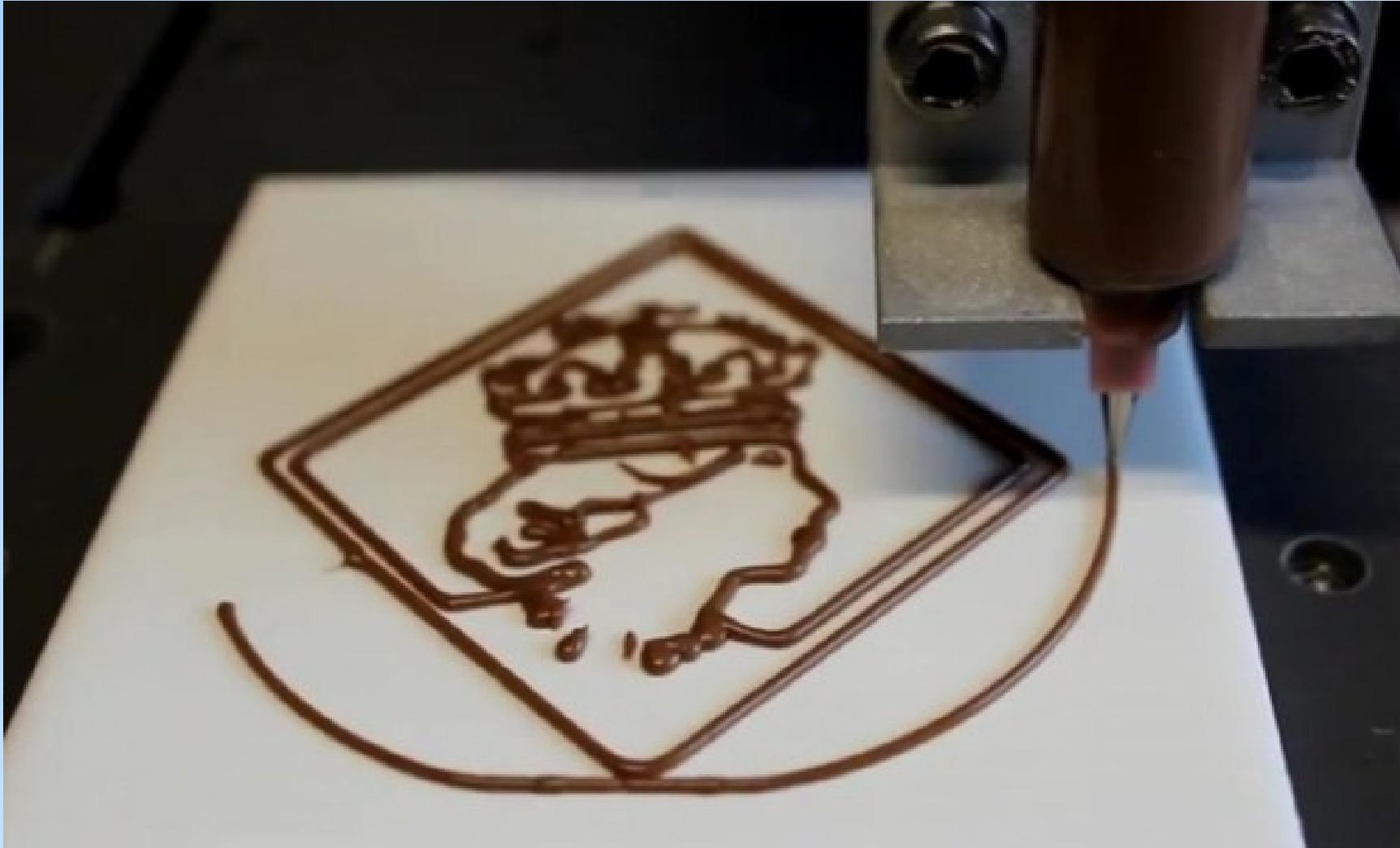
People Making and Thinking



Plastic Can Get Boring...



Everyone Loves Chocolate!

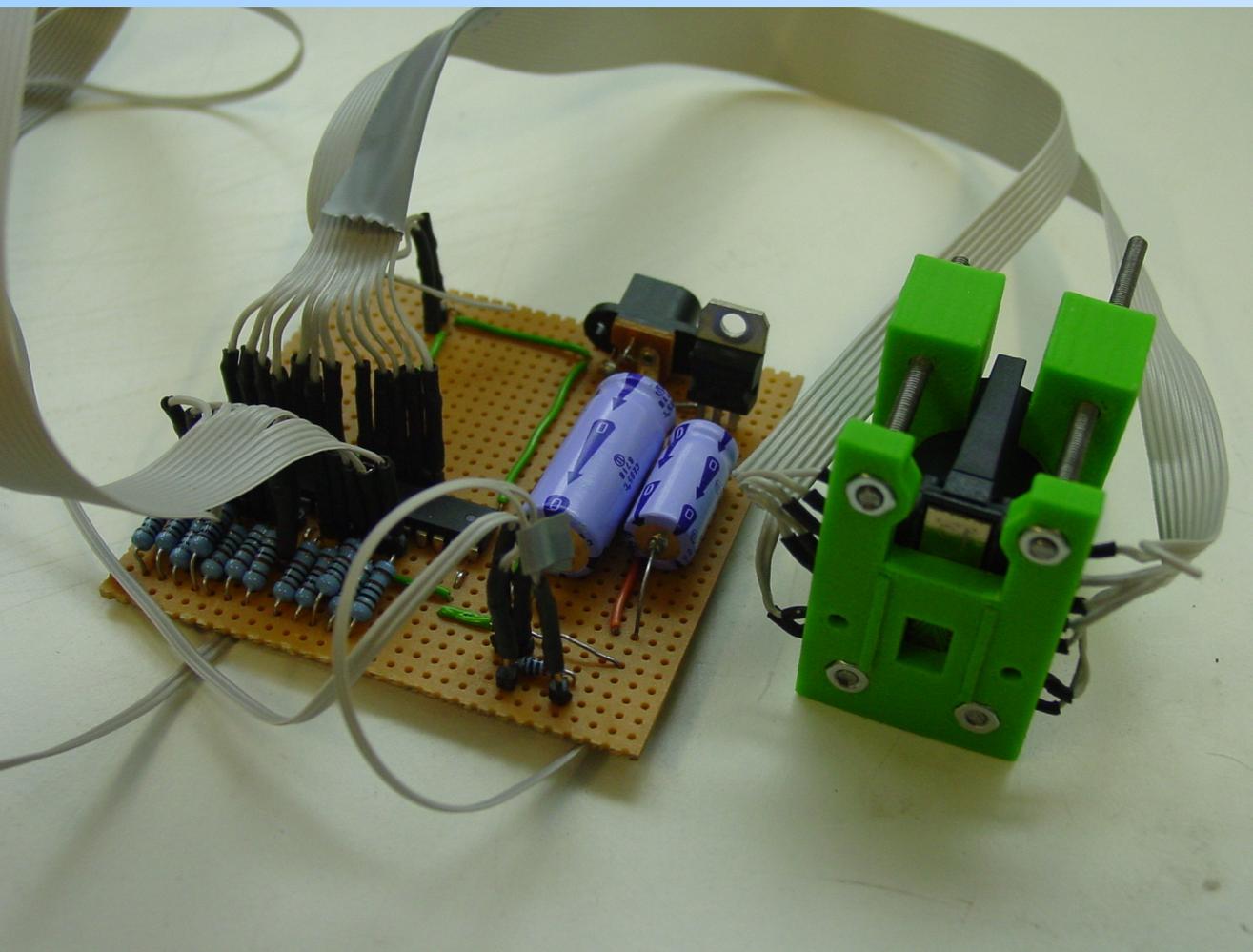


But if there are leftovers



<http://richrap.blogspot.co.nz>

Inkjet Head



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

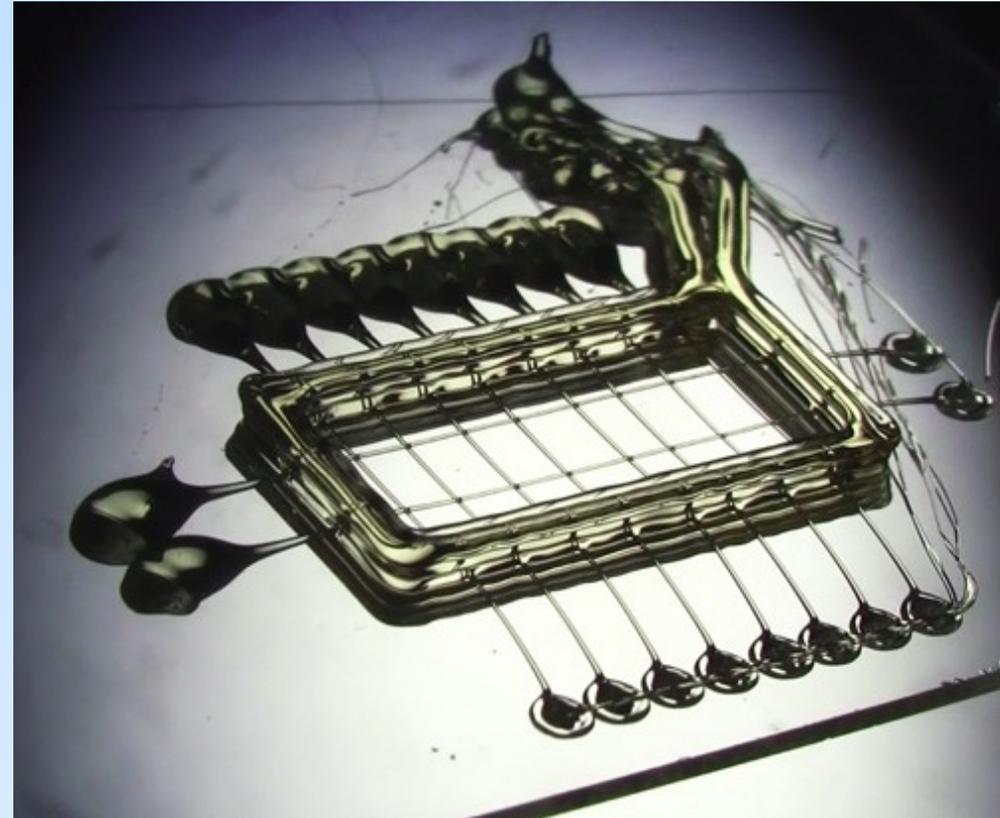
Print a layer - then colour it...

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?

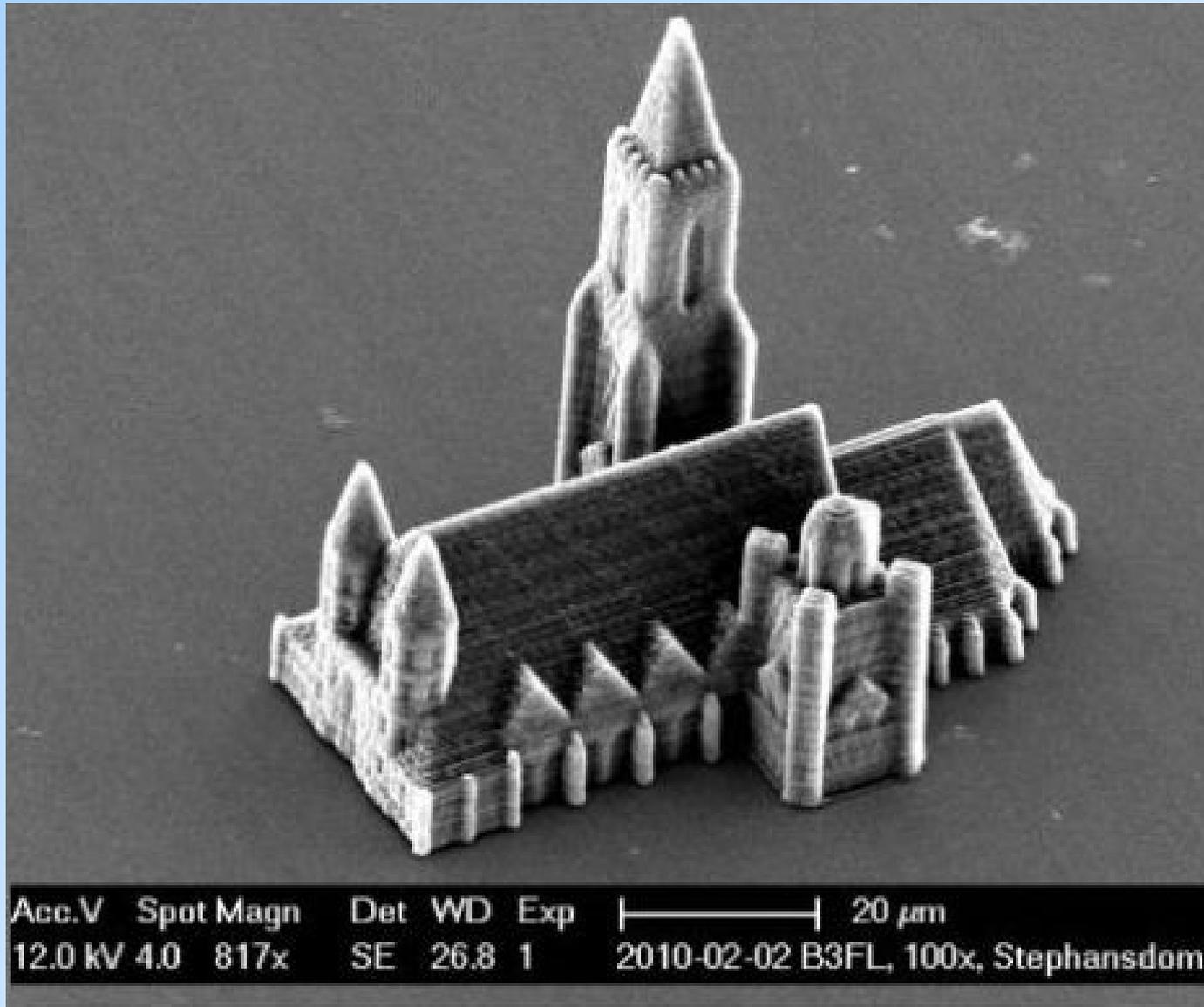


Credit: Jordan S. Miller

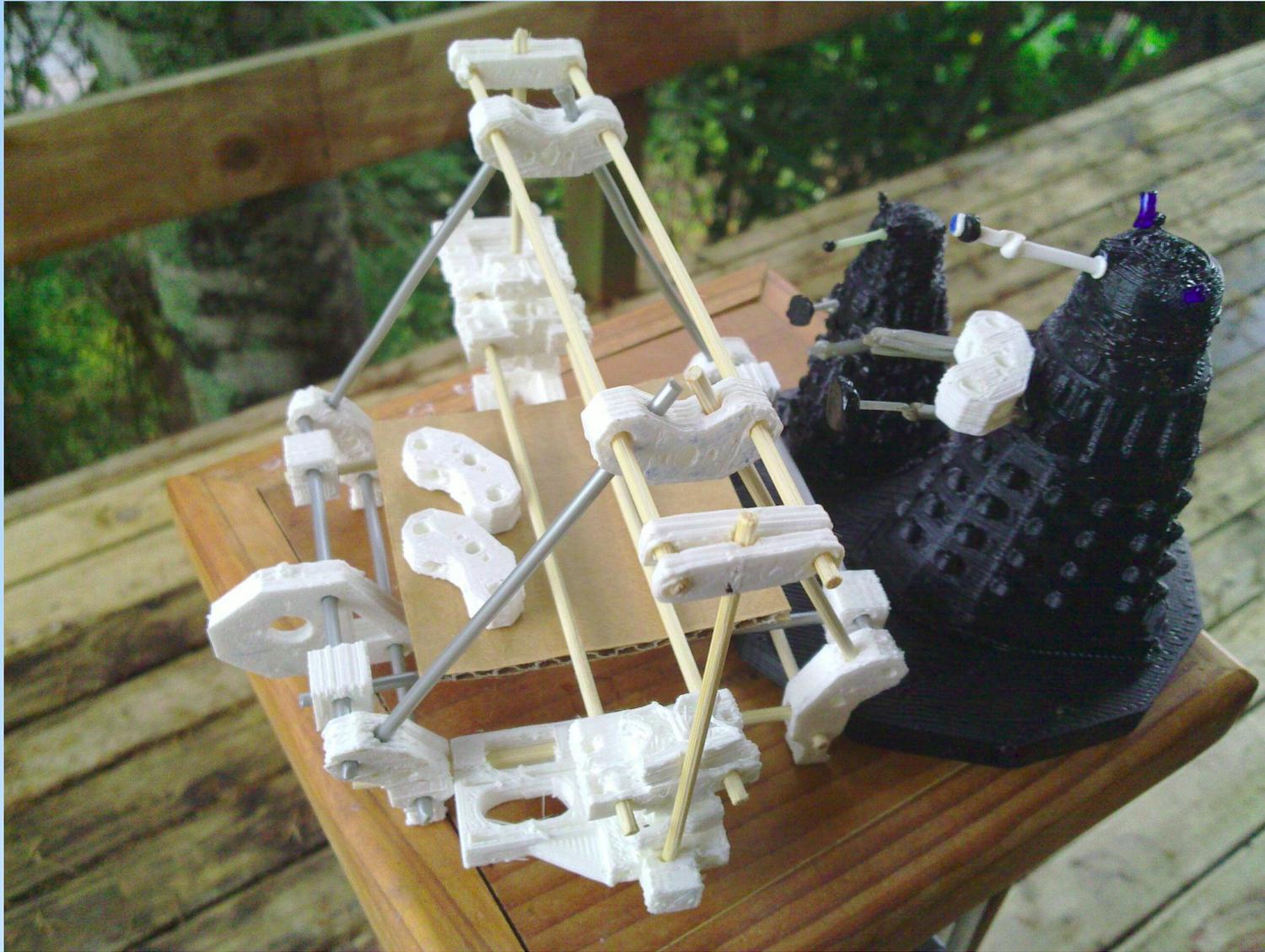
The Very Big ...



... 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

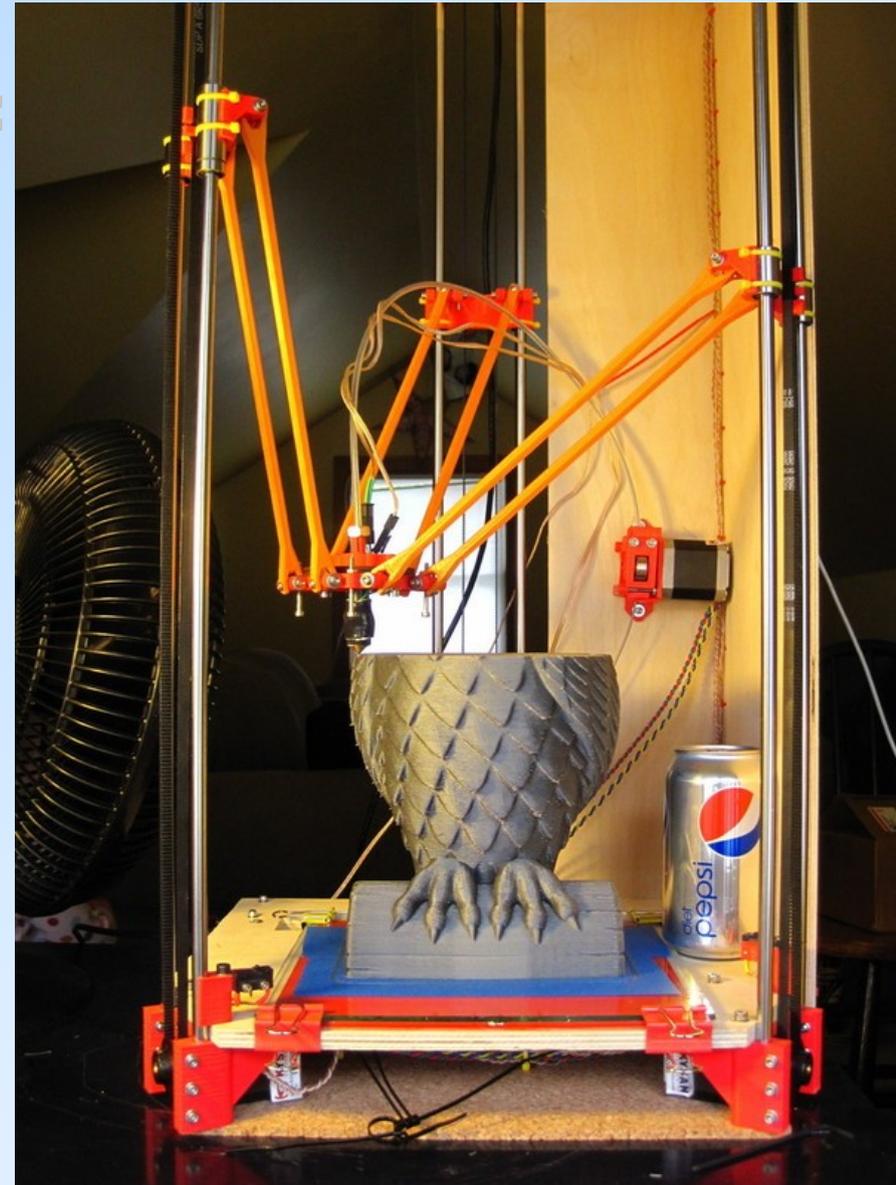
Multiple Materials

Metal

Concurrent print heads

Specialisation is for insects.

<http://reprap.org/wiki/Rostock>

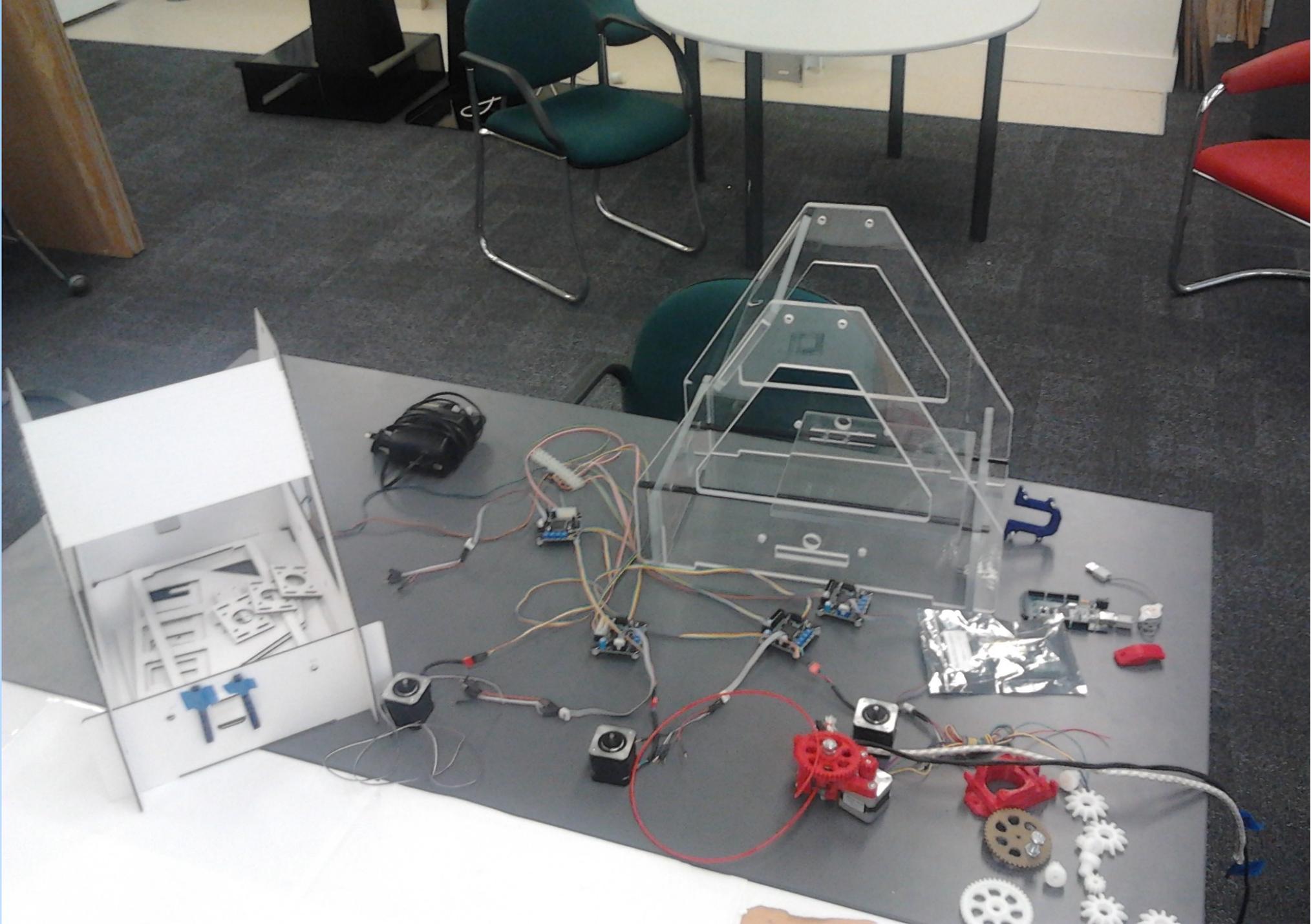


Project RE_ - a 3D Mixtape



**Combining 3D printing with the Maker
upcycling movement.**

<http://project-re.blogspot.co.nz/>

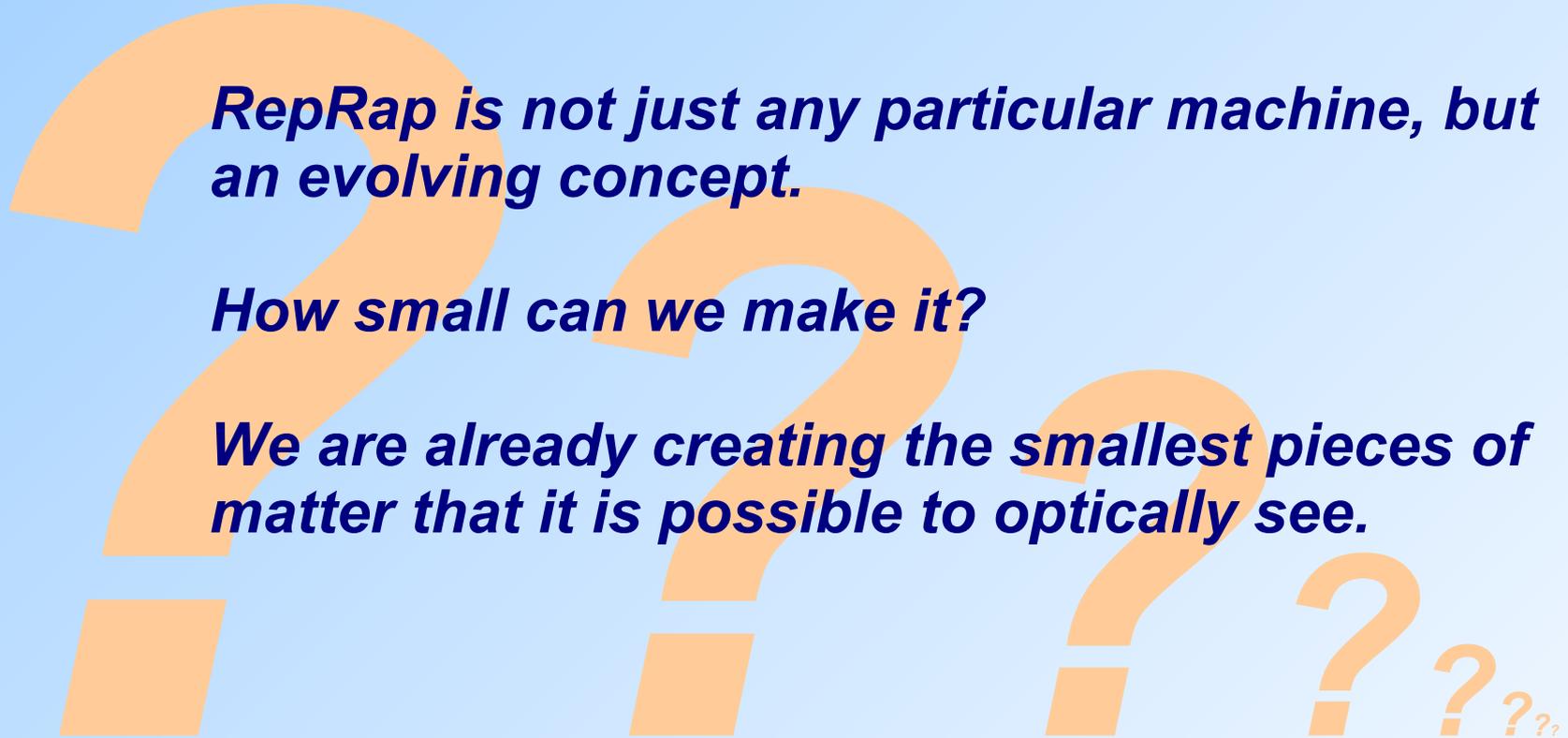


How Far Can You Go?

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.



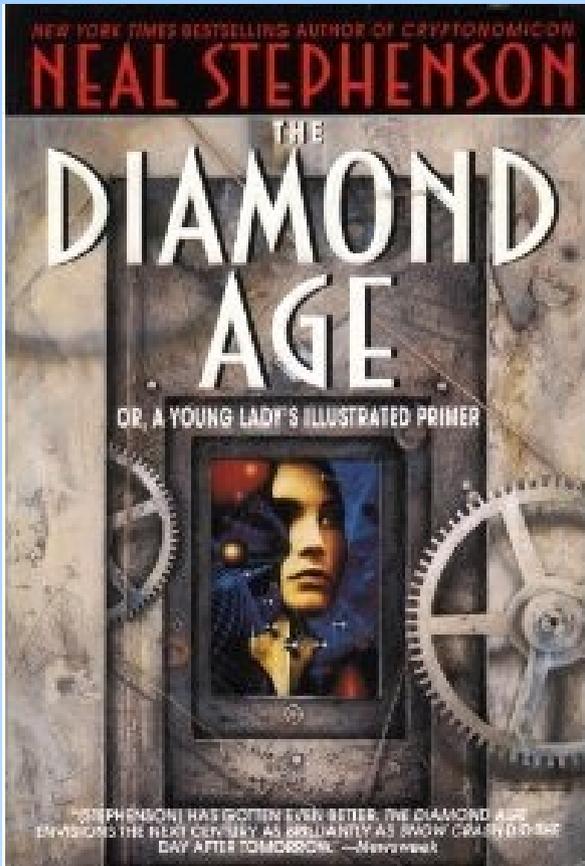
50x50 micron area.

***Wavelength of light:
0.5 micron***

Pixels 0.25 micron

***Source: Agency for Science, Technology
and Research (A*STAR) in Singapore***

The Diamond Age



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?

**NO
PROHIBITONS**

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>

vik@diamondage.co.nz

suz@diamondage.co.nz

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