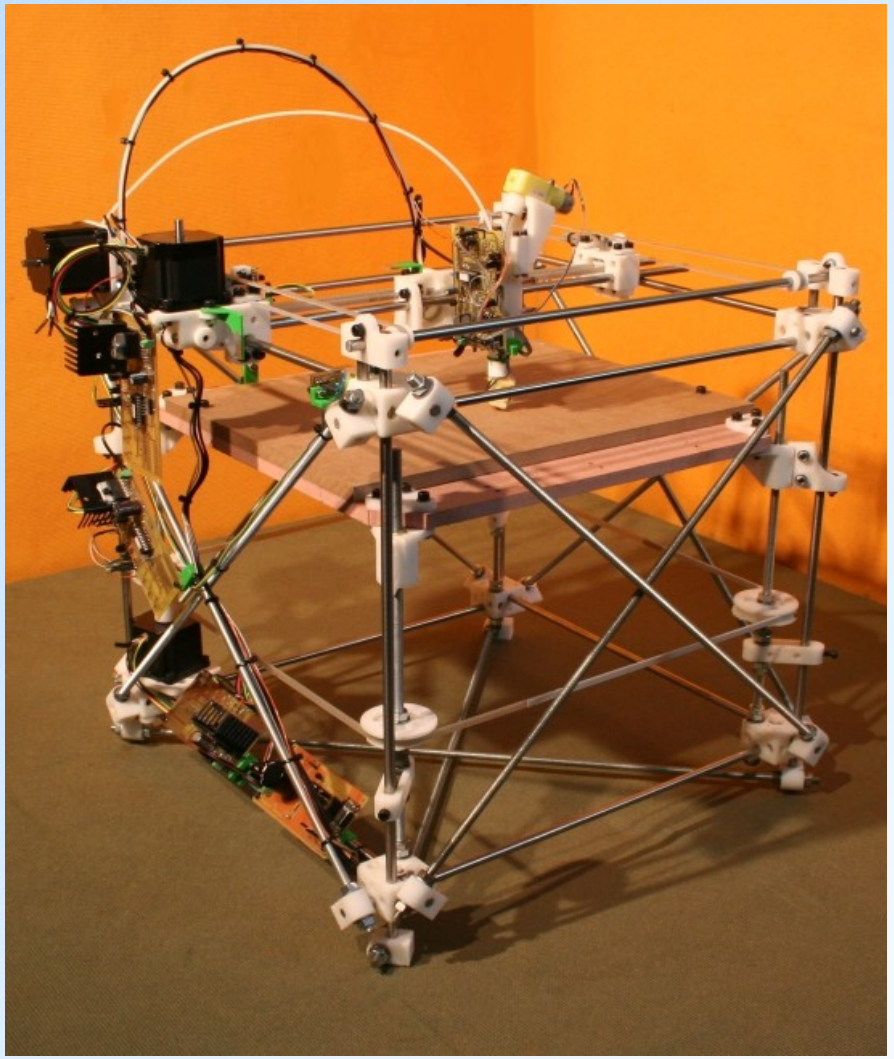
The Replicators Are Coming!

by Vik Olliver

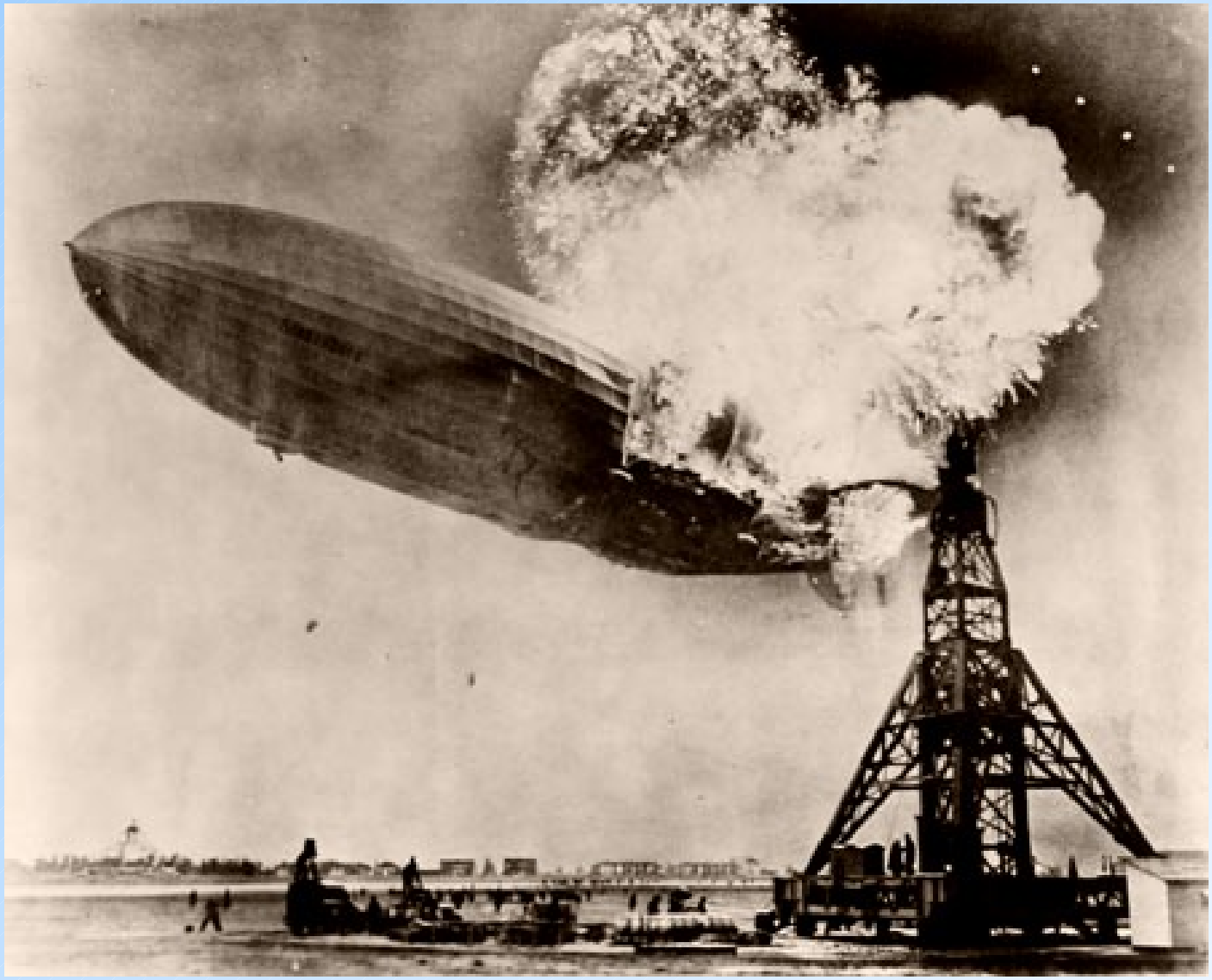
catalyst© IT LIMITED



Presenting:
The RepRap Project
University of Bath

http://reprap.org

RepRap



Hardware sucks.

Why Hardware Sucks

RepRap

Why Hardware Sucks

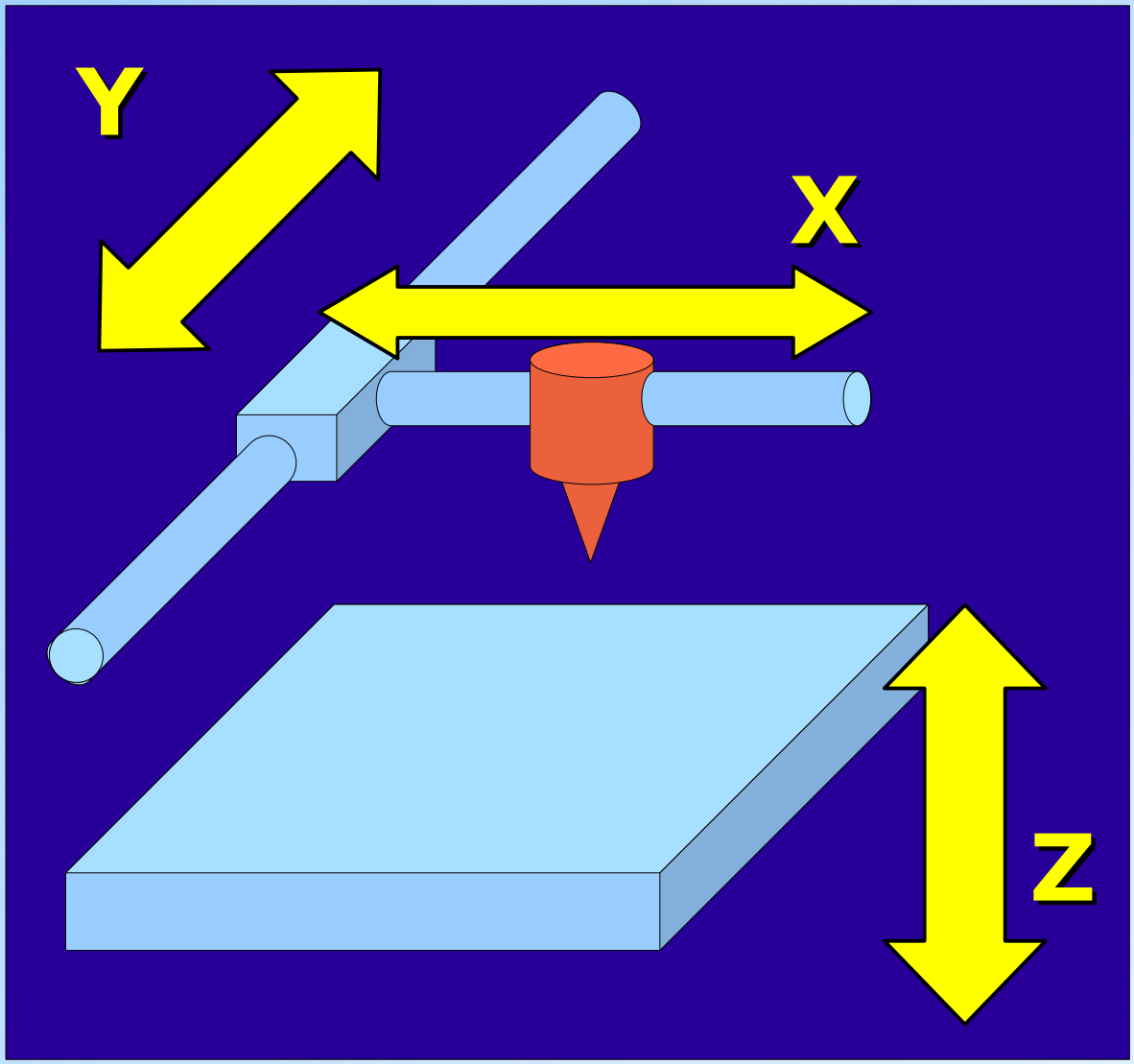
- It's mass-produced for "average" users.
- Its primary purpose is to turn profit ...
- ... or act as a vehicle to sell more stuff.
- You can't really change it.
- Increasingly, you can't fix it either.

If only hardware was like Open Source.

So we thought up RepRap

- A machine that makes utilitarian things
- Uses readily obtainable parts & materials
- It can build electronics
- Builds its own unique components
- Controlled by a domestic PC

Our Solution – 3D Cartesian Robot



Linear axes

Armed with extrusion tools

Builds things in layers

Self-fabricating

RepRap

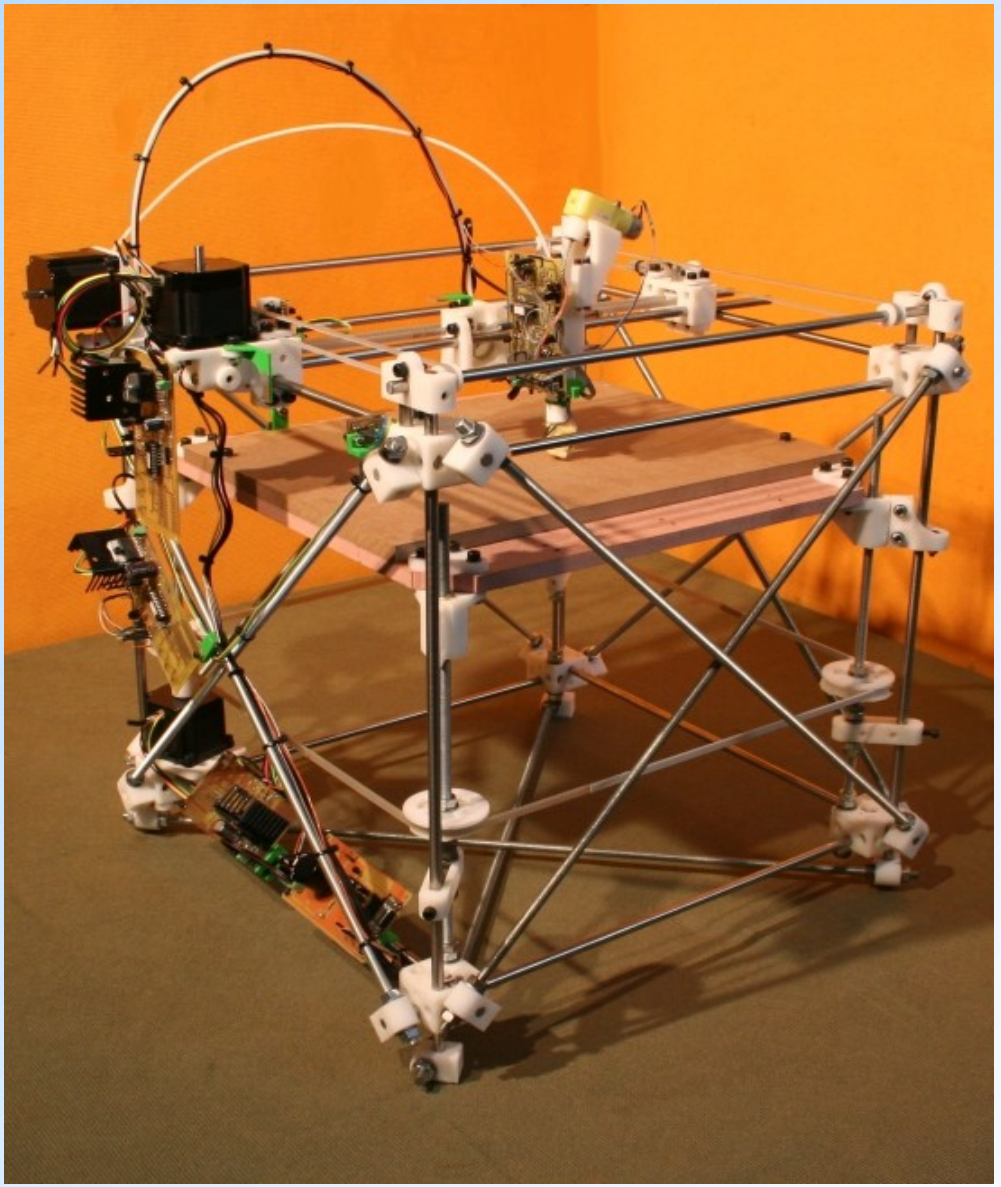
Making The First RepRap

Initial timescale and expense are immaterial

- you only need to build one.

Subsequent growth is exponential.

The First "Darwin"



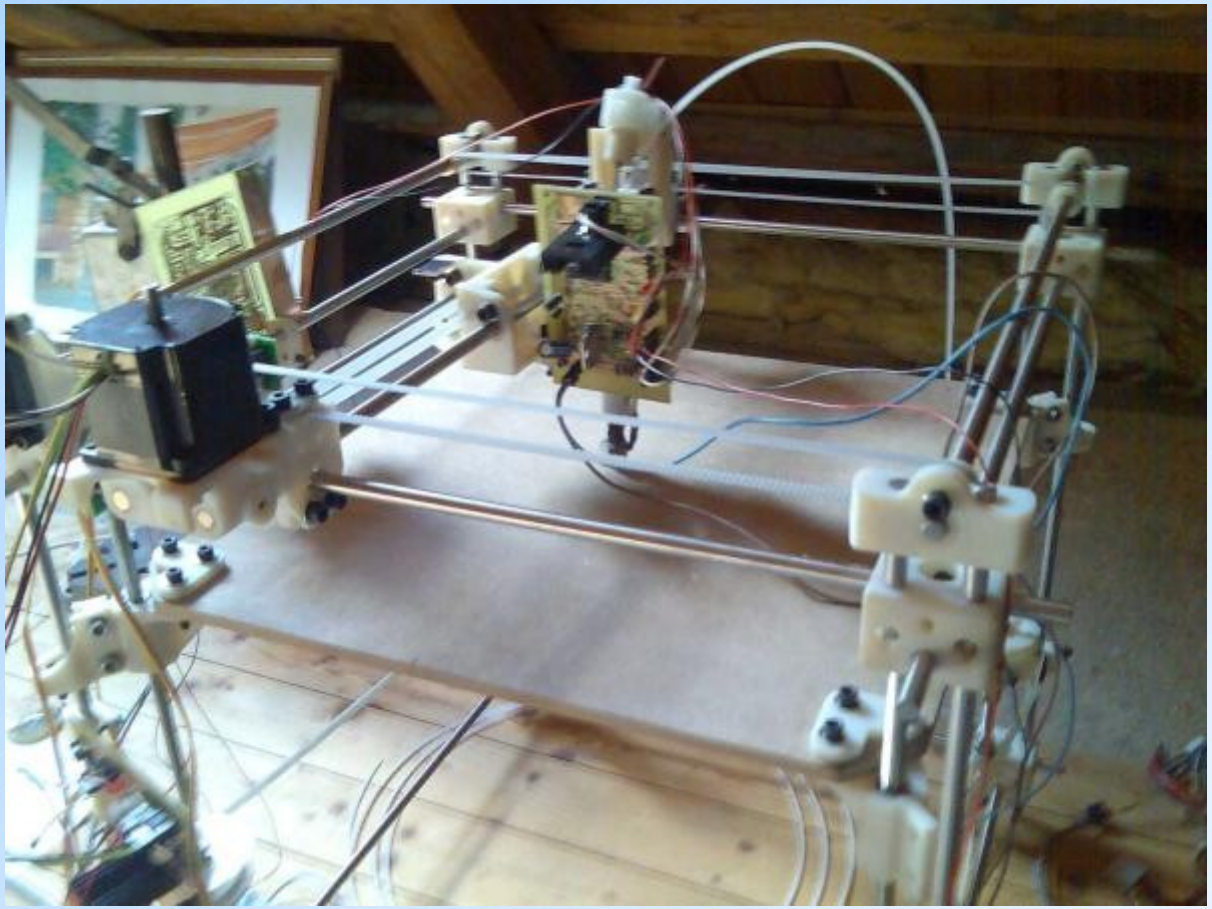
Adrian & Ed, University of Bath

... And Then There Were Two

Vik

RepRap

... And Now There Are Three



Andreas Unterluggauer reprap.nomatic.org

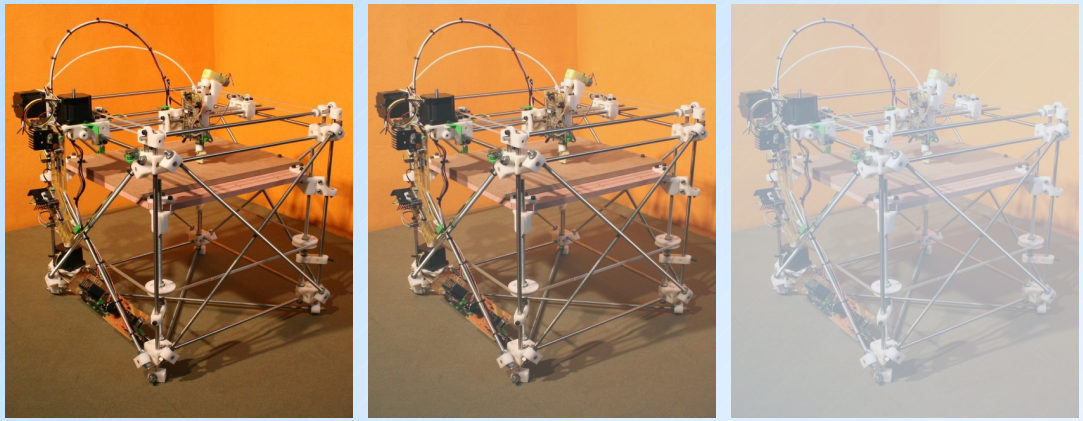
... And then four, and increasing.

Toby Borland's – lasercut from plywood

RepRap

Assume One Works

Now the three are:



1. **The Original**

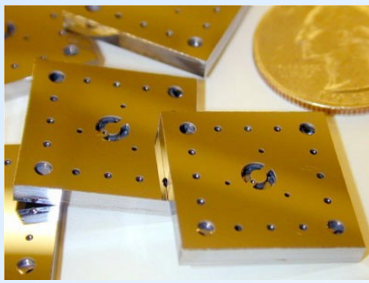
2. **The Copy**

3. **The one that proves the copy can replicate.**

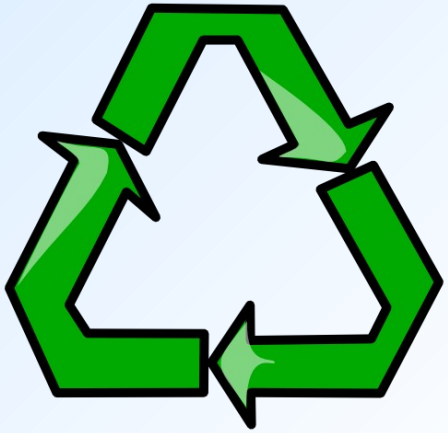
Subsequent costs are raw materials & power.

The Post-RepRap Revolution

- RepRap makes mini-factories



- RepRap makes power generators
- RepRap mini-factories make raw materials

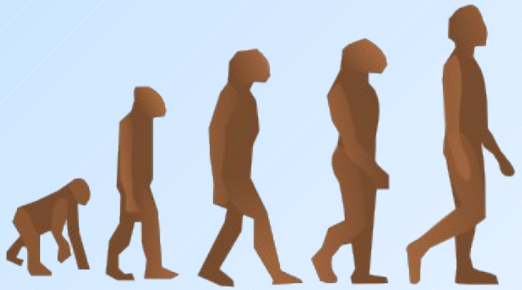


RepRap now needs to make a recycler...

So RepRaps Will:

- Breed like rabbits.
- Be modified by users.
- Accumulate good designs.
- Lose undesirable features.

In short, they will evolve.



Why Get A RepRap?

Because they're so damn cool.

Why Get A RepRap?

You can make things that are otherwise unobtainable.

Obsolete.

Out of stock

CENSORED

US Deliveries **only.**

Just
$25,000+GST!

"New Zealand? You want the Sydney office."

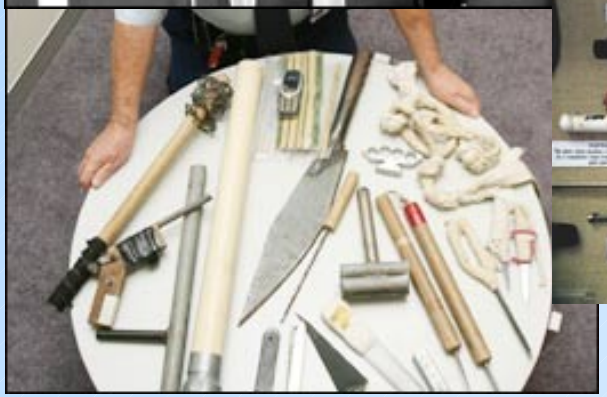
RepRap

What Will People Make?

Someone will RepRap RepRaps and sell them on Ebay.

We don't dictate, the users decide. So we can't tell, but historically ...

Three Things People Will Make With RepRaps



1. Weapons

RepRap

Three Things People Will Make With RepRaps

2. Sex Toys

Three Things People Will Make With RepRaps

3. Drug Paraphernalia

What Do We Hope They'll Do?

Make better RepRaps and tools

Bigger, cheaper, smaller, faster

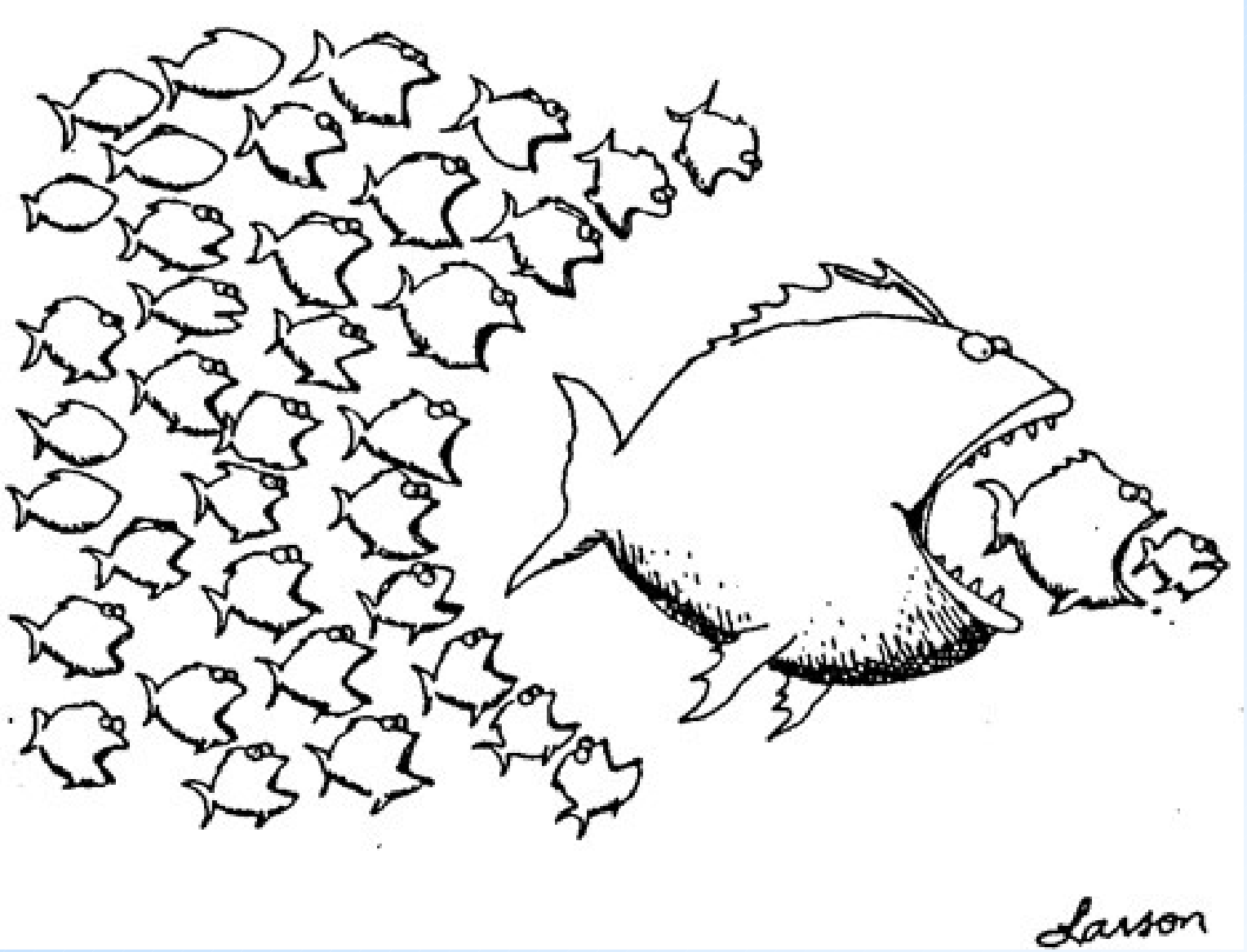
Process more materials

Ceramics, wire, chocolate, concrete

Make it more appealing

Quieter, colours, cases, LOLcats...

How Will RepRaps Change The World?



RepRap

How Will RepRaps Change The World?

RepRap is closer the the agricultural revolution than the industrial revolution.

How Will RepRaps Change Industry?

Anyone can be a manufacturer, customising to suit.

RepRaps reproduce exponentially, so can beat any other process.

No need to wait for new plant to be built and paid for - fast response.

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 etc.

How Will RepRaps Change The Environment?

Things are made where they are needed, in the quantity required.

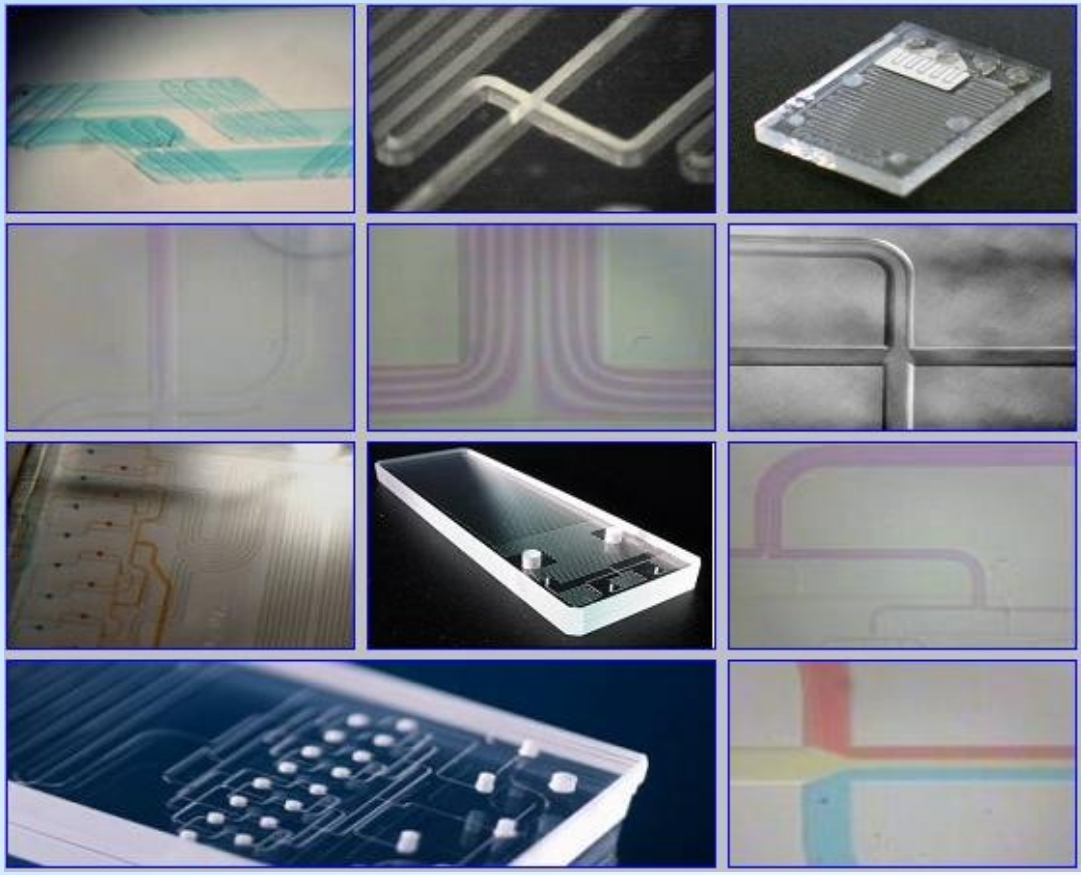
RepRap adapts to the use of locally produced materials.

The PLA Bioplastic absorbs CO_2.

Built-in obsolescence can be left out.

How Will RepRaps Change Our Health?

RepRap can make synthesis labs for life-saving drugs at low cost.



RepRap is an ideal frame for low-cost automated testing systems.

Look out for “early adopters”

RepRap

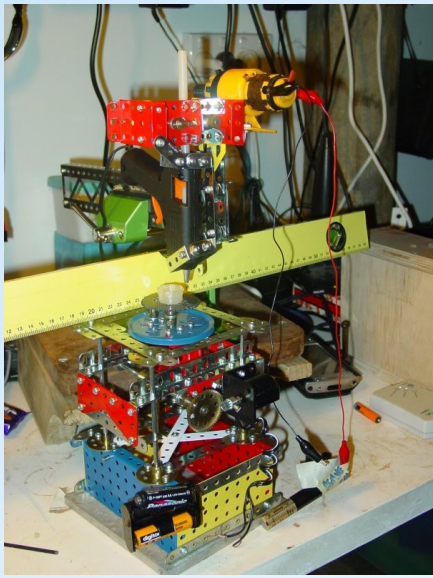
How Will RepRaps Change The World?

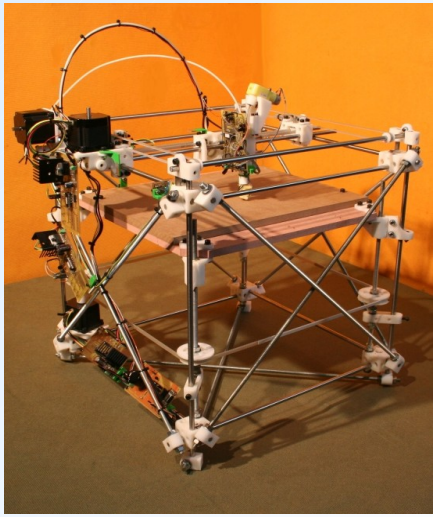
Education:
Use RepRap technology to teach scientific and engineering skills.

Wealth:
If you can make anything, what's money for? Paying taxes on what?

How Far Have We Got?

2005 Mar – Project announced
2005 Apr – Meccano prototype
2005 Nov – Mk 2 Extruder works
2006 Jan – Prototype debut at LCA
2006 May – First recognisable output
2006 Sep – First self-made part
2007 Jan – First shotglass
2007 Feb – Paste extruder works
2007 Mar - Extruded extruder extrudes
2007 May – First Darwin
2007 Sep – Second Darwin
2008 ??? - Second generation Darwin





Equivalent Timeline

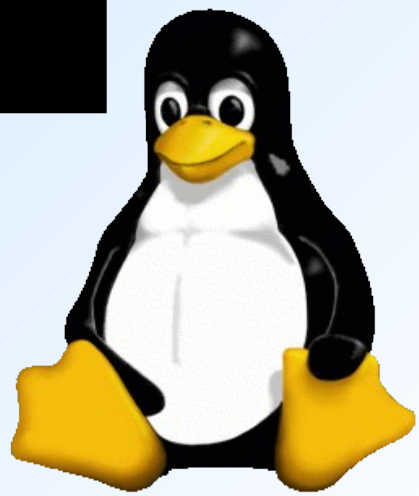
RepRap, from conception to functional V1.0 took about 3 years.

Linux, from

> Hello everybody out there using minix -
>
> I'm doing a (free) operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones. - Linus

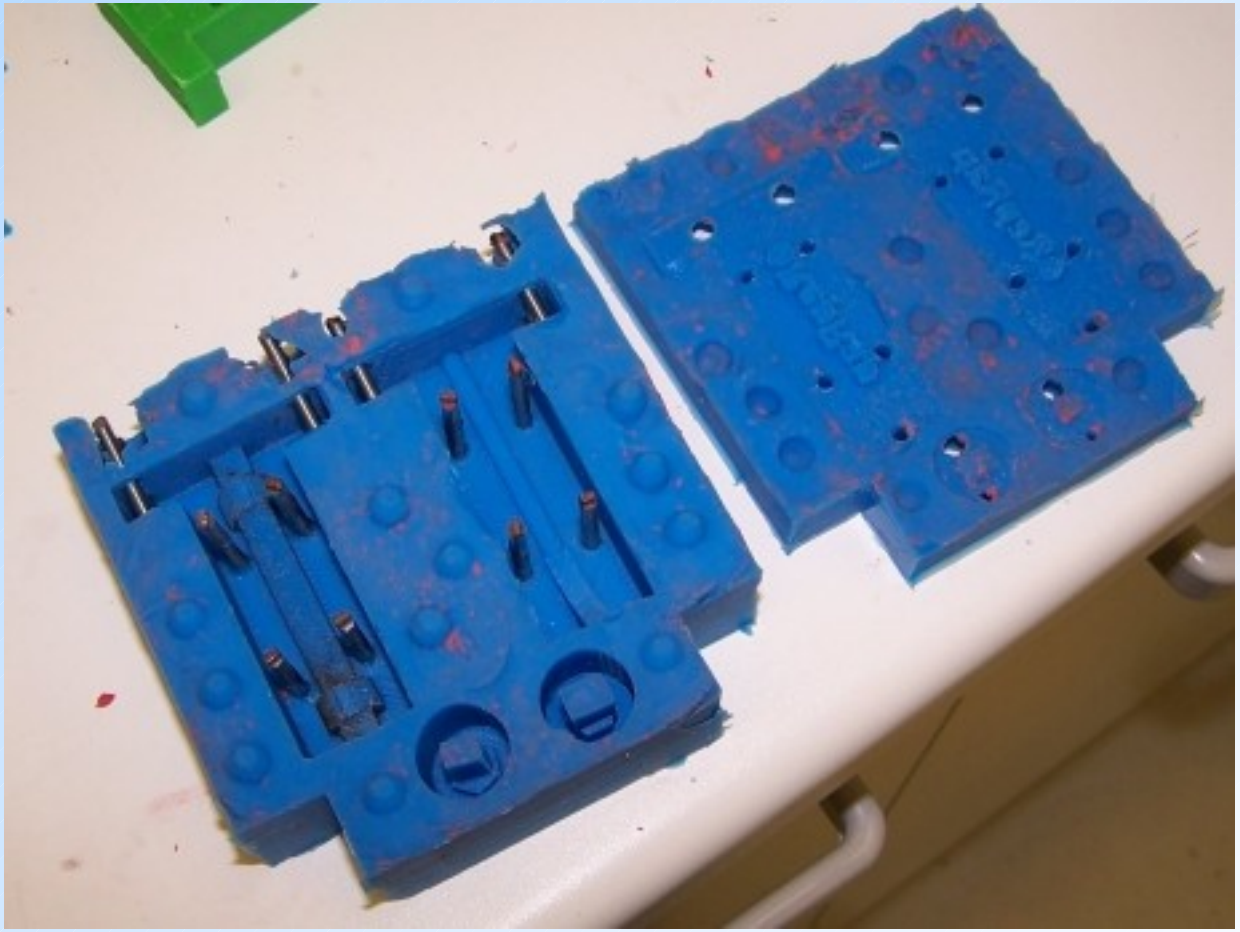
to V1.0 took about 3 years.

How did we achieve this?



We Cheated – The Practical Solution

RepRap needs developers, but has produced little hardware.



We're still early on in the exponential curve.

So we made moulds.

RepRap

We Cheated – The Practical Solution

With Lego, plasticine

... and a bit of silicone moulding resin.

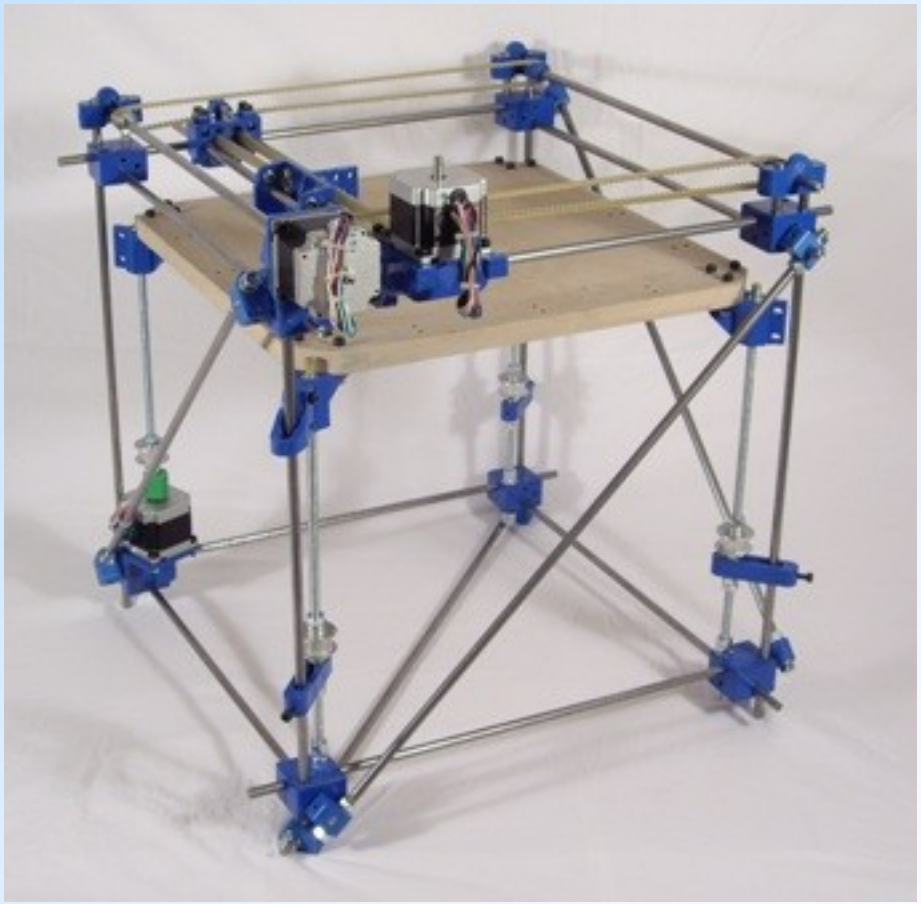
Support

RepRap Research Foundation (RRRF) created to supply researchers with bits:

http://rrrf.org

Parts list generator:

http://parts.reprap.org/

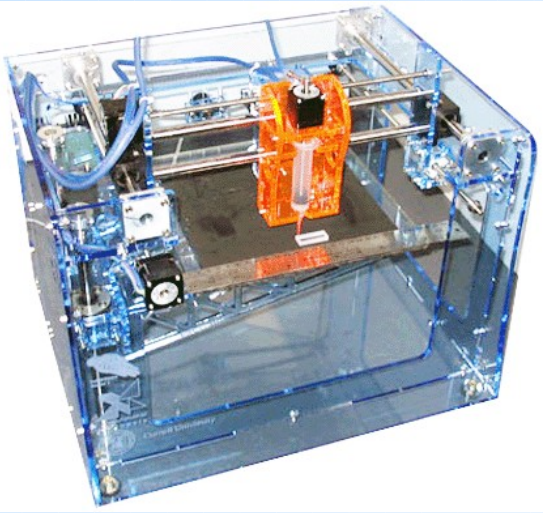


Collaboration

We're collaborating with Fab@Home

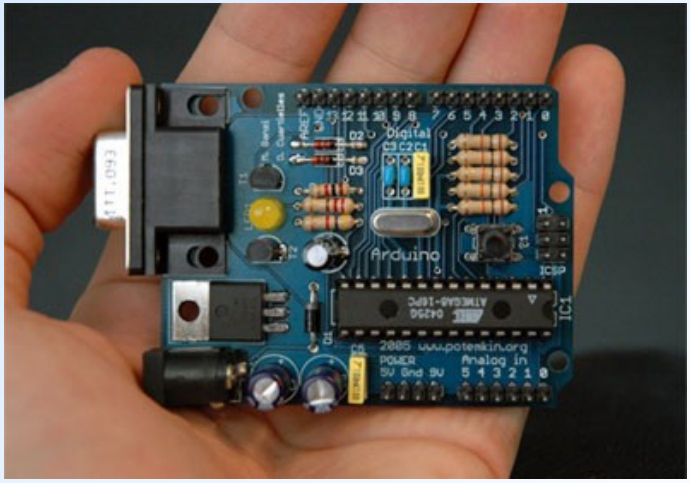
- ***Exchange of extruder designs.***
- ***Results on material extrusion.***
- ***File formats.***
- ***Fabbing electrical components.***

http://fabathome.org



We are developing drivers to use Make's Atmega168 *Arduino* processor boards:

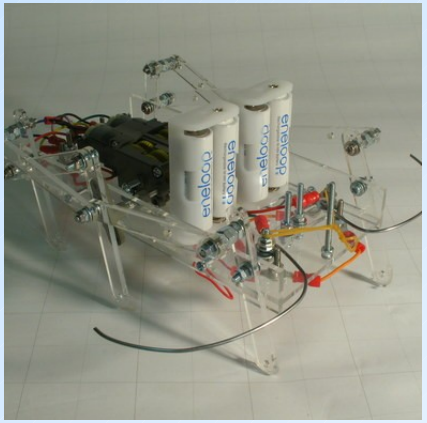
http://www.arduino.cc/



Collaboration

Ponoko

Ponoko in Wellington, NZ
Currently developing a lasercut kit of RepRap components
http://ponoko.com/



YOU

This device is meant to evolve and you good people are an integral part of the process. Enjoy.

RepRap

Project website:

http://reprap.org