Personal Manufacturing, the Gada Prize and the Future of Technology
TRANSHUMANISM
Personalized Human Enhancement

- Personalized medicine
- Longevity or life extension
- Intelligence augmentation
- New business/tech paradigms ("Kurzweil's Law" aware)
- Social enhancement or augmentation
- Molecular nanotechnology
- Personal manufacturing
- Synthetic biology

Progress on any of these is extremely valuable – business perspective or not
Magical Unicorn Predictions:

No more software patents

Really truly synthetic life

Era of post-scarcity
Kurzweil's Law of Accelerating Returns applies to personal enhancement and personal manufacturing
Xerox 9700 [1977]
Cost of personal 3D printers will drop.

Currently $350 to $1200.
Gada Prize @ Humanity+
Gada Prize @ Humanity+

- Must print 3 materials (one must be conductive)
- Must be able to print PCBs
- Print beds must be reusable ~20 times
- Must keep cost under $200
- Must have a build volume of 300x300x100mm
- Must be able to print its own parts unattended within 10 days
- Must print autonomously (no PC/laptop)
- Uses no more than 60 watts

gadaprize.org
IT WILL BE AWESOME IF THEY DON'T SCREW IT UP: 3D Printing, Intellectual Property, and the Fight Over the Next Great Disruptive Technology

Michael Weinberg
November 2010
Open Source Hardware

OSI-style open-source started with software

Copyright law vs. patent law

Society is primed for proprietary innovation

Need new (widely understood) innovation paradigms
So what do you build?
Growth of DIYbio & DIYgenomics
Growth of DIYbio & DIYgenomics

- Slashdot (2010-10-15)
- Nature (2010-10-06)
- Nature (2010-09-01)
- Boston Globe (2010-08-02)
- Nature (2010-07-30)
- BBC (2010-03-31)
- NY Times (2010-03-04)
- NPR (2009-12-27)
- SF Chronicle (2009-12-20)
- The Guardian (2009-03-18)
- New Scientist (2009-01-07)
- Wired (2005-05-01)
- NY Times (2008-08-22)
Needed Lab/Shop Equipment for Personalized H+

- Gel boxes & transilluminator
- Centrifuge (diyfuge, dremelfuge, ...)
- DNA sequencer & synthesizer
- Spin coater & oven
- Chromatography columns
- 3D printer
- Milling machine (shop machinery)
- Would be nice: AFM, STM, SEM, etc.
Jorge Barrera's
Open source CNC
(MFG.com labs)
Candyfab 6000
Reprap Stepper Driver 2.3

20mm
Pulleys Made with a Reprap
Gears made on Reprap
MakerBeam
T-slot
(made on a reprap)
Gridbeam
CEB Field Testing

- 6 Bricks per minute achieved with manual controls
- 12 brick theoretical limit with automatic controls
Organ Scaffolding
3D Tissue Culture
OpenEEG
Eyewriter Eye Tracker
Elphel open source CMOS camera

<table>
<thead>
<tr>
<th>Sync</th>
<th>System Internal / External (with support for multiple sensor frontends - Stereo / 3D Setups available)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interfaces</td>
<td>RS-232, 100Mbit Ethernet, SATA, USB, ZIF IDE, GPIO (for ext. sync)</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>2.4 - 5.8 W (depending on operation and load)</td>
</tr>
<tr>
<td>Weight</td>
<td>215 g (without lens or accessories)</td>
</tr>
</tbody>
</table>

**Key Features**

- Free Software and Open Hardware - specially designed to allow creation of new products
- Color and B/W Sensor Frontends available: Aptina 5MPix CMOS with / without IR Cutoff Filter
- High speed hardware accelerated image/video compression: 80 MPix/s
- Recording formats: Quicktime, OGM, JPEG Image Sequence, JP4 RAW Image Sequence, RAW sensor data, HDR (experimental)
- Available Mediums: Stream over 100Mbit Ethernet (unicast or multicast), 2 Compact Flash Card slots, ZIF IDE Connector for camera internal 1.8” HDD, SATA Connector for external HDD, SSD or RAID
- USB Applications: Audio recording, GPS module & compass allow recording geotagged video, etc.
- GPIO for external synchronization
- User/Developer friendly and open scripting: PHP (API, examples), CGI, C, C++, etc.
- Software Development Kit (SDK) and full hardware documentation freely available
- Firmware Upgrade (both GNU/Linux and FPGA) over the network
- Power supply: Power over Ethernet, 12-36V (mobile applications) or regulated 3.3V

![Elphel NC353L-369-GEO with lens, CF card and compass module (internally installed)]
DIY drones
FabFi point to point radio link
 Specify two points in the 3D Graphics Area to define the endpoints of the DNA duplex.

**Parameters**
- Conformation: B-DNA
- Model: PAM-3
- Base Pairs: 0
- Bases Per Turn: 10.00
- Duplex Length: 0.0 Angstroms

**Advanced Options**
- Rubber band Line: Display As: Ribbons
  - Enable line snap
Community Aggregation

- When futurist organizations began, the Internet wasn't doing technology like this
- Distributed development models
- Strategy: Apply software development methods and workflows from open-source software to the world of hardware and technology
- Liaison between these projects and Humanity+
- Aggregate projects and updates together
Get Involved In Making

http://hackerspaces.org/wiki/List_of_Hacker_Spaces
BioCurious

BioCurious.org
A hackerspace for biotech
Experiment with friends
Join the biotech revolution

239 BACKERS
$35,319 PLEDGED OF $30,000 GOAL
0 SECONDS TO GO

FUNDING SUCCESSFUL
This project successfully raised its funding goal on September 23.

PLEDGE $3 OR MORE
The Coffee Level. Can you live without

http://vimeo.com/12873908
JOIN THE NARRATIVE

MAKE STUFF

What do you need from me?
Bryan Bishop <kanzure@gmail.com>
m: 512-203-0507

http://heybryan.org/

irc: #hplusroadmap on freenode

Thank you.