

# How can Open Hardware democratize & improve science?

Denisa Kera, Hackteria.org

Rüdiger Trojok, Biocommons

Mirela Alistar, Bioflux

# Denisa Kera

facebook.com/DenisaKera  
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Philosophy & Design: Prototypes?  
Open Science in the Global South  
Collector of DIYbio prototypes



**NUS**  
National University  
of Singapore



Biology|LifeSciences|Biotechnology





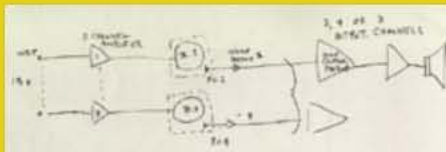
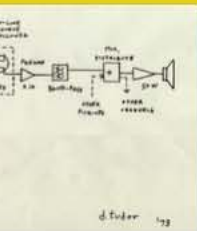
Landscape with Cannon (Albrecht Dürer, 1518) & Lickometer circuit



# Uncanny, subversive, sublime & all other circuits

Explore creative uses, shapes and forms of conductive materials and experiment with hybrid and strange circuits. Follow one of the categories: #cardboard circuits #aesthetic circuits #circuit theory #circuit examples

ARCHIVE



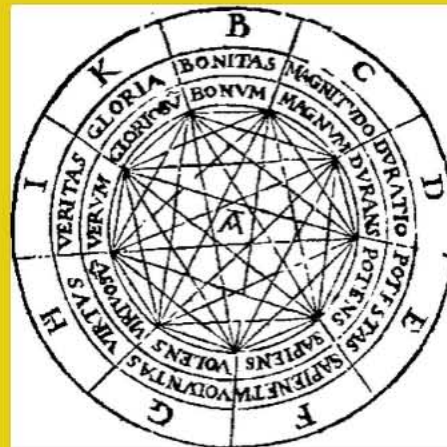
(via [DAVID TUDOR: Electronics](#))

Source: [davidtudor.org](#)

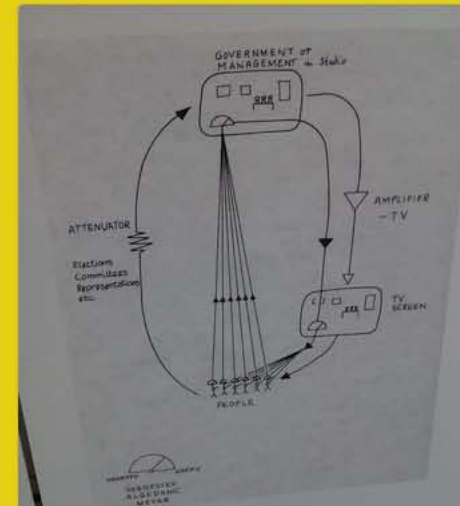


[mediagoblin.tami.org.il](#)

**ECOLOGICAL POTENTIAL**



(via [history of encoding, in pictures](#))



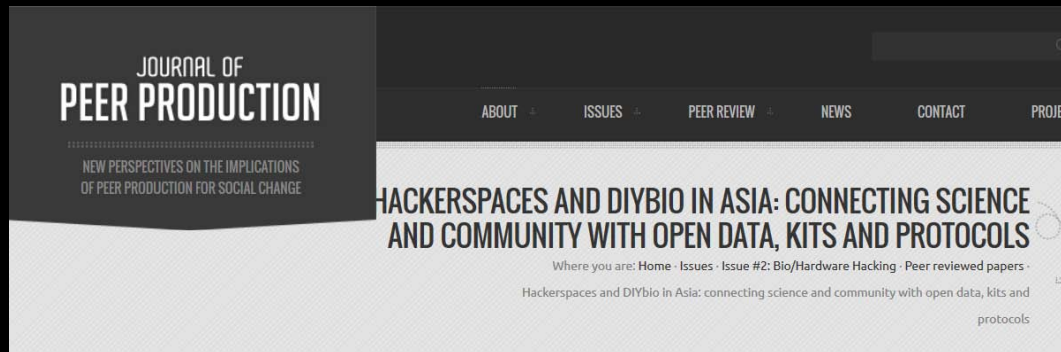
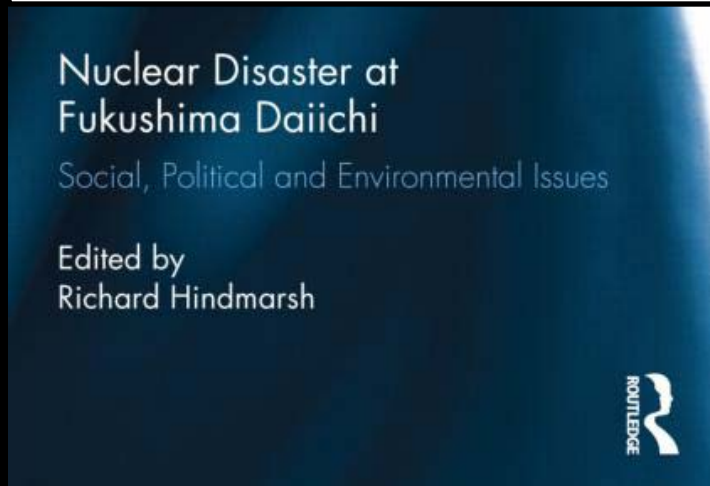
## Energy anthro circuits

We are just ci  
organisms fro  
All ecology is  
complex and  
even human v  
more than so  
evolutionary

<http://cardboardelectronics.tumblr.com/> with Yair Reshef



D. Kera, J.Rod, R. Peterova:  
Post-Apocalyptic Citizenship  
and Humanitarian Hardware



With Marc Dusseiller, Sachiko Hirose, students & collaborators



# HACKTERIA.ORG

## Open Source Biological Art

### DIY Biology | Generic Laboratory Infrastructure

- \* Website
- \* Knowledge Sharing
- \* Instructions
- \* Workshopology
- \* Citizen Science
- \* DIY Lab Instruments
- \* Open Source Hardware
- \* Global network



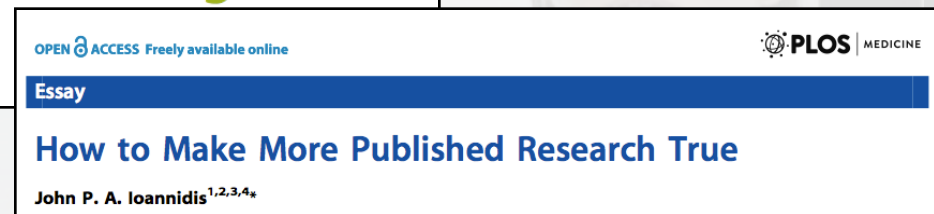
Artists, Designers, Hackers, Researchers, Makers, Teachers, Geeks and YOU

Radical Transdisciplinarity

# Democratize & improve science?

## (Thanks, Scott Edmunds/GigaScience Journal!)

- Article structure & journal policies (Ingelfinger, etc.) prevents transparency, dissuades sharing of data & methods
- Lack of reproducibility is the norm



- Ioannidis: “an estimated 85% of research resources are wasted”<sup>1</sup>
- Exponential increase in number of retractions<sup>2</sup>

1. <http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1001747>

2. <https://theconversation.com/open-access-and-the-looming-crisis-in-science-14950>



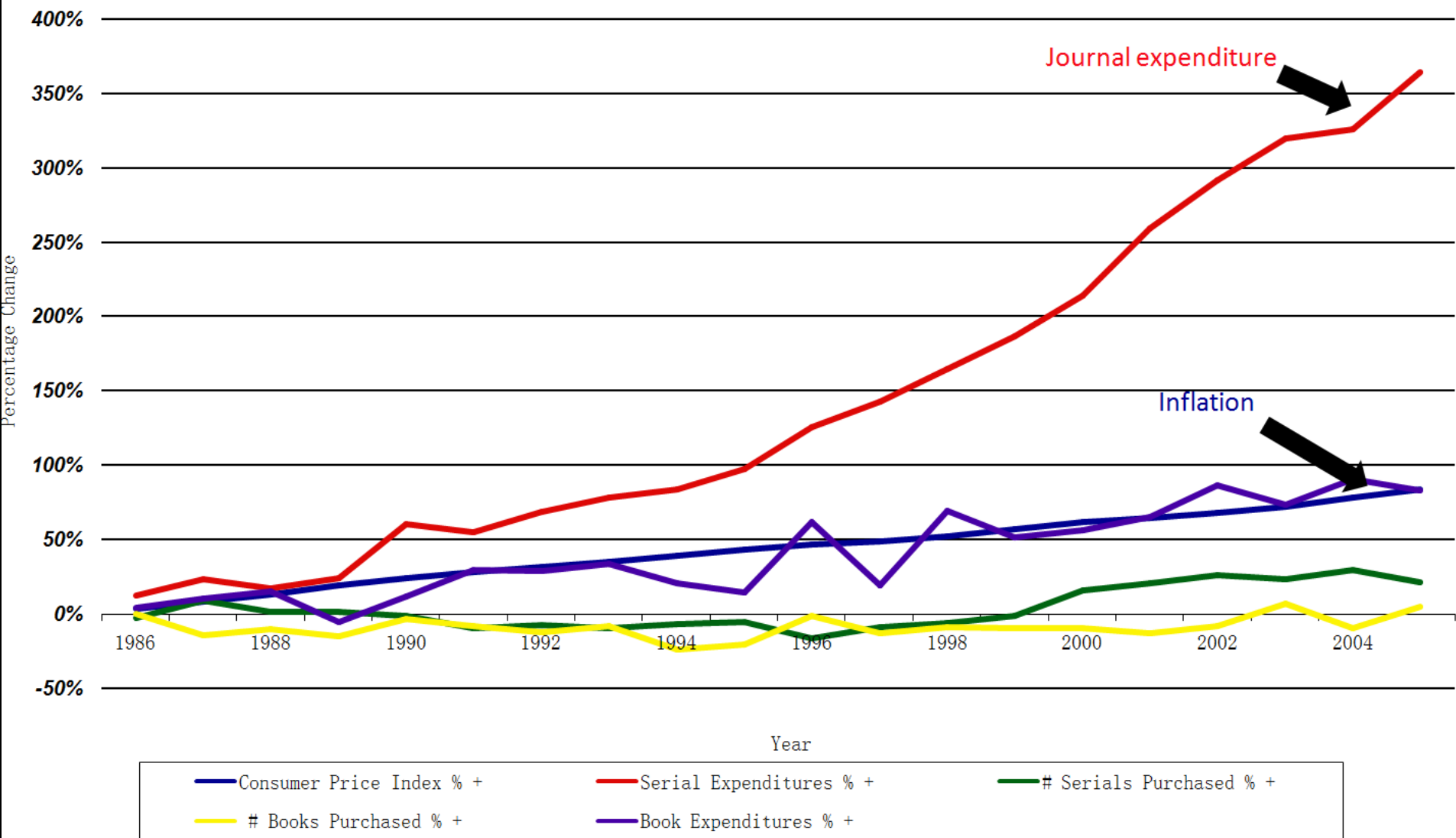
# Science Publishing profits...

<i>operating profit</i>	<i>company</i>	<i>industry</i>
7%	<u>Woolworths</u>	supermarkets, pokies
12%	BMW	automobiles
23%	Rio <u>Tinto</u>	mining
35%	Apple	premium computing
<b>34%</b>	<b>Springer</b>	<b>scholarly publishing</b>
<b>36%</b>	<b>Elsevier</b>	<b>scholarly publishing</b>
<b>40%</b>	<b>Wiley</b>	<b>scholarly publishing</b>




# Increasing strain on library budgets

MIT library purchases v inflation 1986–2006



# Changing the rules of the game to:

- Credit open data & usable things
- Time to rethink of reuse beyond just academia (citation) and industry (IP)
- Time to rethink funding models
- Need different shaped  researchobject





# ReCon

# Research in the 21st Century: Data, Analytics and Impact

[Home](#)[About](#)[Programme](#)[Registration](#)[Venue](#)[Contact](#)[Hackday](#)[Sponsors](#)

## Home

We are looking forward to welcoming you to ReCon in June (19th – 20th)! This conference focuses on changes and developments in research communication in academia, including dealing with vast volumes of data, social networks, publishing and the use of metrics. A number of factors are influencing the way we communicate research in 2015 including new technologies, publishing policies, the variety of research outputs and the assessment of research impact. This conference aims to explore the evolution of research communication. What incentives are required for researchers to change how they communicate their work? What role will metrics play in the future at the journal level, article level and researcher level? How will we deal with the large volume of data and research outputs that we are creating?

Register here:

[Buy Tickets](#)

Speakers:

## Keep up with #ReCon on Twitter

### #ReCon\_15



**Graham Steel** @McDawg 12 May  
@CMKeithW So close ! No worries, we will be recording it though !  
[#ReCon\\_15](#)

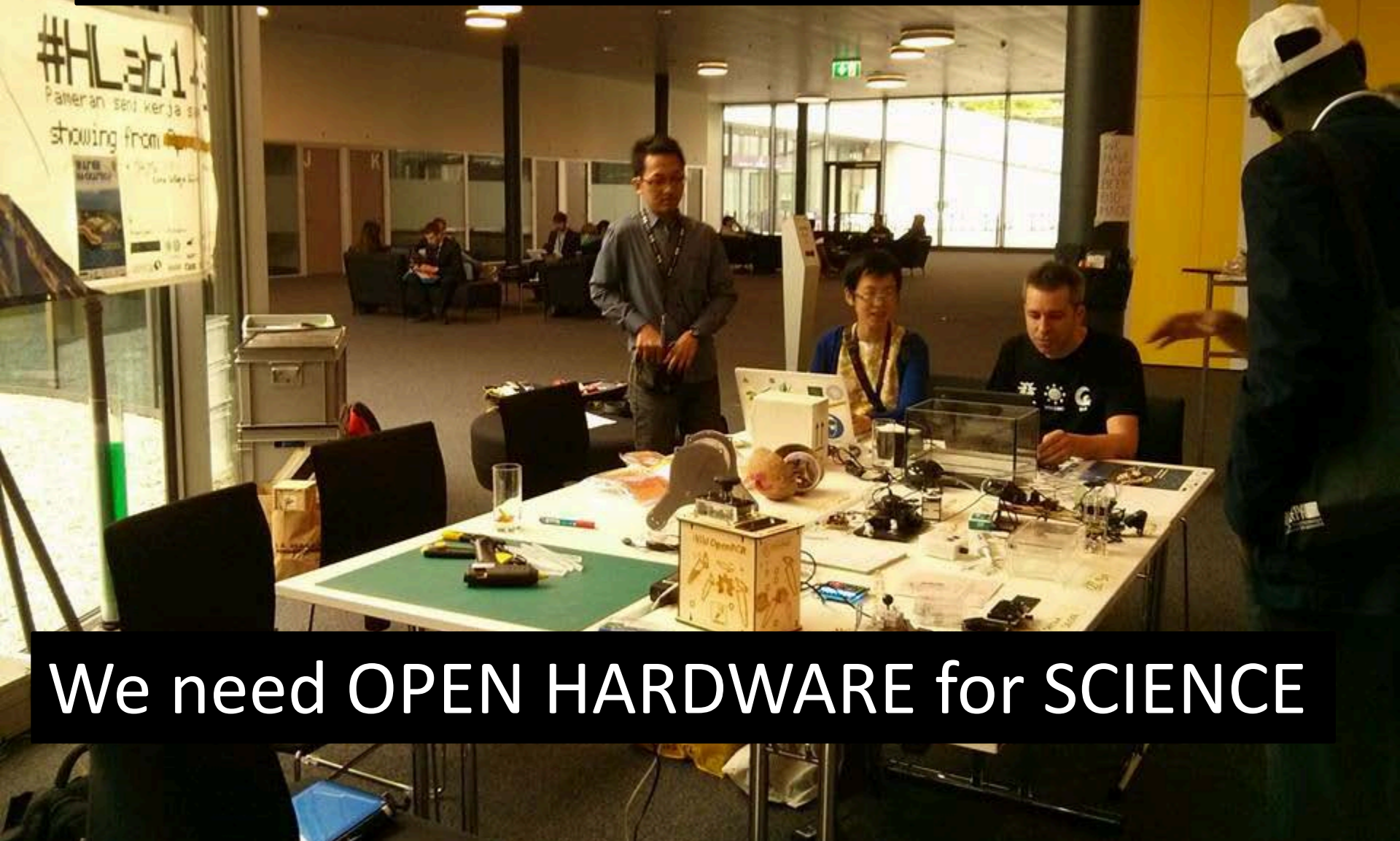


**Digital Science** @digitalsci 12 May  
Research in the 21st Century: Data, Analytics and Impact - @McDawg on @ReConEvent [ow.ly/MO9fb](#)  
[#ReCon\\_15](#)  
Retweeted by Thomas Yaeger  
[Expand](#)

<http://reconevent.com/>



Open Data, Open Access etc. is great but to truly democratize science we need to involve the public & Global South!



We need OPEN HARDWARE for SCIENCE

## DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Engineering > Electrical and Computer Engineering > Faculty Directory > Full-Time Faculty > Joshua M. Pearce

### DEPARTMENT

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Part-Time Faculty -

Faculty Emeriti -

Staff Directory

Giving Opportunities

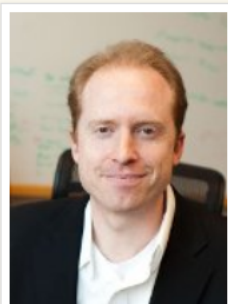
Contact Us

Job Openings

Student Awards

RESEARCH

## Joshua M. Pearce



### Contact

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906-487-1466  
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Associate Professor, Materials Science and Engineering  
Associate Professor, Electrical and Computer Engineering

PhD, Materials - Engineering, The Pennsylvania State University  
BS, Physics and Chemistry, The Pennsylvania State University

### Links



## Understanding Open Hardware and Citizen Science

Hita Ordo Natural Fiber (HONF) Foundation

Open Source Hardware production has been ongoing in Indonesia since 2005 and aims to increase affordability and access to lab equipment faced by many Southern countries. This project seeks to connect existing stakeholders and initiatives in Indonesia, while determining to what extent similar projects can be utilised in Nepal and the Philippines.

OCSDNet Participant : Hermes Huang



 **HONF Foundation** shared Irene Agrivine's post.  
24 January · 🌐

Cool project from the girls of xxlab



**Irene Agrivine** added 10 new photos — with House Natural Fiber and 4 others.

From the land of waste to the land of beauty #SOYACOUTURE

This experiment tries to explore the possibility of using the liquid waste of tofu production (which causes a big pollution in the river) into a bio leather through a simple scientific process using some lovely bacteria that you can do in your kitchen. We will go to a crowd funding soon to make this waste into an affordable and wearable product. SUPPORT US #xxlab

**Climate Change Adaptation**

**Barriers To Knowledge Sharing In India**



# transformaking

International Summit on  
Critical and Transformative Making  
Indonesia 2015

September 11-15

## Transformaking Outline

*International Summit on Critical and Transformative Making, Indonesia 2015*

[read the outline](#)

## Transformaking Now!

World Summit for Critical and Transformative Making | Indonesia 2015

*The "Maker" culture after...*

1.7 million years after the first hand axes  
2600 years after the definition of democracy  
170 years after the industrial revolution  
70 years after the electronic revolution  
20 years after the global communication revolution...

<http://transformaking.org/>

DIY SUBMARINE

COLONIAL SPY  
DEVICE - SAMPURAM

VOLTA  
CELLS FOR  
BEAM MOVING

NANO-DROP

DIY LASER TRAP  
LASER TNEEZER

WATER  
SPECTROMETER

DIVIDE & CONQUER  
MOLECULES & PARTICLES  
in electric field

DIY  
GEL BOX

DIY WEBCAM  
HACKED  
MICROSCOPE

DIY WHAT IS THIS FOR? MAKE  
A SENSORS FOR WATER QUALITY

A  
SOR



DAPHNIA MAGNA

Small aquatic invertebrates commonly called water beetles

used in toxicology and other aquatic investigations

1.5 x 1.5 mm

Water beetle

Water beetle

Water beetle

DIY LASER TWEETZER

NANO-DROP

WATER  
DROPS

MOLECULES & CONQUER  
in electric FIELD

DIY WEBCAM  
HACKED  
MICROSCOPE

GIVEN NAME

LAST NAME



DIY  
GEL BOX



DIY  
LASER TRAP  
TNEEZER



VIRAL  
CELLS  
FOR  
BEAM  
MOVING

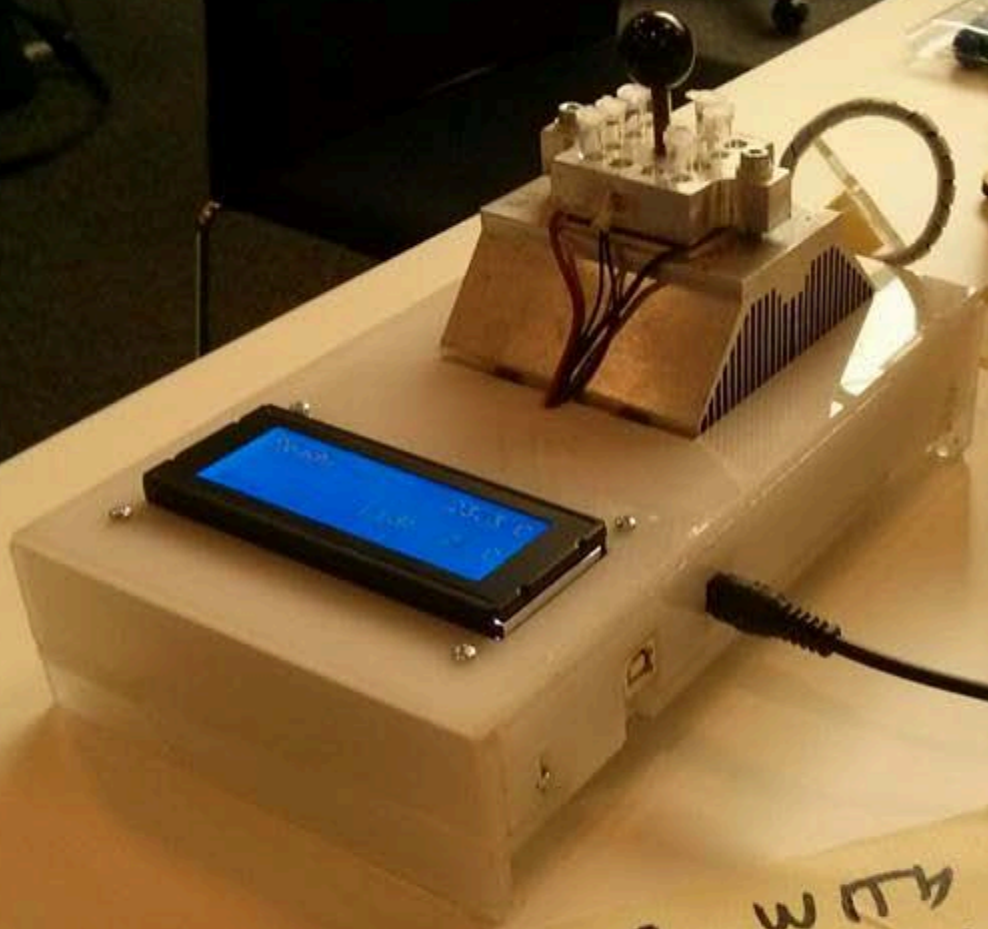
NANO-DROP

DIVIDE & CONQUER  
MOLECULES & PARTICLES  
IN ELECTRIC FIELD









OPEN PCR

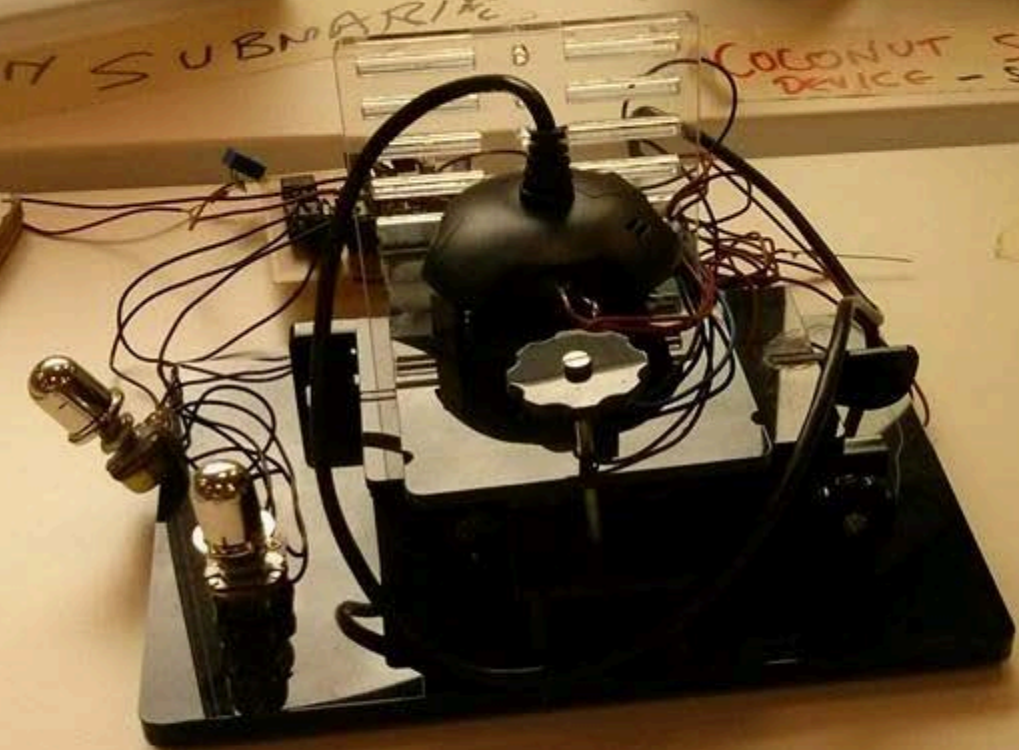
MAGIC DNA WITH TOOL :-)

copy & PASTE  
HA?

DIY SUBMARINE

COCONUT SPY  
DEVICE - samprana

VJing  
CELLS FOR BEAM  
MOVING



DIY  
LASER <sup>TRAP</sup>  
TWEETZER

MAX 12VDC

AGE







OPEN PCR

NO IDEA WHAT IS THIS FOR, MAY  
DAPHNEA AS SENSORS FOR WATER QUALITY



SIGN IN

FUSION 360 / OVERVIEW FEATURES **COMMUNITY** CUSTOMERS PARTNERS TRY OR BUY LEARNING

## SakuraPCR Tools

UPLOADED 20 APRIL 2015



Project assets

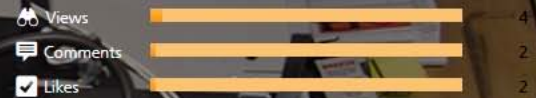


SHINGO HISAKAWA  
TOKYO

+ FOLLOW

VIEW PROFILE

### STATISTICS



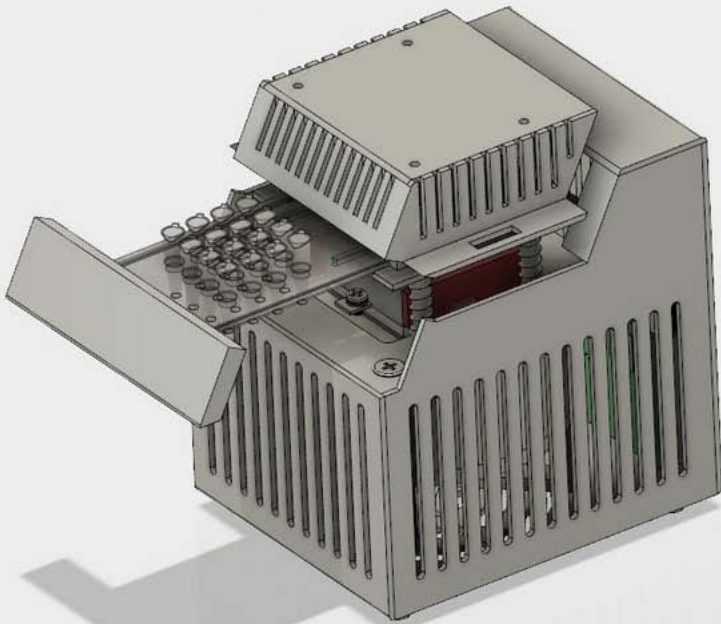
### PRODUCT

Fusion 360 Autodesk 360 Rendering

### TAGS

### SHARE

Share 0 Tweet 0 Pin it



ShareToFusion360Hub20150420114631.png

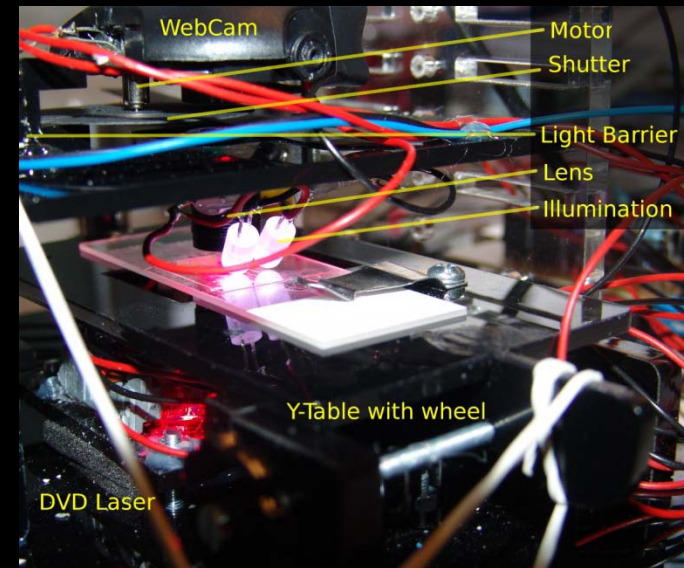
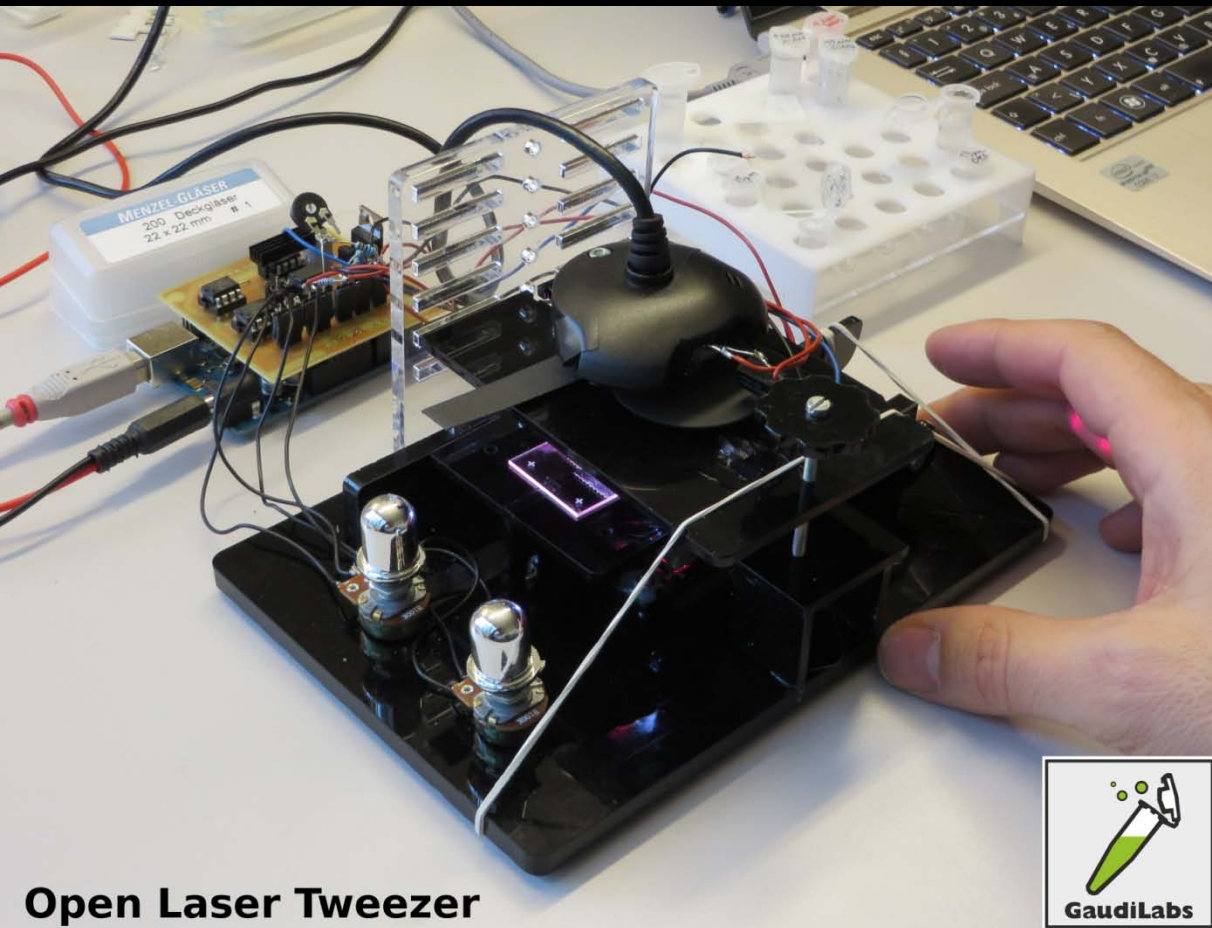
# your all•in•one lab



bento lab is the first complete **personal** laboratory, complete with a PCR machine, a centrifuge and a gel electrophoresis unit with blue LED transillumination.

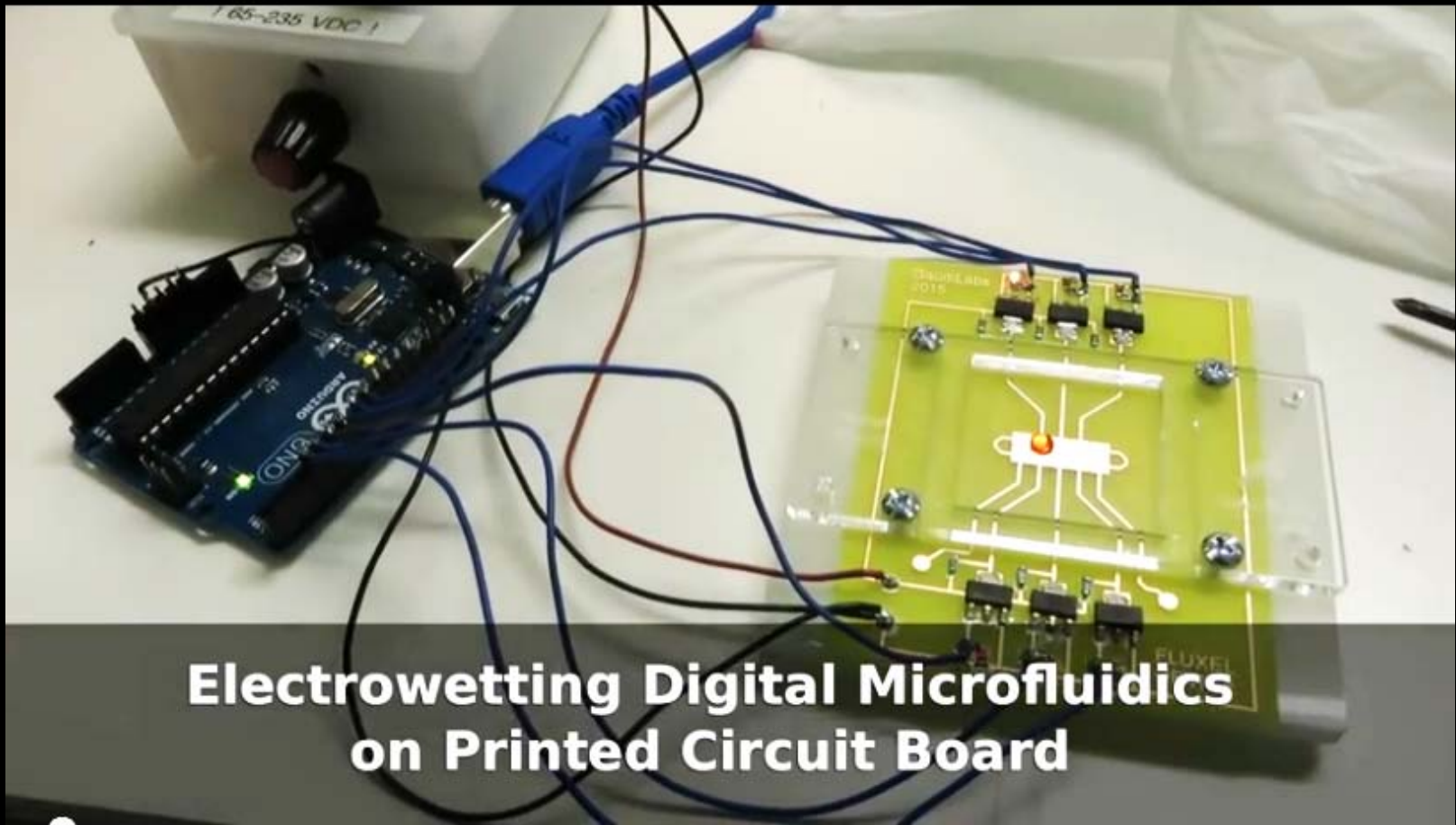


# Open Laser Tweezers – Total Cost of Ownership: 100 CHF



Urs Gaudenz & Gaudi Labs

# ELECTROWETTING



**Electrowetting Digital Microfluidics  
on Printed Circuit Board**