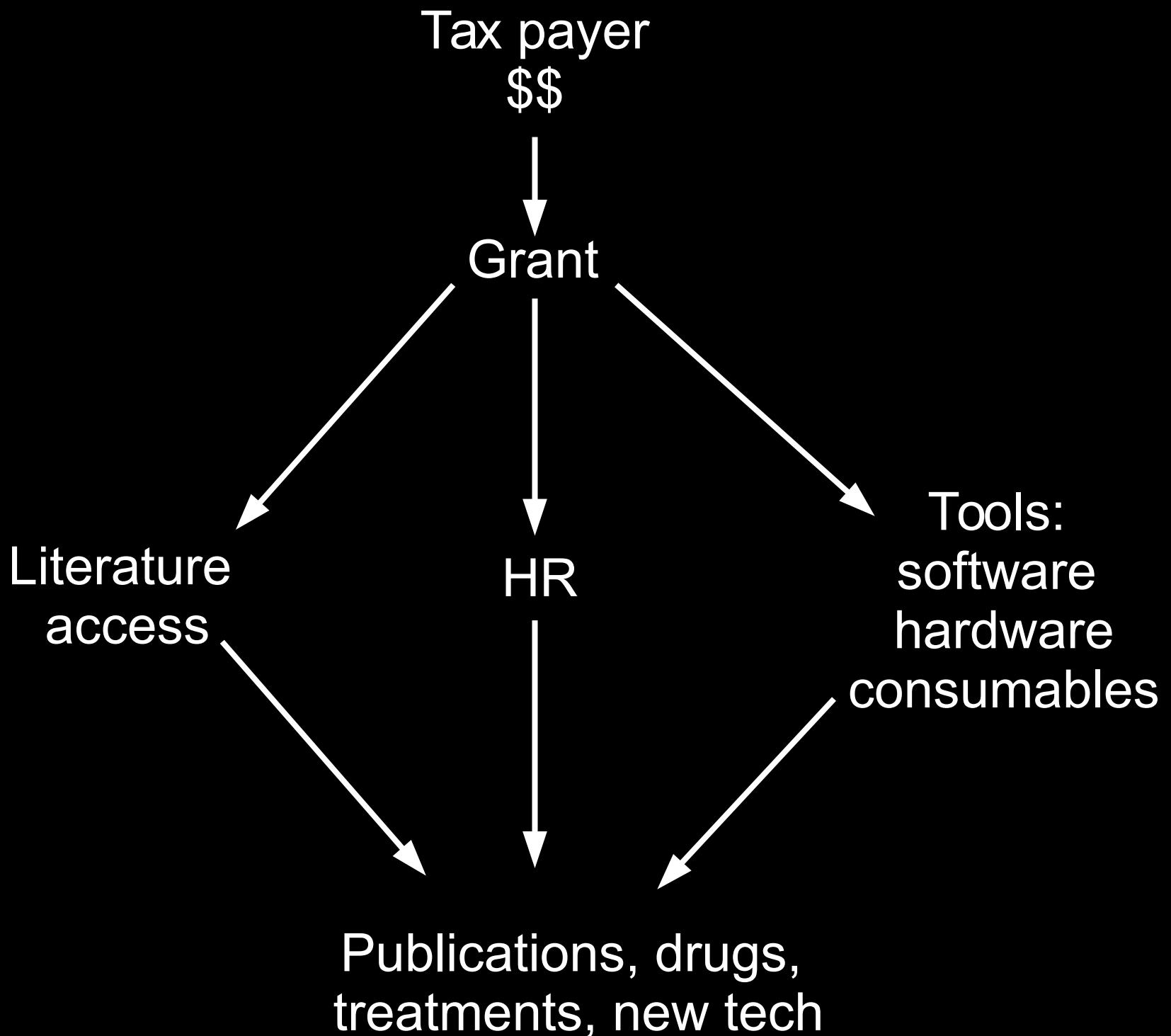
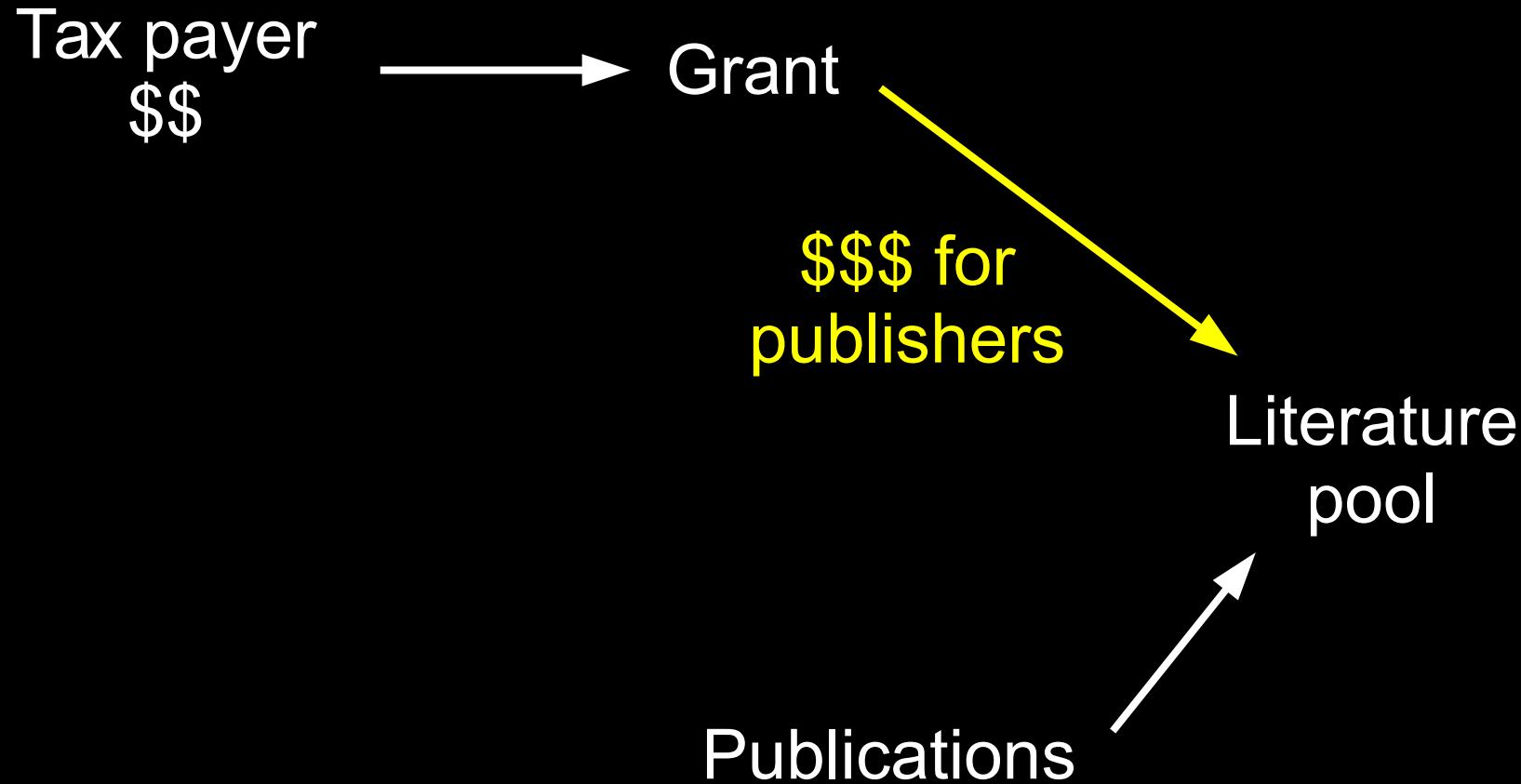


# Open source and open access: The (long due) review of modern science

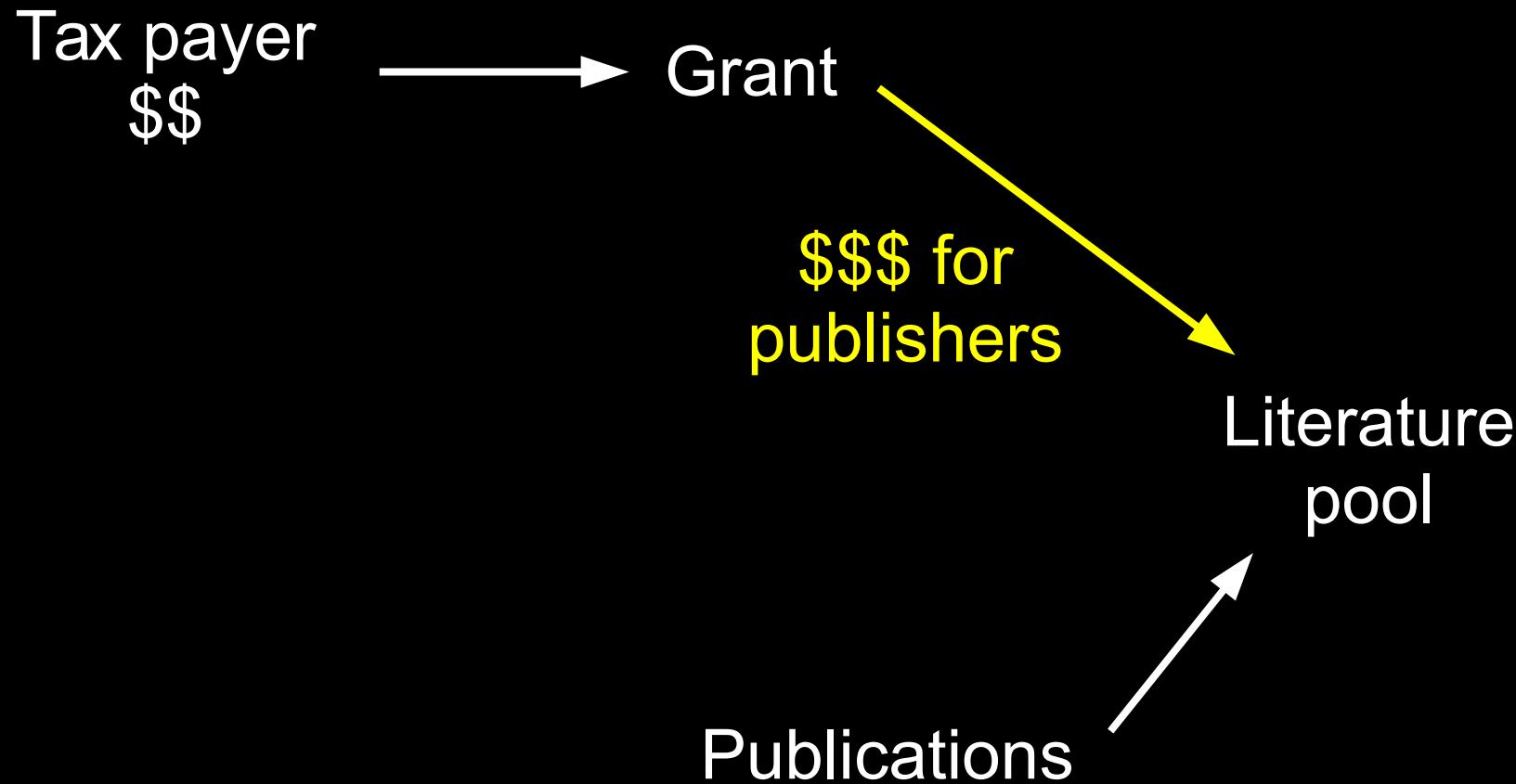
12<sup>th</sup> International Conference of the Society of Neuroscientists of Africa  
André M. Chagas  
University of Tuebingen  
Graduate School for Neural & Behavioural Sciences



# Literature access



# Literature access



Taxpayer money pays for access to knowledge that was developed using tax payer money (shuts less wealthy institutions and public out)

# Literature access

Open access journals, one idea many  
solutions:

**frontiers**



**PeerJ**



Publishing fee is payed once, and the publication  
is available to all (public and scientists alike)

# The peer review process

- Peer review:
  - “Anonymous”
  - Biased



# The peer review process revisited

- Back to open access!
  - Pre-print
  - Updated peer process

frontiers



PeerJ

# Tools

Behavioral setup for rats (Jan 2015)

- Regular (proprietary)

- 2 PCs (2 x 250€)
- Acquisition card (610€)
- Windows (130€)
- MATLAB (500€)\*
- Microsoft office (100€)
- Total: 1840€

# Tools

Behavioral setup for rats (Jan 2015)

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  - Acquisition card (610€)
  - Windows (130€)
  - MATLAB (500€)\*
  - Microsoft office (100€)
  - Total: 1840€
- Open source
  - 01 Raspberry Pi (31€)
  - Arduino (10€)
  - Linux (0€)
  - Python (0€)
  - LibreOffice (0€)
  - Total: 41€

# OPEN SOURCE

- Philosophy where the blue prints for a product/design are made universal via a free license.

# OPEN SOURCE

- Philosophy where the blue prints for a product/design are made universal via a free license.
  - It is closer to you than you think!



# OPEN SOURCE

- Philosophy where the blue prints for a product/design are made universal via a free license.
  - Leads to:
    - Lower costs
    - Decentralized development
    - Easy customization
    - Transparency
    - Portability / outreach
    - Innovation

# Decentralized development Easy customization



# Quality control / Transparency

- “Analyses were done using custom written routines in X”.

# Quality control / Transparency

- “Analyses were done using custom written routines in X”.

## Retraction: Hires et al, Whisker Dynamics Underlying Tactile Exploration

At the request of the authors, *The Journal of Neuroscience* is retracting “Whisker Dynamics Underlying Tactile Exploration” by S. Andrew Hires, Alexander L. Efros, and Karel Svoboda, which appeared on pages 9576–9591 of the June 5, 2013 issue. The authors report, “After publication we discovered that higher-order eigenmodes were incorrectly summed when calculating the time-dependence of whisker shape during touch with a rigid object. Correction of this error revealed that our boundary conditions were inappropriate for the whisker-object interactions treated in our paper. Modification of these boundary conditions will alter the results presented in Figures 6–11. We therefore wish to withdraw the article. A corrected treatment will be published in the future. We apologize for any confusion caused by this error.”

Retracted September 2013

Received December 20, 2012.  
Revision received April 1, 2013.  
Accepted April 5, 2013.

# Quality control / Transparency

Open source your data and code into an online repository

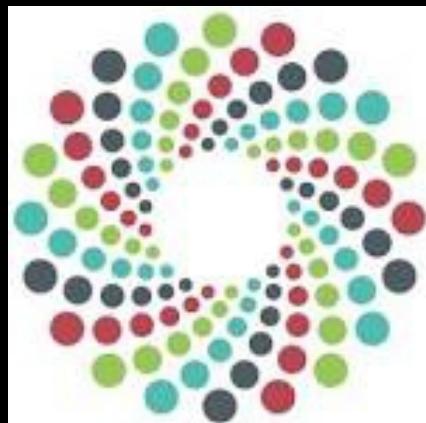
```
1 # script to generate a file for storing data from the posner test run in arduino:  
2  
3 #import necessary libraries:  
4 import os #library that enables system operations  
5 import datetime #library to get the current date  
6 import serial #import library to read/write serial port  
7  
8  
9 #serial port address  
10 portName="/dev/ttyACM0"  
11 #check to see if there are any devices connected to the serial port:  
12 if os.path.exists(portName):  
13     #create the serial comm object (first par is the serial port and the second,  
14     #the baud rate)  
15     ser = serial.Serial(portName, 115200)  
16     serFlag=1  
17 else:  
18     serFlag=0  
19     print("no serial devices connected!")  
20     print("continuing without serial communication \n")  
21  
22
```

“Given enough eyeballs any problem becomes trivial”

# Quality control / Transparency

Open source your data and code into an online repository.

They become citable and traceable through digital object identifiers (DOIs)



# Quality control / Transparency

Open source your data and code into an online repository.

They become citable and traceable through digital object identifiers (DOIs)

frontiers in  
**NEURAL CIRCUITS**

ORIGINAL RESEARCH ARTICLE

published: 05 December 2013  
doi: 10.3389/fncir.2013.00190



## Functional analysis of ultra high information rates conveyed by rat vibrissal primary afferents

André M. Chagas<sup>1,2</sup>, Lucas Theis<sup>3,4</sup>, Biswa Sengupta<sup>4,5,6</sup>, Maik C. Stüttgen<sup>7,8</sup>, Matthias Bethge<sup>3,9,10</sup> and Cornelius Schwarz<sup>1,2,10\*</sup>

### ACKNOWLEDGMENTS

This research was supported by grants from the Deutsche Forschungsgemeinschaft (SCHW577/10-1/10-2 and BE3848/2-1) and the BMBF (FKZ 01GQ1002). Further support was provided by the Hertie Foundation. The open access fee for this article was funded by the Open Access Publishing Fund of the University Tübingen. The data presented here (stimulus and spike trains) are publicly available online at: <http://dx.doi.org/10.6084/m9.figshare.845773> and <http://dx.doi.org/10.6084/m9.figshare.845770>.

# Tools (hardware)

## PCR Machines (Thermal Cyclers)

1 - 24 of 24 products displayed

Product Name	SKU #	Capacity	Product Size	List Price EUR	Qty
Applied Biosystems® 2720 Thermal Cycler	4359659	1 x 96-well x 0.2 ml tubes	1 instrument	4,998.00	<input type="text"/>
GeneAmp® PCR System 9700 Dual 384 well	N8050002	2 x 384-well x 0.02 ml tubes	1 instrument	16,980.00	<input type="text"/>
GeneAmp® PCR System 9700 Dual 96 well	4343176	2 x 96-well x 0.2 ml tubes	1 instrument	16,980.00	<input type="text"/>
GeneAmp® PCR System 9700, 60 well and 0.5 mL tube	4310899	1 x 60-well x 0.5 ml tubes	1 instrument	9,810.00	<input type="text"/>

Tax payer money pays for intellectual property of instruments developed using tax payer money.

# Tools (Hardware)



U\$ 500.00 (cheaper if  
one gets the necessary  
parts themselves)

So my science is more transparent  
and robust, is that all?

# Innovation

Vol 466 | 1 July 2010

nature

OPINION

## Most people are not WEIRD

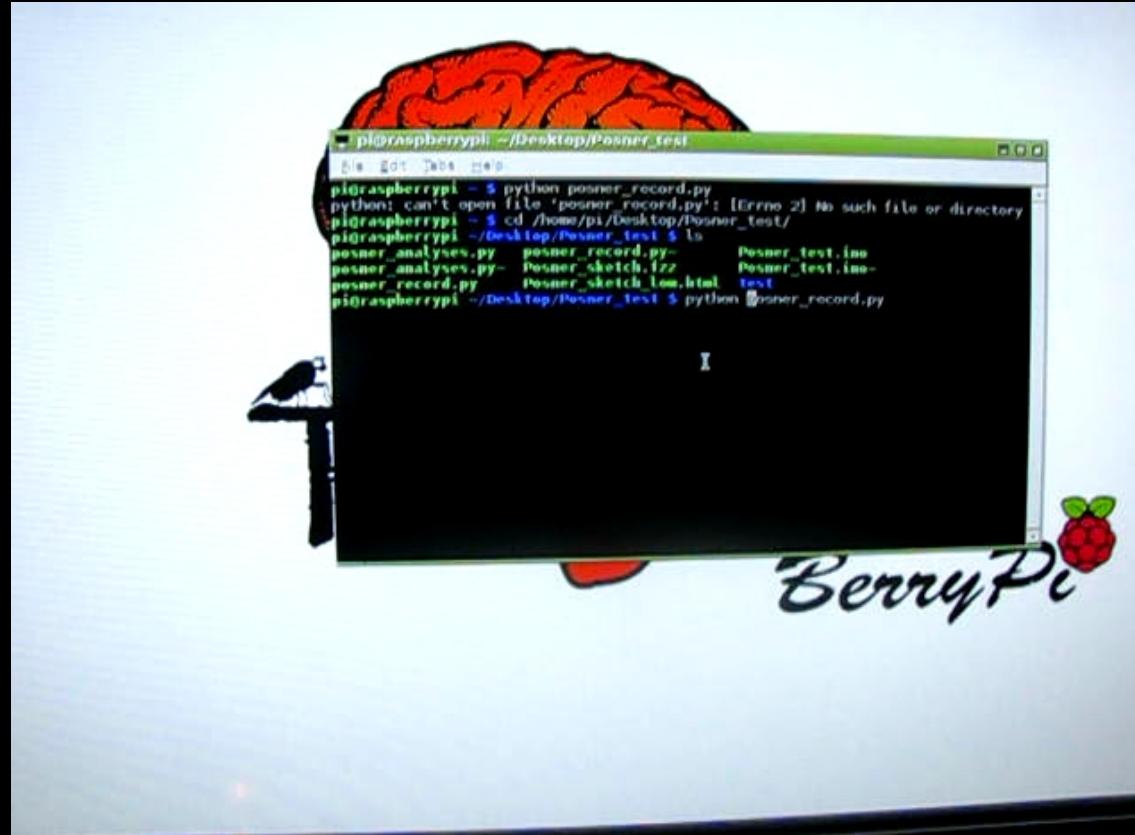
To understand human psychology, behavioural scientists must stop doing most of their experiments on Westerners, argue **Joseph Henrich, Steven J. Heine and Ara Norenzayan**.

and behaviour. A 2008 survey of the top psychology journals found that 96% of subjects were from Western industrialized countries — which house just 12% of the world's population<sup>3</sup>. Strange, then, that research articles routinely assume that their results are broadly representative, rarely adding even a cautionary footnote on how far their findings can be generalized.

# Innovation



# Innovation



Mobile Posner's test – [www.openeuroscience.wordpress.com/tutorials](http://www.openeuroscience.wordpress.com/tutorials)

# Innovation

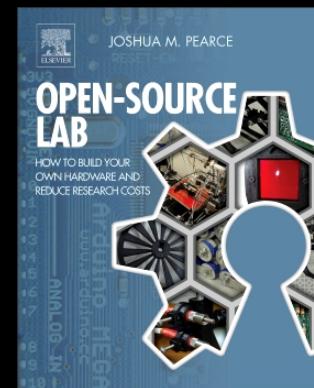
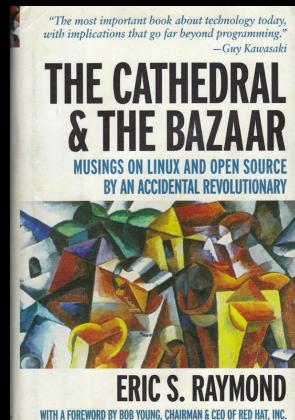
## Most people are not WEIRD

To understand human psychology, behavioural scientists must stop doing most of their experiments on Westerners, argue **Joseph Henrich, Steven J. Heine and Ara Norenzayan**.



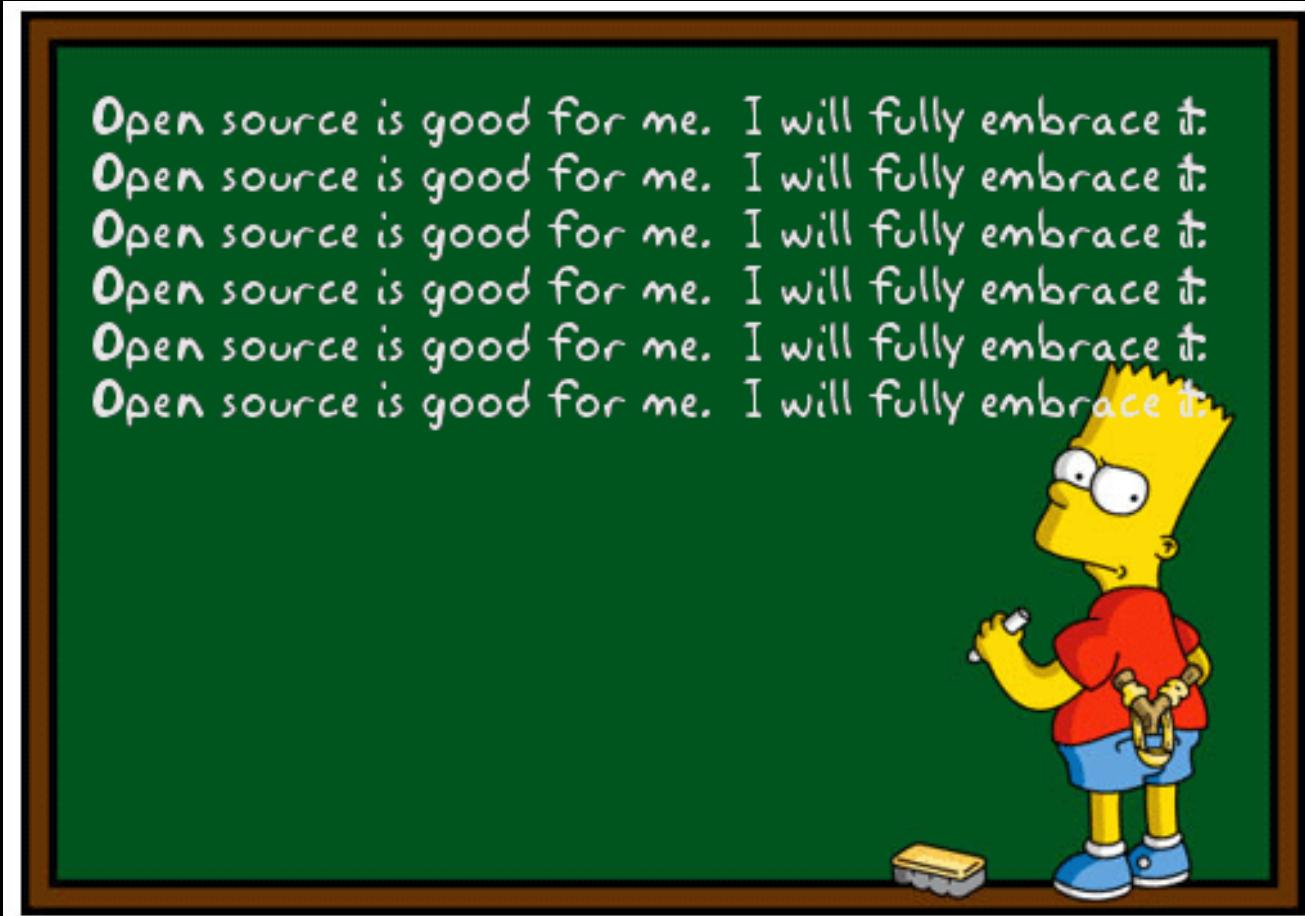
# Where can I get more information?

- Explore! You'll be surprised on how much can be found with the following phrase in google:
  - open source “insert desired equipment/topic here”
- [www.openeuroscience.wordpress.com](http://www.openeuroscience.wordpress.com)
- [www.trendinafrica.org/opensource](http://www.trendinafrica.org/opensource)



# Conclusions

- New technologies are decentralizing the production process and making development collaborative
- Open source leads to / takes advantage of this decentralization
- Open access and improved peer review make papers more transparent and robust
- Scientists can take advantage of the open source/open access philosophy and make science transparent, reliable and affordable to everyone



# Finished products



# OPEN SOURCE

- Philosophy where the blue prints for a product/design are made universal via a free license.
  - Good practice:
    - If you use someone else's work, always cite from where you got plans
    - If you modify a blue print, share it with others

The equipment I need for my experiment is not available, do I give up now?

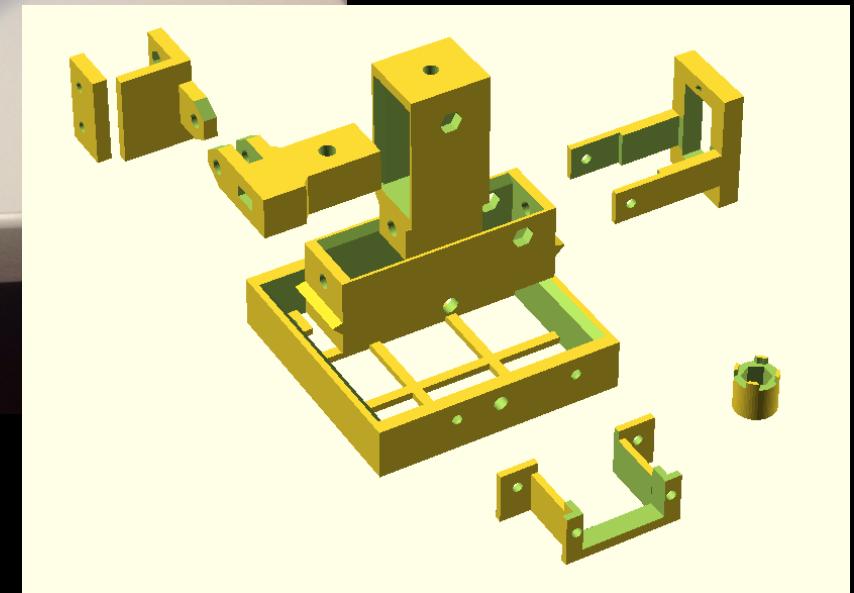
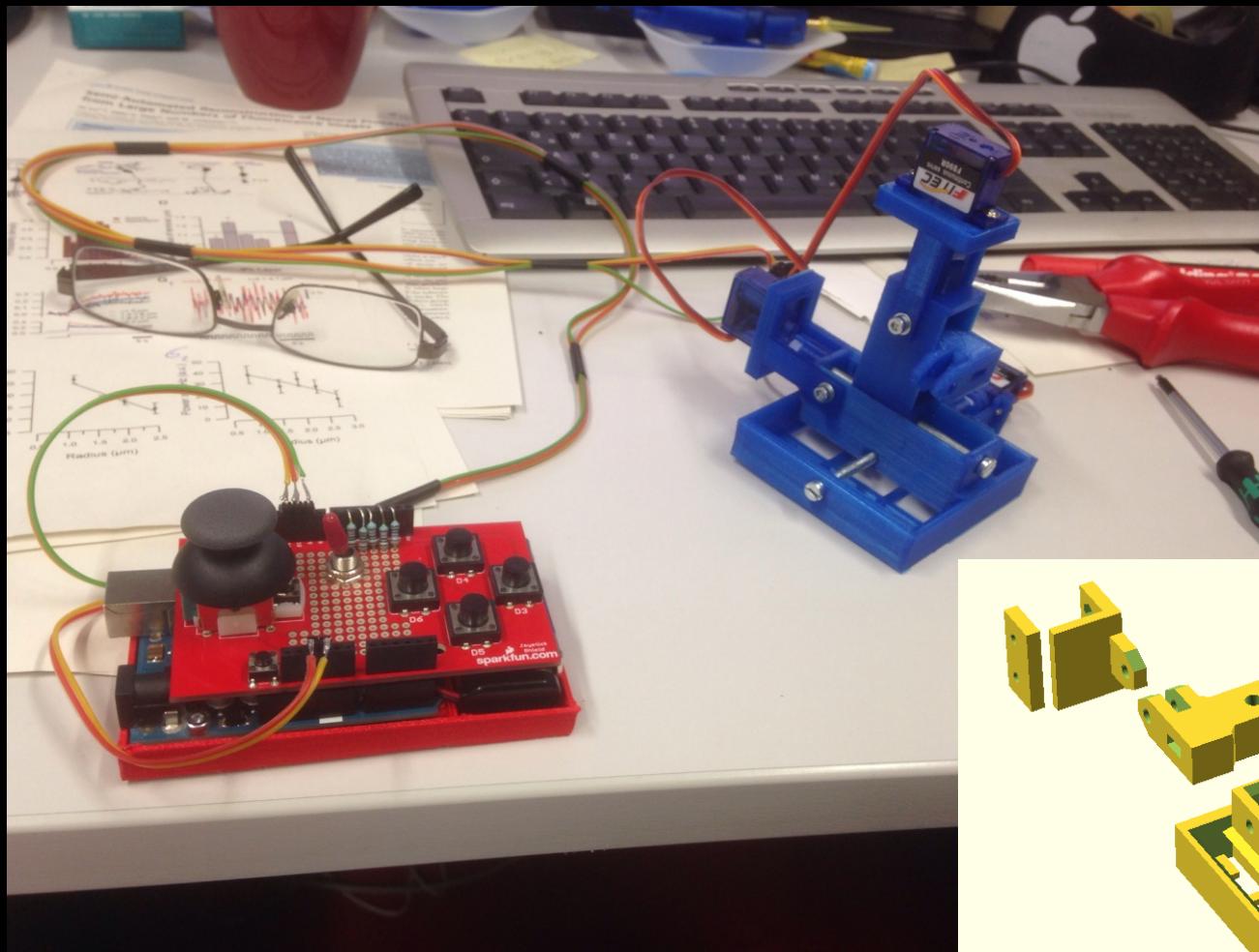
# Open source

The equipment I need for my experiment is not available, do I give up now?

**NO!!!**

Everyone can create equipment...

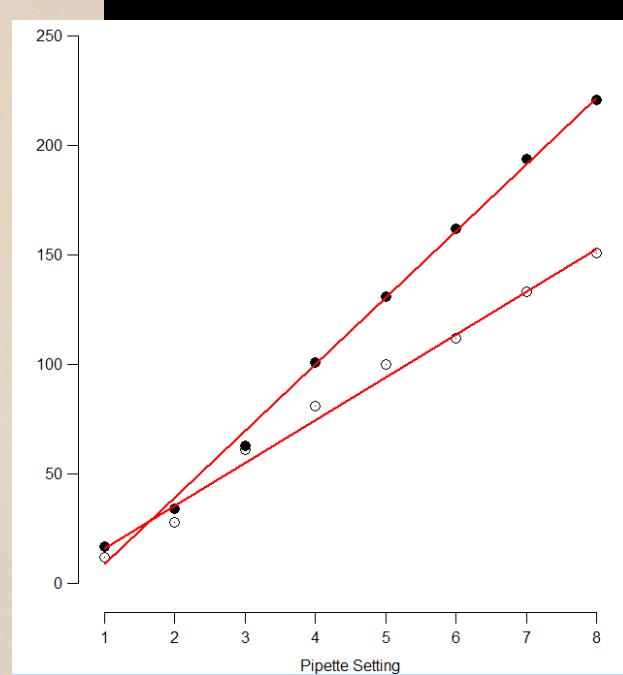
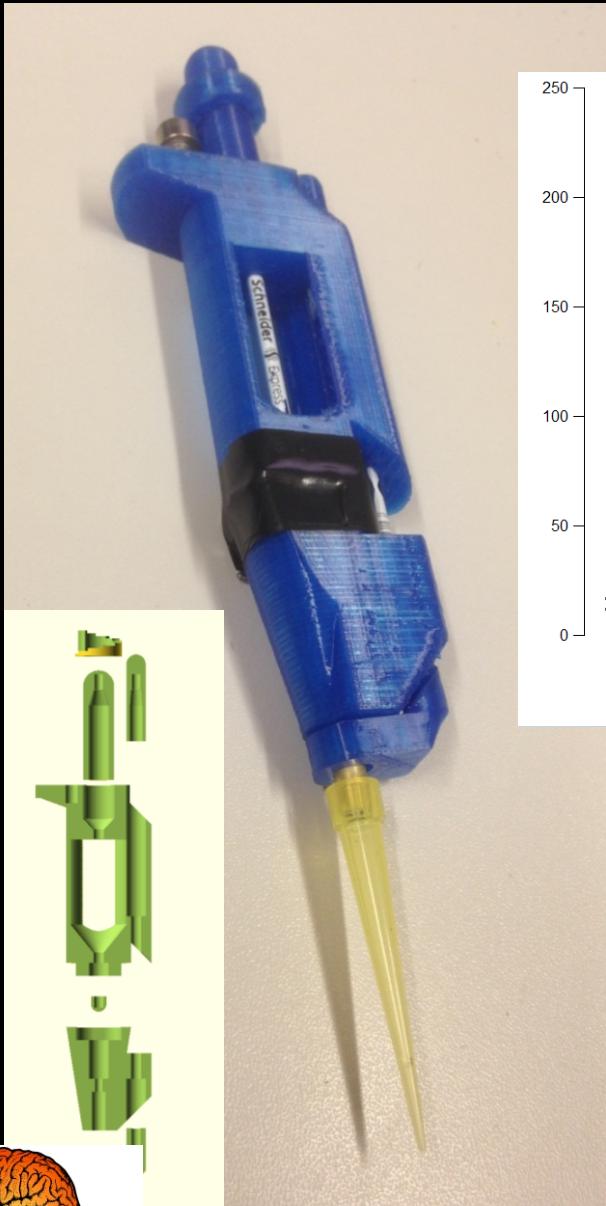
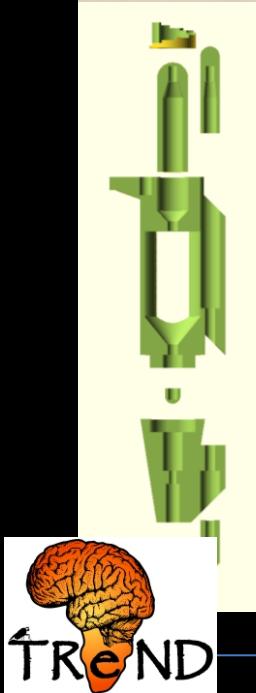
# Fully motorised micromanipulator



Slide from T. Baden

<http://trendinafrica.org/activities/open-source>

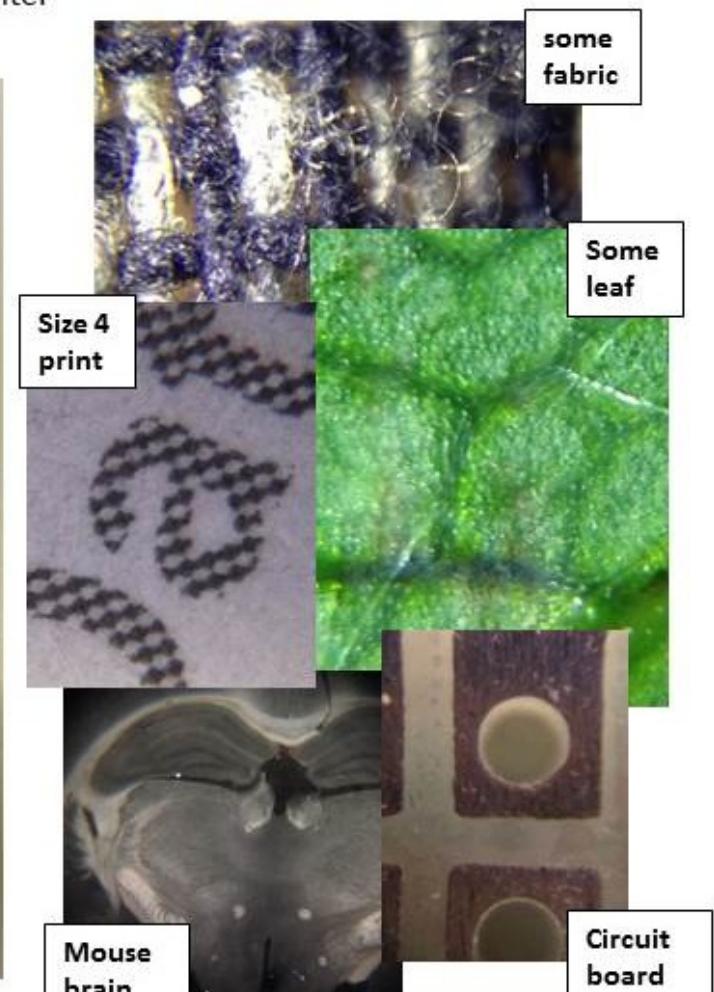
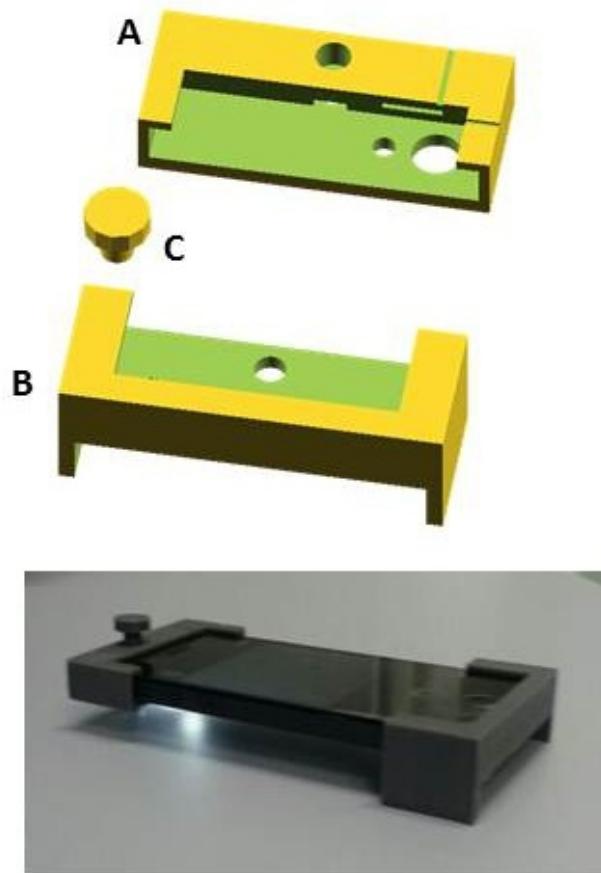
# Pipettes



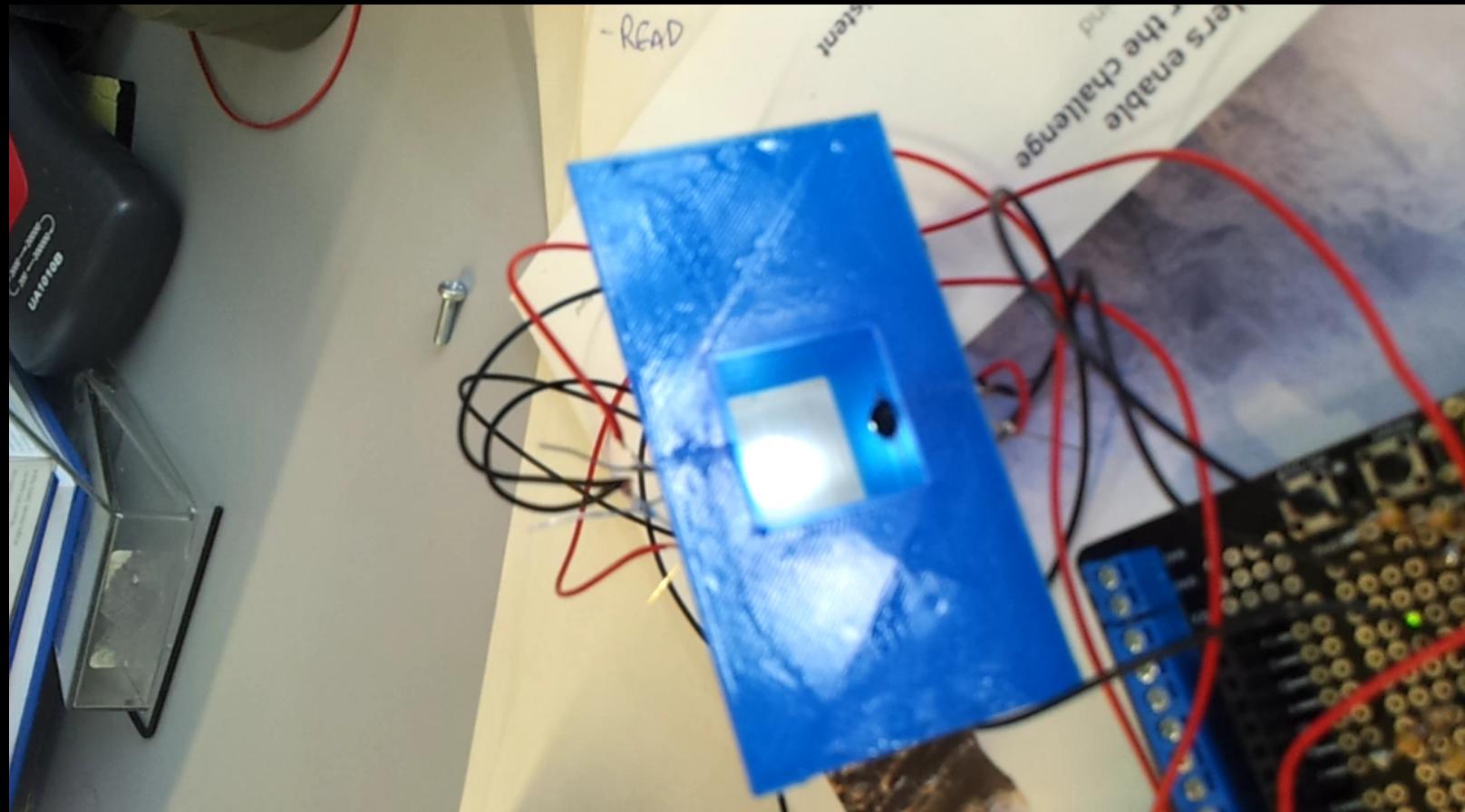
# PhoneScope

iPhone5 version printed on Felix printer

normal quality, no supports: ~1 hr 10 mins



# Nose poke device for rodents



25€ worth of electronics  
1€ worth of plastics