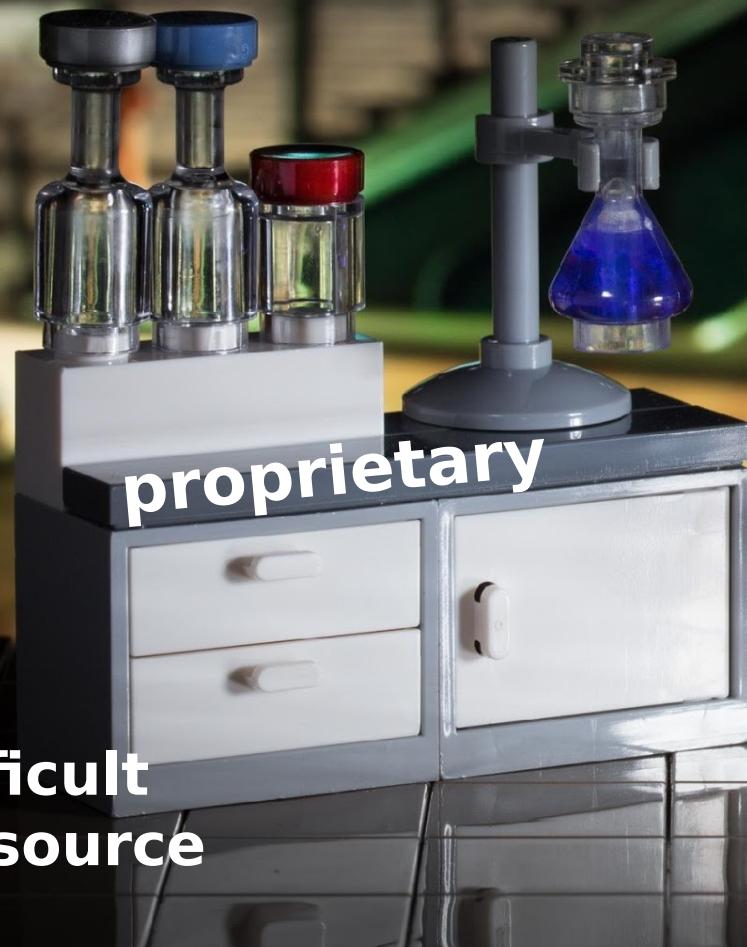


# Global open science hardware: an introduction

**Kaspar Emanuel, Juanma Garcia, Naiane R Rios**

1. Why open hardware?
2. How to make hardware  
open
3. Global Open Science  
Hardware Community
4. What can you do?

# Science requires TOOLS



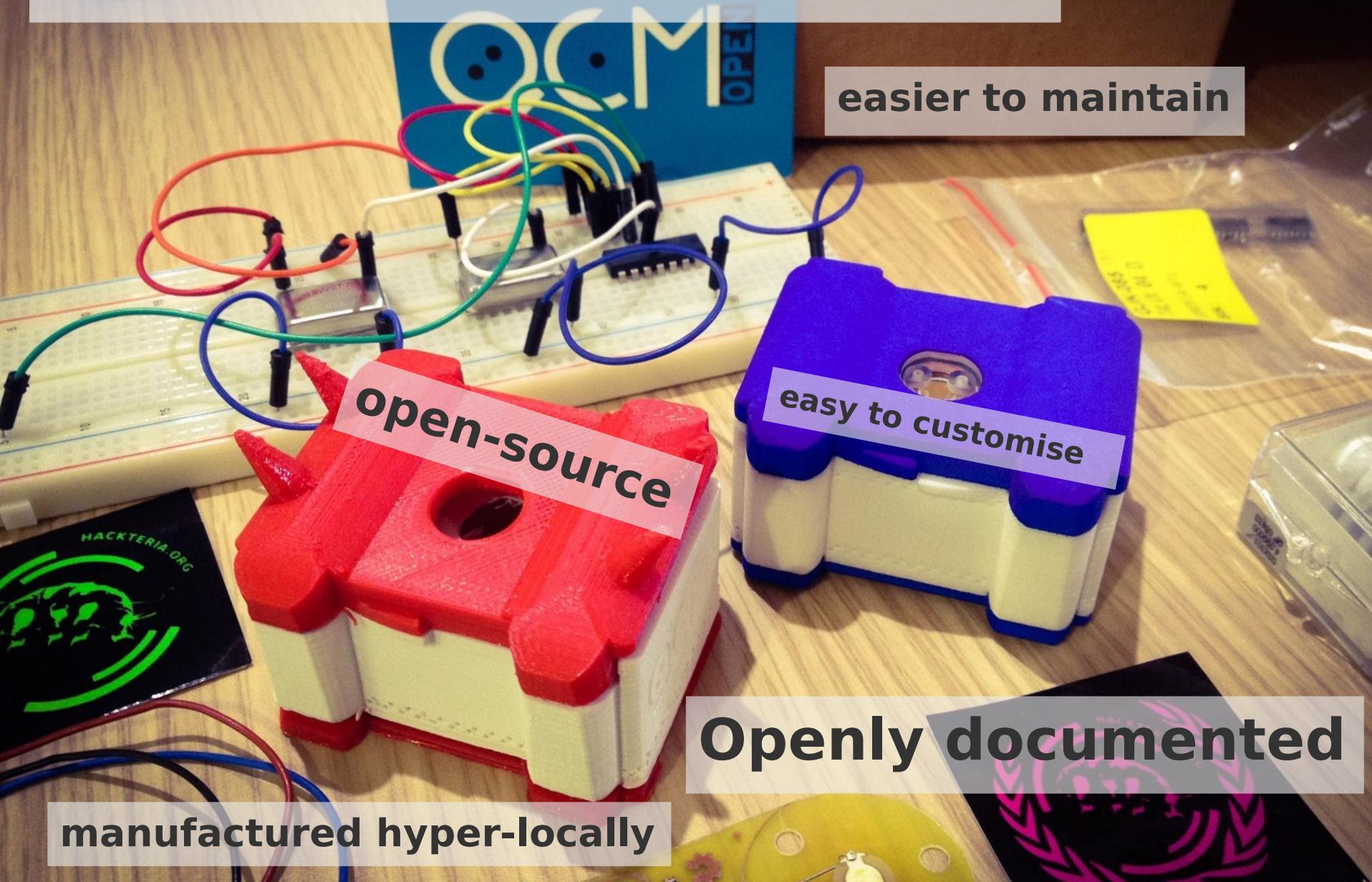
difficult  
to source

a  
black  
box

difficult to  
customise



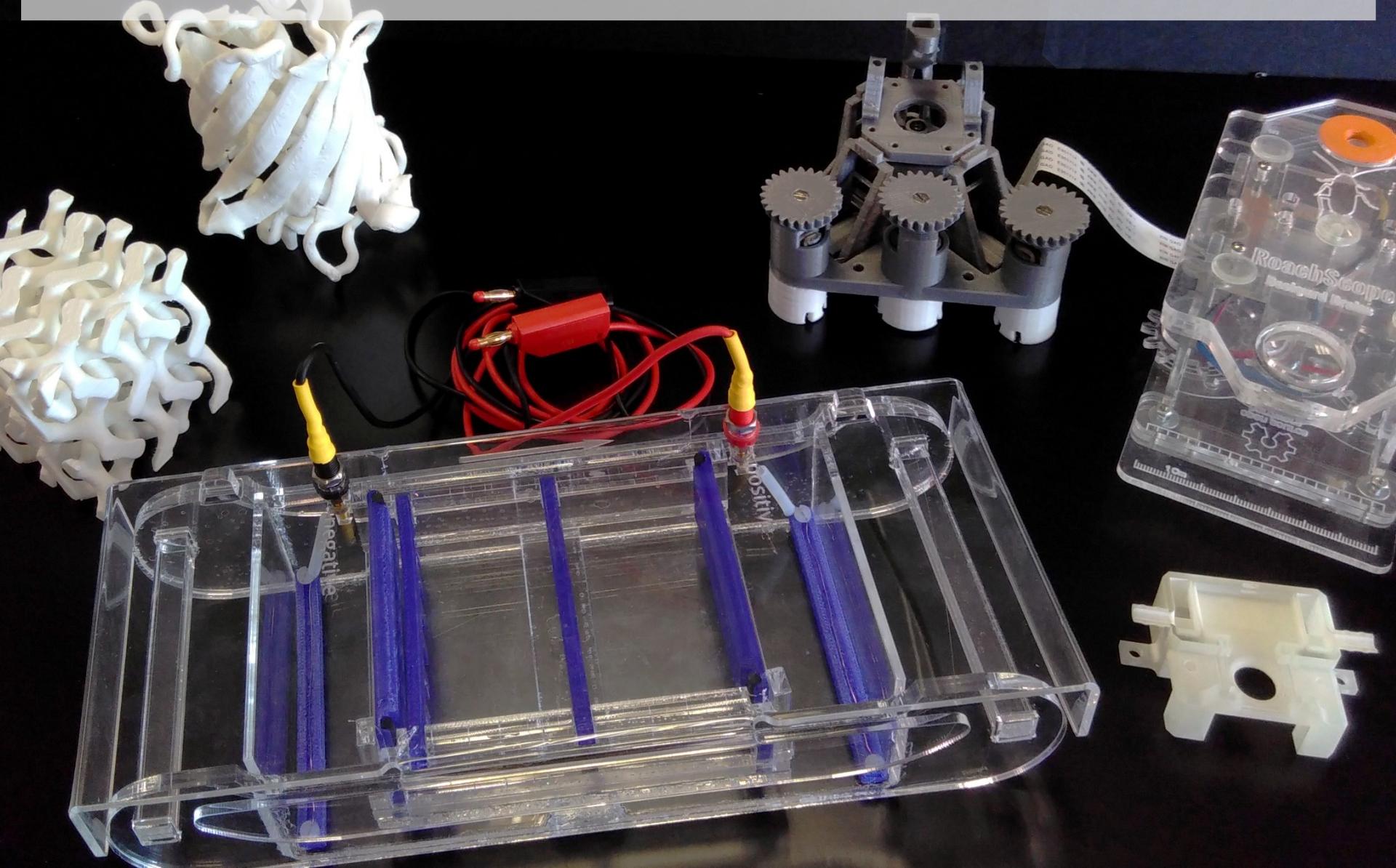
# Makers make tools

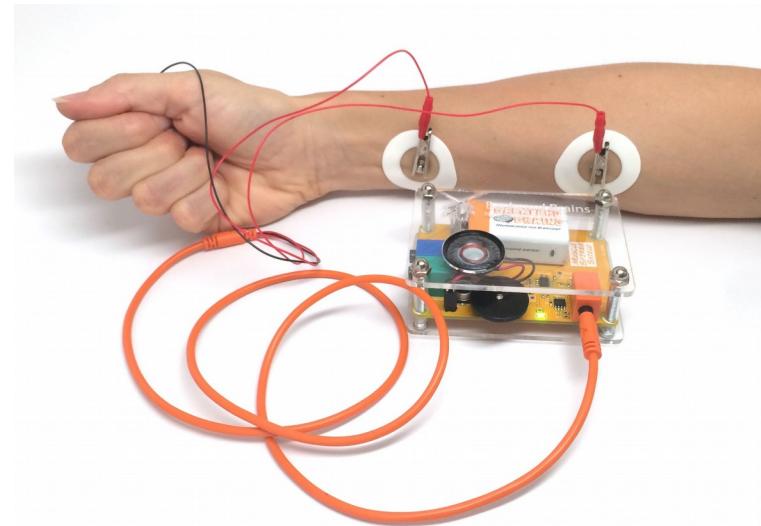
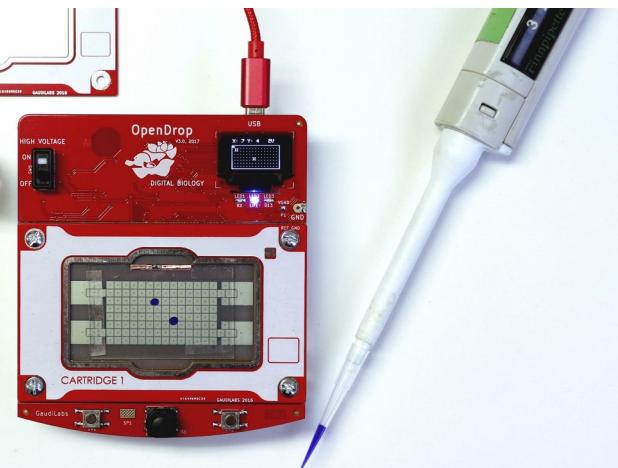


manufactured hyper-locally

Openly documented

# There are lots out there...





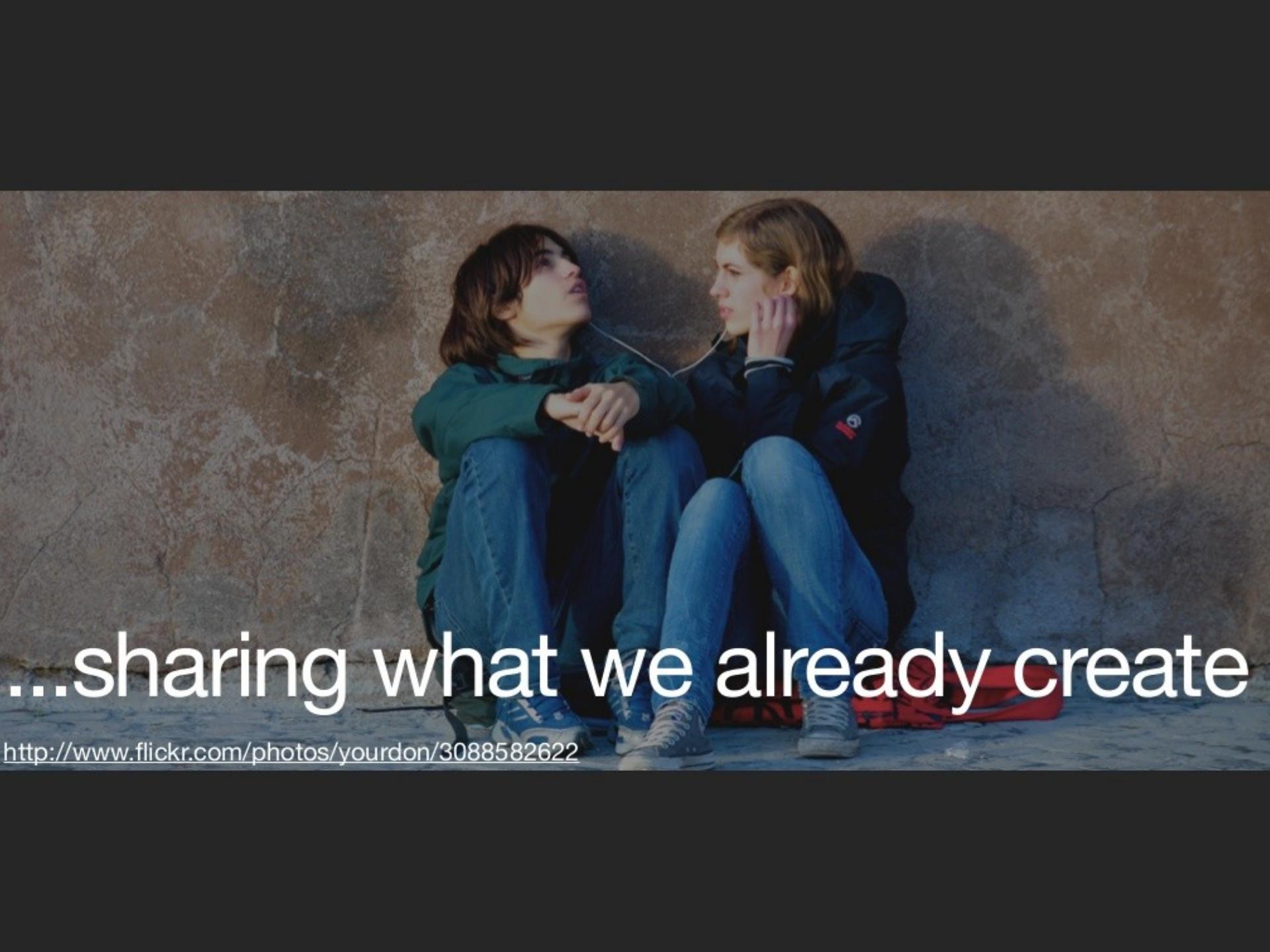
1.Why open hardware?

**2.How to make hardware  
open**

3.Global Open Science  
Hardware Community

4.What can you do?

What  
does  
“Open”  
mean?

A photograph of two young women sitting on a textured, reddish-brown wall. They are wearing casual clothing: one in a green hoodie and blue jeans, the other in a dark jacket and blue jeans. They are sharing a pair of white headphones, with one woman listening and the other looking up. The scene conveys a sense of connection and shared experience.

...sharing what we already create

<http://www.flickr.com/photos/yourdon/3088582622>

A piece of data  
or content is

**OPEN**

if **anyone** is free to  
use, reuse, and redistribute it

subject **only**, at most, to the  
requirement to attribute  
and/or share-alike.



Open source hardware is hardware **whose design is made publicly available so that anyone can study, modify, distribute, make, and sell the design or hardware based on that design.**

The hardware's source, the design from which it is made, is available in the preferred format for making modifications to it. Ideally, **open source hardware uses readily-available components and materials, standard processes, open infrastructure, unrestricted content, and open-source design tools** to maximize the ability of individuals to make and use hardware.

Open source hardware gives people the freedom to control their technology while sharing knowledge and encouraging commerce through the open exchange of designs.

- 1.Why open hardware?
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open
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- 4.What can you do?



# GOSH...

- changes the culture of science
- democratizes science
- has no high priests
- empowers people
- has no black boxes
- is impactful tools
- allows multiple futures for science

<http://openhardware.science>

CERN, Switzerland  
2016





- { ll → STRATEGIES + TACTICS FOR  
MAKING VALUES EXPLICIT?  
+ REMAKING VALUES  
→ DOES A DESIGNED OBJECT HAVE  
INHERENT POLITICS OR DO  
THEY EMERGE VIA CONTEXT/USE?  
→ IS OPEN BIO OPEN? WHO CAN D.I.Y.?  
How does language shape this?  
→ HOW CAN O.S.M. MOBILIZE PUBLIC ACTION?  
→ (IS OPENNESS IN CONFLICT W CAPITALISM?)  
How do we do openness (+ social goals)  
in capitalist spaces?  
→ How do we think O.M. can change the world?



# 100 PARTICIPANTS FROM 30 COUNTRIES

---



THE GROUP INCLUDED SCIENTISTS, SOCIAL SCIENTISTS, ARTISTS, LAWYERS, ARCHITECTS, COMMUNITY ORGANIZERS, DEVELOPERS, TEACHERS, AND STUDENTS ●

---

TO SUPPORT THIS DIVERSITY, THE ORGANIZERS CREATED A **CODE OF CONDUCT<sup>25</sup>** BASED ON RESPECTING DIFFERENCES.



# GLOBAL OPEN SCIENCE **HARDWARE** ROADMAP

Making  
Open Science  
Hardware  
ubiquitous  
by 2025



Learn

learn about OSCH, the contexts in which it currently operates, and the ways in which OSCH impacts society.

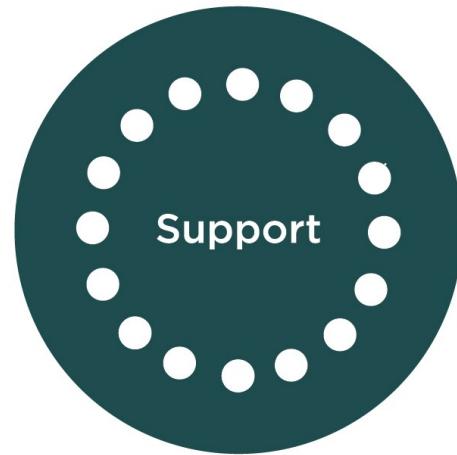
## Recommendations

1. Create a common research agenda with the OSCH community.
2. Publish research findings!
3. Convene and collaborate to improve Open Hardware licensing and contracting strategies for OSCH.
4. Produce better ways of Monitoring and Evaluation for OSCH.



We will know we have created the necessary conditions to help our projects when we have:

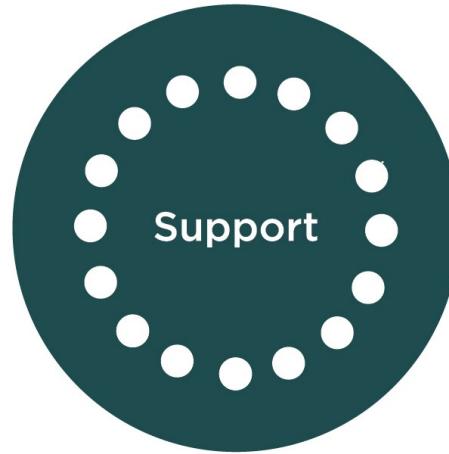
- A common pool of open educational resources, empirical Free and Open Source studies
- Open Hardware documentation and licensing guidelines that are widely adopted



support individuals and forge partnerships to create the conditions under which OScH can flourish.

## Recommendations

1. Draft a comprehensive guide for public and philanthropic funders on supporting OScH development
2. Prepare and disseminate OScH documentation, testing and validation “best practices.”
3. Support the development of Free and Open Source tools for hardware design.
4. Provide training sessions and workshops to support current OScH projects.



This milestone will be reached when:

- There is evidence of widespread institutional and community support for OscH
- Institutional mandates and policy-level debates in support of Free and Open Source technologies will necessarily include Open Hardware for the sciences
- Accessible and steady sources of funding for projects will also be available



grow with respect to local differences, increasing the diversity, scale and impact of the OScH community.

## Recommendations

1. Global and regional meetings and online forums.
2. Design and implement mentorship programs and educational resources for OScH projects.
3. Advocate for OscH in policy and institutions.
4. Support the development of OScH distributor networks. Identify or develop resource sharing best practices for scaling up manufacturing and distribution.



This goal will be reached when equitable conditions are well-established for OScH development, dissemination, and use.

- 1.Why open hardware?
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# Publish Open Hardware!



HardwareX

# Document, document, document...



Hackaday.io, GitHub, Thingiverse, OshPark Shared Projects,  
Wordpress and other Blogs

# Join communities

## GOSH Community Forum

[Sign Up](#)[Log In](#)[all categories ▾](#)[Categories](#)[Latest](#)   [Top](#)

Category

Topics

### General

This is the right place for general discussions about Open Science Hardware. Want to show or ask for something, this is the right place to start.

[■ Funding opportunities](#)

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### GOSH 2017

This is the right place for discussions about the 2017 Gathering that takes place in Santiago, Chile. Welcome to GOSH 2017!

- Sessions ■ I. Support GOSH Community
- II. Grow GOSH Community ■ III. GOSH for traditional developers
- IV. Research to support GOSH ■ V. Institutional support for GOSH
- VI. Funding ■ VII. Education, training, learning
- VIII. Impacts and Seeing Success
- IX. Supporting GOSH in all its parts

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### Communities

Space for supporting community communication and engagement. If you would like to use this space for your community, please contact GOSH organizers for creating a dedicated category.

- Lantino Americanas ■ Education
- Single Pixel Camera dev group ■ Digital Biology ■ AfricaOSH

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Latest

[Bacterial Motility Analysis Software/Hardware Project](#)[■ General](#)

collaboration, development

6

3h

[Introduce yourself!](#)[■ AfricaOSH](#)

70

13h

[Resources for teaching electrical circuits to elementary school kids](#)[■ General](#)

gosh\_resources

0

1d

[Sourcing parts locally](#)[■ General](#)

gosh\_resources

1

1d

[Introduce yourself](#)[■ AfricaOSH](#)

3

2d

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# 开放科学 硬件大会召集令

## GATHERING FOR OPEN SCIENCE HARDWARE

中国 2018 CHINA  
深圳 Oct, 10<sup>th</sup> - 13<sup>th</sup>  
Deadline for Application: 20 May



# VISIT [HTTP://OPENHARDWARE.SCIENCE](http://OPENHARDWARE.SCIENCE)

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