

*visual notes*  
*from the*

*Gathering*  
*for* *Open*  
*Science*  
*Hardware*



*Panamá City, Panamá*  
*October, 2022*

# OPEN SOURCE SCIENCE HARDWARE

**T**he Gathering for Open Science Hardware, is an integral part of the Global Open Science Hardware community, serving the community's needs by convening meetings, facilitating activities, providing an online forum for the community and acting as publisher.

In 2016, GOSH convened 60 members of the community at CERN in Geneva. This event identified commonalities in approach and the need for similar standards, best practices and enabling technologies; all of which led to the publication of the GOSH Manifesto.

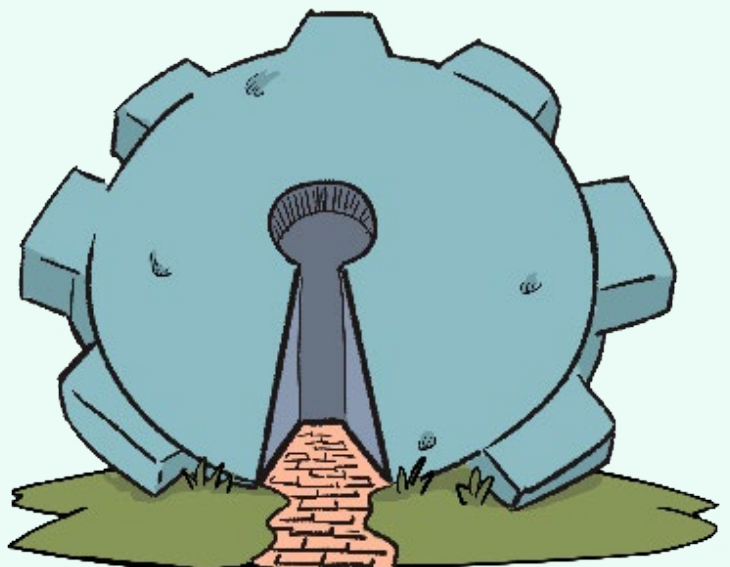
Since then, three more meetings have been convened in **Santiago de Chile, Chile (2017)**, **Shenzhen, China (2018)** and most recently in **Ciudad de Panama, Panama (2022)**. These gatherings have supported the deepening of existing connections, the creation of new links, and the development of a **Roadmap** for making Open Science Hardware ubiquitous by 2025. A mission which could have powerful implications for the delivery of scientific research, education, outreach, as well as wider multidisciplinary societal benefits■

# What is **Open Source Hardware** in the first place?

“Open source hardware” is hardware (physical objects, like computers, machinery, furniture, etc.) whose design is made **publicly available**, so that anyone can study, modify, distribute, make, and sell the design or hardware based on that design.

Ideally, open source hardware uses readily-available components and materials, standard or non-specialist processes, open infrastructure, and other open-source design tools to ensure individuals are able to make use of the hardware in any capacity.

By removing restrictions and barriers such as legal consequences, open source hardware gives people the freedom to control their technology while sharing knowledge and encouraging commerce through the open exchange of designs ■



# Progress is Open Source

**E**xperimental science thrives on the ability to use, study, replicate, and improve scientific instrumentation. When a researcher needs specialized equipment, proprietary or closed-source hardware may be too expensive to obtain and maintain, impossible to repair, difficult to access, or may even have complex user agreements that limit its

use. This situation is fundamentally detrimental to the production of knowledge and its potential for creating equitable and sustainable solutions to current and future problems. Therefore, **open source science hardware** plays a crucial role in public life, research, and action by removing these barriers.

## So, why specify the science part?

The Open Science Hardware community seeks to bring together developers and users of scientific tools and research infrastructures to support the pursuit and growth of knowledge through global access to hardware for science.

**Open Science Hardware** refers to any piece of hardware used for scientific investigations that can be obtained, assembled, used, studied, modified, shared, and sold by anyone. It includes standard lab equipment as well as auxiliary materials, such as sensors, biological reagents, analog and digital electronic components ■

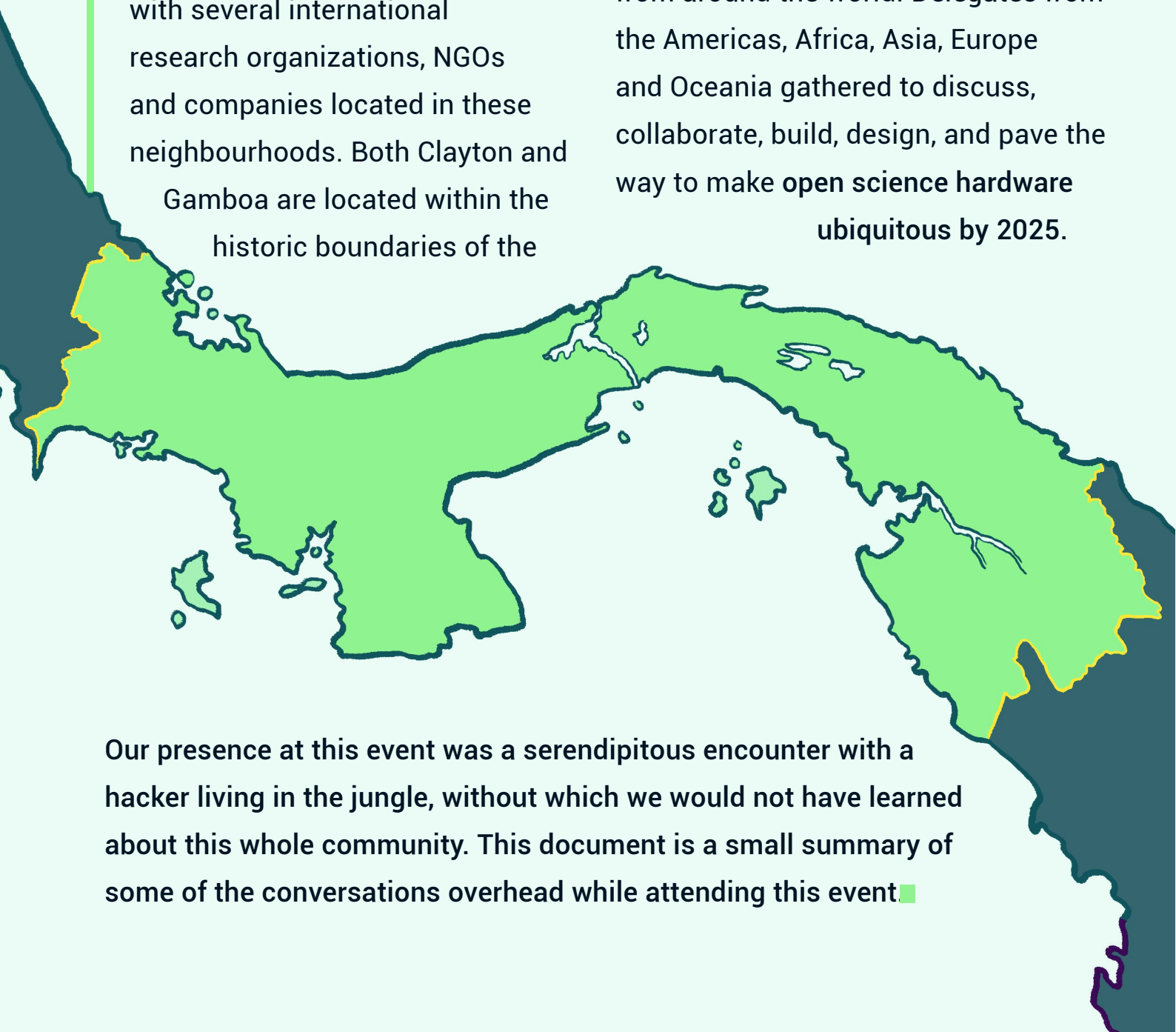
# Where

**GOSH 2022** took place in a particularly wet and rainy October in **Clayton** and **Gamboa** in Panama City. These two areas are hubs of scientific research and international collaboration, with several international research organizations, NGOs and companies located in these neighbourhoods. Both Clayton and Gamboa are located within the historic boundaries of the

Panama Canal Zone, a former exclave and colony of the United States of America. The Canal Zone (or Zona, in Spanish) was abolished in 1979 and the land formally returned to Panama in 1999.

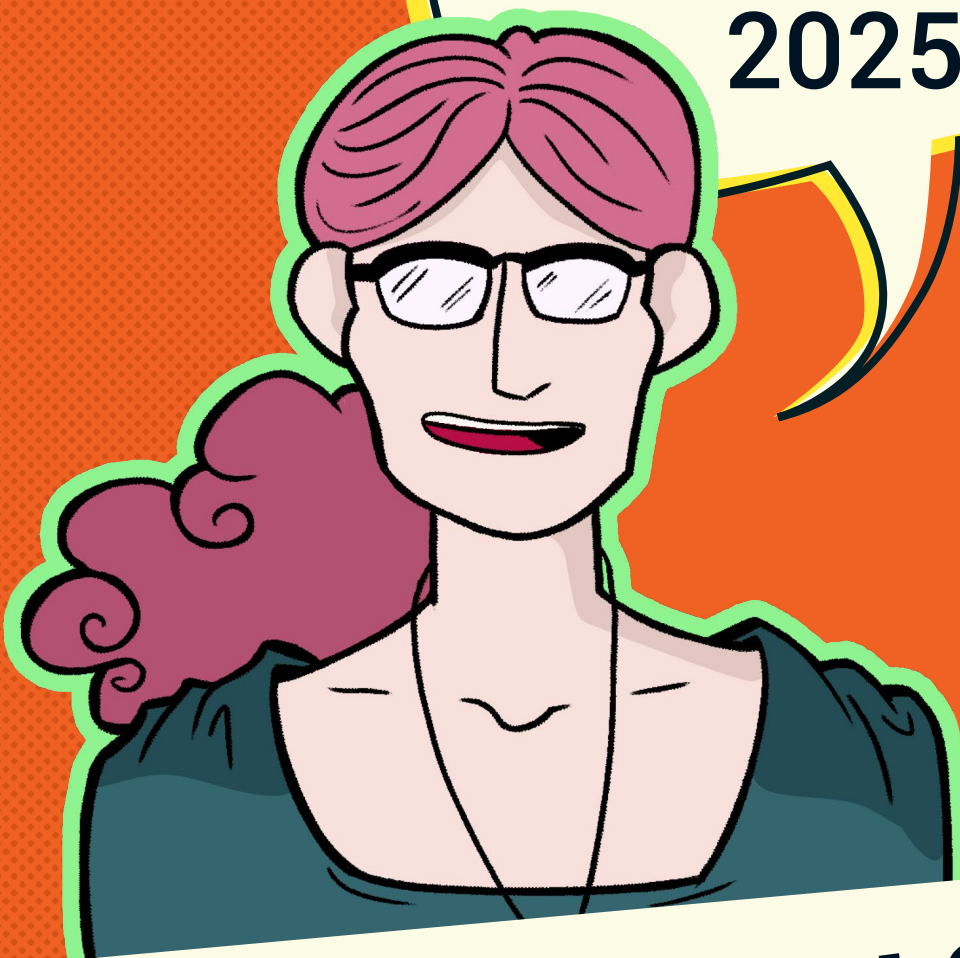
GOSH 2022 convened members, both old and new, of the **GOSH community** from around the world. Delegates from the Americas, Africa, Asia, Europe and Oceania gathered to discuss, collaborate, build, design, and pave the way to make **open science hardware** ubiquitous by 2025.

Our presence at this event was a serendipitous encounter with a hacker living in the jungle, without which we would not have learned about this whole community. This document is a small summary of some of the conversations overhead while attending this event. ■



# Some quotes from the stage...

Our mission is to make  
*Open Science*  
*Hardware*  
ubiquitous by  
**2025**



**DR JENNY MOLLOY**



How gatherings  
like this can

***Change***  
and ***Evolve***

as we get closer  
to our goal ?



**MARIA FRANGOS**

We are using this  
gathering to write a

***CONSTITUTION***

please come and  
contribute!



**LIZ BARRY**



# HOW IS GOSH EMPLOYED IN THE NEOTROPICS?





## **ANDY QUITMEYER**

**DIGITAL NATURALISM LABORATORIES**

**dinalab.net**

**@digitalnaturalism**

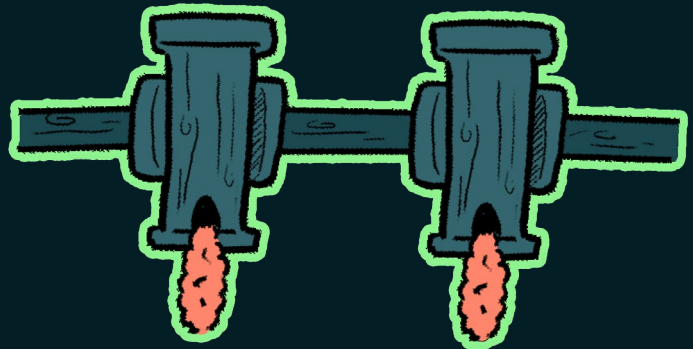
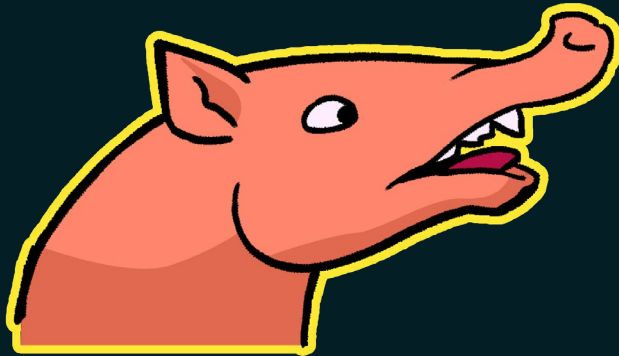
Hacker-adventurer studying intersections between wild animals and computational devices.

He blends biological fieldwork and DIY digital crafting with a community of scientists, artists, designers and engineers from around the world at his Field Station Maker Space in Gamboa.

# SOME OF ANDY'S WORK

## ANIMAL ENRICHMENT TOYS

Collaboration with the Panamerican  
Conservation Association (APPC)



## UPCYCLING

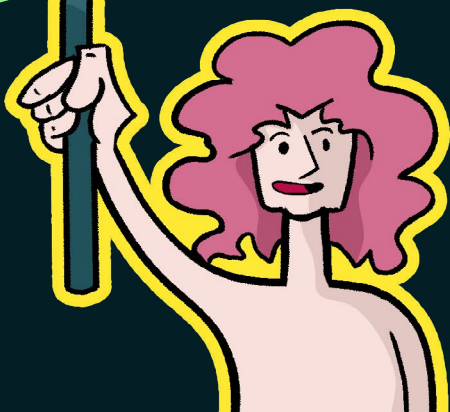
Andy picks up all the plastic  
waste from the Smithsonian  
Tropical Research Institute's  
Gamboa Lab and uses it to  
make swag.



Andy not only co-organized GOSH 2022,  
but made all the upcycled swag for the event.

# AN *UN* CONFERENCE

EVERYONE  
WHO IS  
HERE IS  
THE RIGHT  
PERSON



**G**OSH gatherings are held in an “**unconference style**”, as set by GOSH’s ever-evolving **Community Events Framework**, a document that sets out suggestions and best practices on how to hold community events.

This means that the majority of the conference is actually **planned and created by the participants once they arrive!** Only a basic structure is pre-planned, and the overall conference is **free to change and evolve** to fit the needs of the participants.■

## **WE NEED TO DOCUMENT AS MUCH AS WE CAN.**

Do it in whatever method you prefer the best.

Drawings are really valuable for notetaking.

Use audio recordings, photos, videos, writing.

Document everything and anything that will capture ideas.



These are some  
suggestions  
about how to  
hold a  
productive  
conversation  
or facilitation  
session experi-  
enced during the  
Unconference.

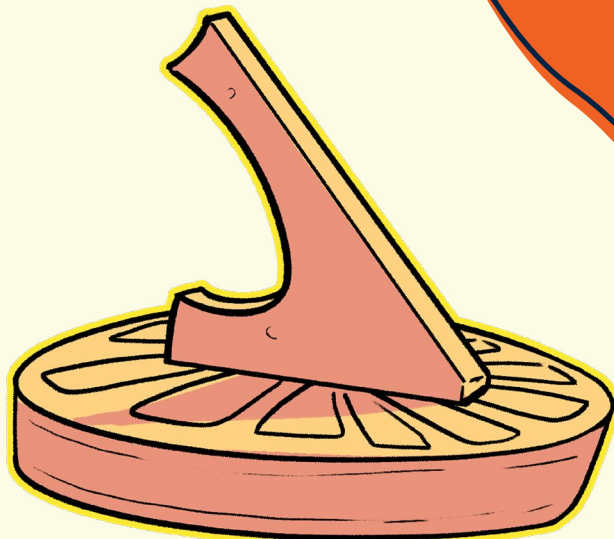
## Bump Stack

During a discussion, some people will contribute more than others. Facilitators keep track of who contributes and **bumps the quiet ones to the top of the stack** to ensure all voices are heard and all opinions considered. The quiet ones are often the deep thinkers!



## One minute – one topic

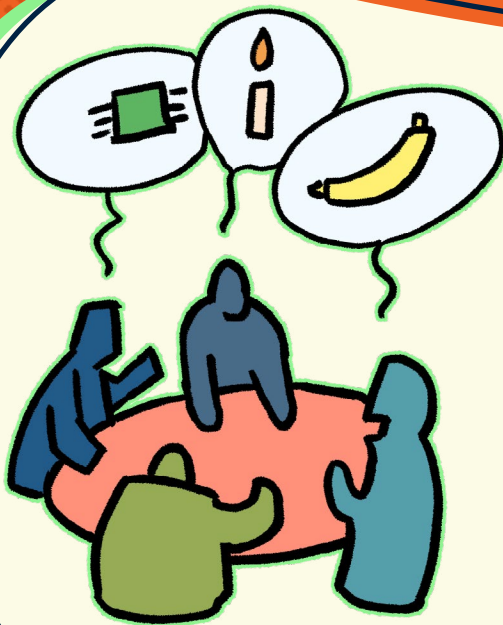
Everyone gets a minute to talk about something, followed by a minute's break to **think** about it.



## Problem solving...

The *real value* is in how we develop the *ontology or methodology* that really solves the *problem*.

And that is the  
**SPECIAL SAUCE**



## Just talk, we'll give you solutions

A method in which **every person** has a full three minutes to lay out their problem. The rest of the group **listens** and then **offers solutions to the problem**. This technique is to allow for a **variety and breadth of experience** to brainstorm solutions to specific problems.

# And finally, some quotes from participants

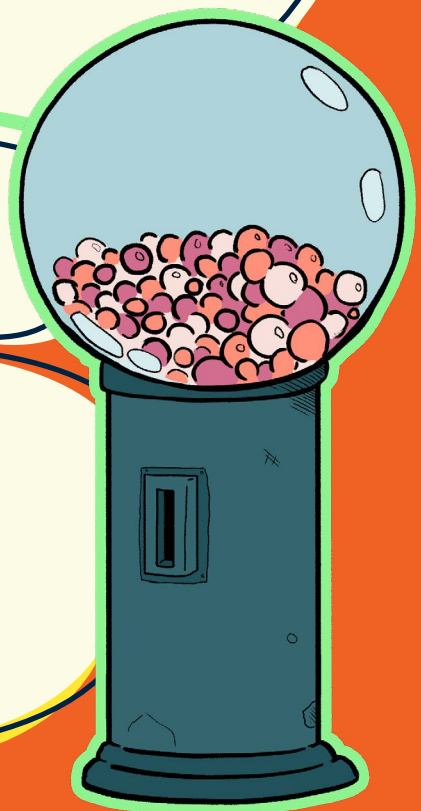
**Solutions** need to be  
**relevant** to a community.

Just what the hell does  
**ubiquitous** mean?

Distribution of community  
**resources** through **open**  
**source software.**

Connection to a  
**global network.**

Locally build module  
to support **solving**  
**local problems.**



# What is Outreach?

*A conversation with Jay Poh and Ian Cooke-Tapia about outreach in OSch, what it looks like, and how it takes place.*

Outreach is when you work with live/fluid/changing/active interactions rather than passive or static relationships. For communication to become outreach, there has to be a **back and forth** between different stakeholders towards the creation of a common goal.

**Whatever definition we employ,  
we still have to ask of outreach:**

**WHO DOES IT?**

**WHY IS IT?**

**WHO DOES NOT DO IT?**



# An Outsider's Questions to OScH

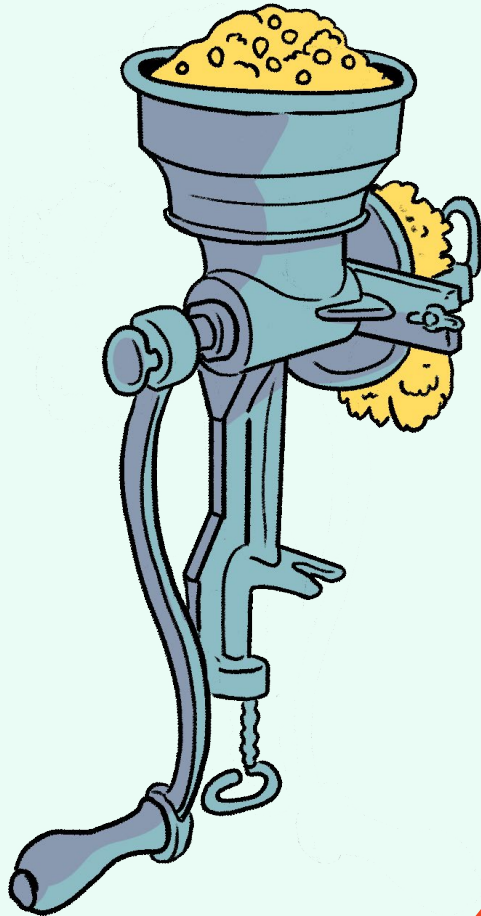
If coding and open source practices are so open source and available for all to learn and to build lives and careers around, why some people get into it and some don't?

Why programmes try to develop a tech-savvy population function in some places but not in others?

What are the individual and intrinsic motivations and what are the wider, external motivations?

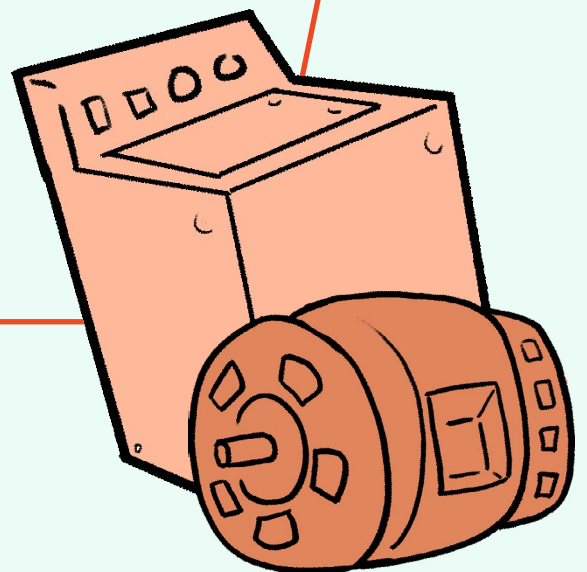
And are these barriers to ensuring that OScH becomes ubiquitous, or are they starting points to build outreach projects and programmes?

# Innovation Distribution at a Local Level

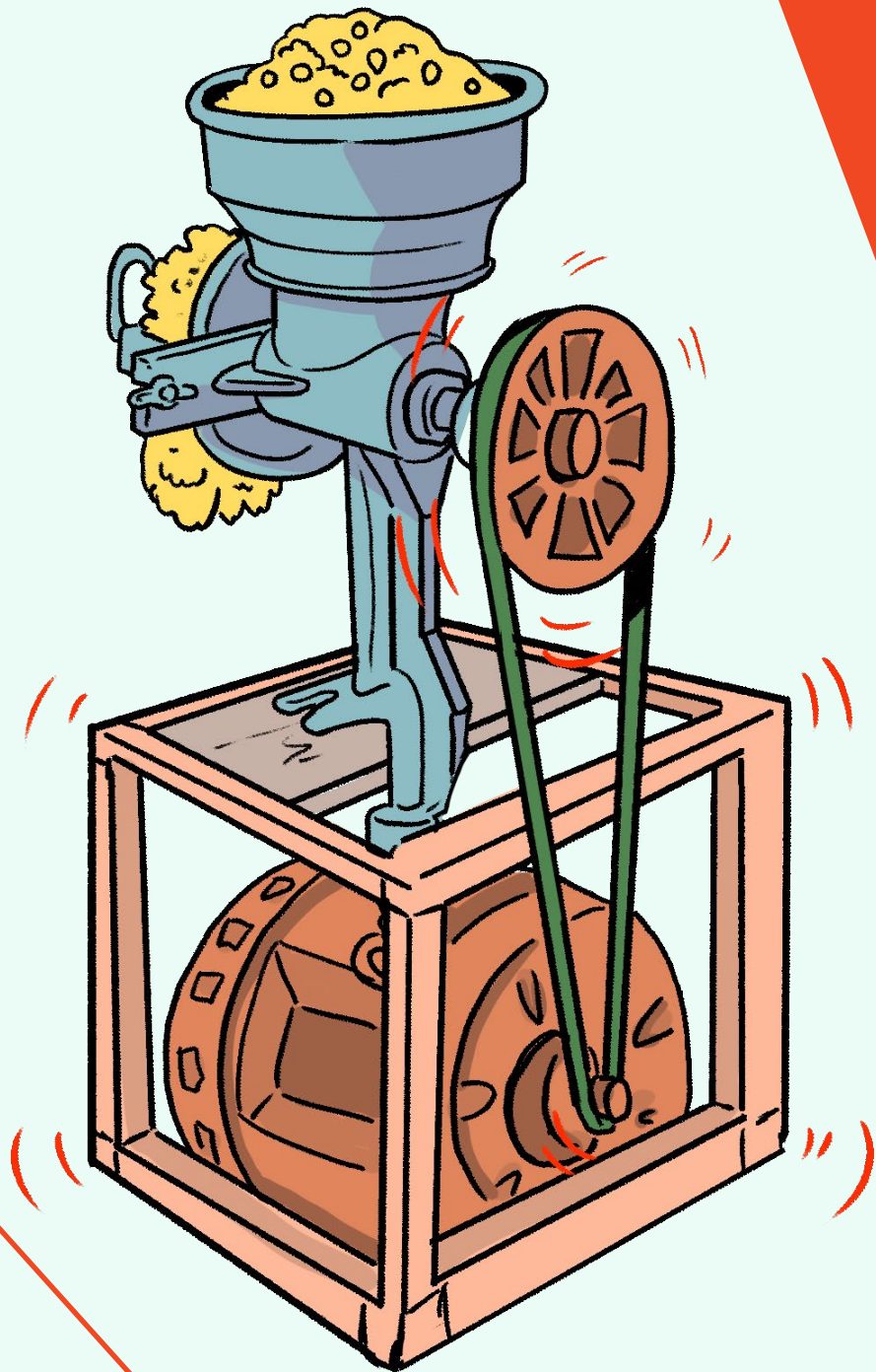


Hand cranked corn grinders are a common rural steel tool, used to make delicious tortillas in a labor intensive process.

When a person with arthritis asked a local steelworker if they could make something to help, the repair person realised they could rig old washing machine engines to create an electrical corn grinder.



After seeing it used, other locals started asking the steelworker for a similar system, which allowed the steelworker to iterate and improve on the design.



Currently, the steelworker offers this as a bespoke service, and the idea is spreading farther out ■



# THANK YOU FOR READING!

This illustrated summary was initiated, drawn on site, edited and designed by **Cooked Illustrations** for the **Gathering of Open Science Hardware** 2022 Conference taking place in Panama City, Panama.



To find out more about Cooked Illustrations' science and research communication work, go to:

<https://cookedillustrations.com>



**GOSH**  
Gathering for Open  
Science Hardware

To find out more about GOSH's work and projects, go to:

<https://openhardware.science>

