Open Hardware Hackathon 2021

Host and organise on the Open Lab Team, in the Hackathon Channel:
https://teams.microsoft.com/l/channel/19%3a5gvXCoTRbAAfQrMANdzPtKo7NvzS3esY6kPy
DPiGUx81%40thread.tacv2/General?groupId=3875ffd2-4d3e-4c5c-8929-
b9fef2e60e5e&tenantId=4ffa3bc4-ecfc-48c0-9080-f5e43ff90e5f

For more info, contact a.d.edwards@reading.ac.uk or other organising team members:
- Ruya Meltem Sariyer r.sariyer@pgr.reading.ac.uk
-
-
Or join the organising team!

Working title:
Micro-Bio-Hack: a small hackathon about Microbiology, Microfluidics, and Microscopy

What is Open Hardware? What is Open Source?
Whilst open hardware is like many things complex when you look closely, the basic principle is simple:
Develop hardware (pretty much anything you can think of: from circuit boards to complete lab instruments, ranging from complex microscopes to simple 3D objects)
Publish a full list of components
Publish the design of any custom components
Publish instructions on how to make
Publish guide for how to use
Publish using an open license, to allow anyone to adapt or re-use

Open Source software is quite widely known to have become a critical segment of computing, from semi-open (Android), to fully open. Open Source hardware may be following and building on this, but there remain significant differences, and some serious barriers.
Why 3D printing helps Open Hardware but is not the whole story
Open Hardware isn't just about 3D printing. Mostly it doesn't need 3D printing. Often 3D printing is the worst way to make hardware.
However: almost all hardware needs some custom bits (not just off-the-shelf components), and often the best way to make these custom components on a small scale is to 3D print them. 3D printing makes it easy to replicate simple plastic parts of many different shapes. 3D printing is just like 2D printing- harder than you think, but nearly anyone can do it now.

Examples of success of Open Hardware
Desktop 3D printing
Rapid prototyping has been common for many decades, but cheap, simple, melted plastic based 3D printing only came to our homes through Open Source "RepRap" 3D printer movement, driven by hobbyists and enthusiasts, but now mainstream.
Raspberry Pi and Arduino
The Raspberry Pi is a single board computer platform/ecosystem, that has spread dramatically and allowed many people (myself included) to build computer systems cheaply and easily. Interestingly, it's not fully Open Source. Arduino likewise for microcontrollers. So if you want to build a custom computer or robot, it's cheap and easy. Much of the software

and hardware around these systems is very well documented online, so you can use it even without proper training (!).
CERN has increasingly used open source hardware, rather than just buying instruments.

DRAFT Timetable

Day	Time	Activity	What?
Friday 10th September	Lunchtime	Launch, plenary talks	Hear about the Hack, learn about open hardware
	Afternoon	Team formation Hardware session	Build a digital microscope Get help
Weekend	*Any time*	*Build your team's open hardware project*	*HACK*
Monday 13th September	Morning	Hardware session	Finish building your microscope, take some pictures Get help
	Afternoon	Team presentations Judging Grand prizegiving	Win a prize for your amazing open hardware team project

Hackathon Activity: Hardware session

Everyone gets to build and operate a digital microscope. The winner will take it home!

We will supply parts for each team to build OpenFlexure microscopes, but you are welcome to choose a different design.
The three main activities you will complete are:
Mechanical: assemble microscope
Computer: run your Raspberry Pi headless; connect via VNC and via OpenFlexure servo
Operate: look at small things with your digital microscope

What to bring: we will need teams to run Raspberry Pi computers, which is easiest if you have a HDMI monitor, and USB keyboard + mouse. However, they can be run remotely via wifi using a laptop, if you install VNC or OpenFlexure microscope software.
We will try to supply enough monitors and keyboard/mice for each team, but if you can bring these (or bring your own Raspberry Pi) that would be helpful.

Hackathon task: Team projects

We will form teams, ideally new teams with mixed backgrounds, to spark new ideas and to solve problems faster.
Each team will develop their own open hardware project to pitch, and at the final session all teams will present their project in 3 minutes.
Hackathons typically lead to presentations of a micro business plan or 'hack', this presentation should demonstrate:
WHAT: What is the idea?
WHY? What can be achieved? What problem can be solved?
HOW? Evidence this can work- e.g. model, prototype, example images, example designs, sketches
WHO CARES? Why does it matter?

Theme and challenges

Our overall theme is Open Hardware: we have a particular interest in hardware for life science research but have no prejudice. Projects should either **develop new open hardware**, or **apply open hardware to** current and future challenges.

Challenges are flexible but we encourage projects in fields such as:
Microbiology: ideas for developing and using open hardware in microbiology
Microscopy: ideas for using open digital microscopes
Healthcare: how can open hardware be used to tackle global health problems
Types of open hardware are also flexible but we envisage projects might develop:
Types of digital microscope
Hardware for health data collection

Prize: TBC
https://www.redbubble.com/shop/ap/35017835
Microscope?

Audience

Whoever is interested in Open Source Hardware!
We hope to include people from very diverse backgrounds, role, experience level and career stage
From masters student to professor; from healthcare, biomedical science and pharmacology to engineering, computing, instrumentation… We also welcome arts and humanities participants, food and agriculture.

We would also like to invite members of rLab Hackspace in Reading:
https://rlab.org.uk/

Funding

I'm exploring both the budget to run, and possible sources of support. Should be inexpensive and several options to support.

Links

links to Open Hardware pages; more to be added!
GOSH
https://openhardware.science/

CERN
https://ohwr.org/welcome

Al's open hardware stuff:
https://centaur.reading.ac.uk/89600/7/OpenResearchCaseStudy-2020-Edwards.pdf

https://hackaday.com/2019/11/30/robot-vs-superbug/

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0224878