

The use of open source hardware in the medical field

Biohacking in the medical field: Perspectives for developing countries

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Open Neuroscience



Brief Intro

- 2013/1 → **openeuroscience.com** started
 - Open source projects related to Neuroscience
- 2013/2 → Open source adviser @ Trendinafrica.org
 - Organization of open labware workshops
 - development of open source tools
- 2015 → Editor of PLoS channel: Open source toolkit
 - Curation and collection open source projects for science
 - Send your projects!

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Open Source/Open Access

- Culture/philosophy “started” in the ~60s
 - Mainly computer software/drivers
- all blueprints are shared
 - Information is free (as in freedom)



<http://www.hdwallpaperspulse.com/wp-content/uploads/2016/08/08/green-android-logo-image.png>



<https://www.wikipedia.org/>

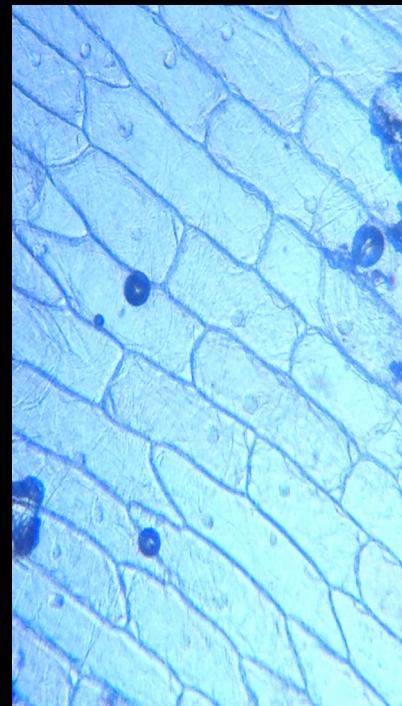
Open Source/Open Access

- No intellectual property or patents
 - Existing companies sell service
 - Leading to fairer prices and access
- Hardware
 - Also around for some years
 - Gained power with:
 - Price drop in electronics
 - DIY manufacturing tools (3D printers, laser cutters, etc)
 - Online repositories

The use of open source hardware

- Open source hardware → defined by OSHWA:
 - Hardware needs to be released with documentation
 - Software for the hardware must be open (or easy to make open)
 - Redistribution agnostic (derivation, businesses, hobbyists, etc)
 - Attribution
 - No discrimination (persons and endeavor)

Diagnostics



**Off the shelf
components +
smartphone**

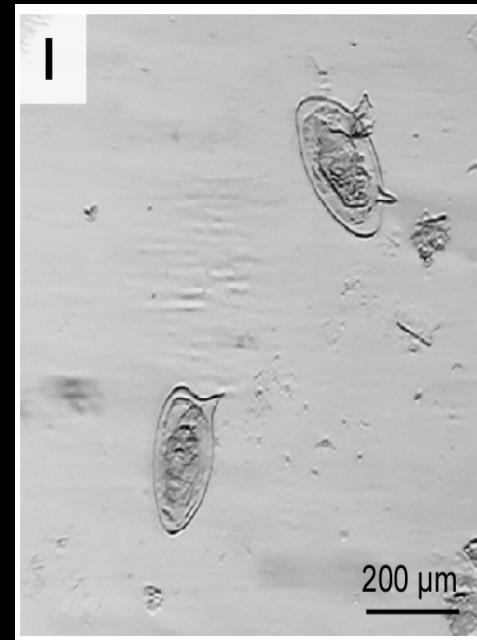
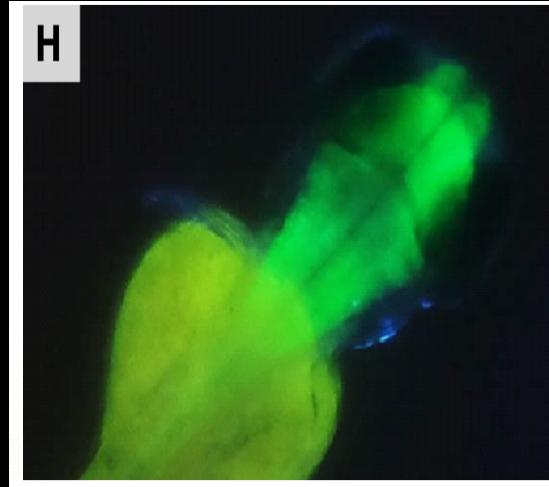
10€ worth of materials

Assembled in 30 min

Digital data

<http://www.instructables.com/id/10-Smartphone-to-digital-microscope-conversion/>

Diagnostics



FlyPi

100€ in materials

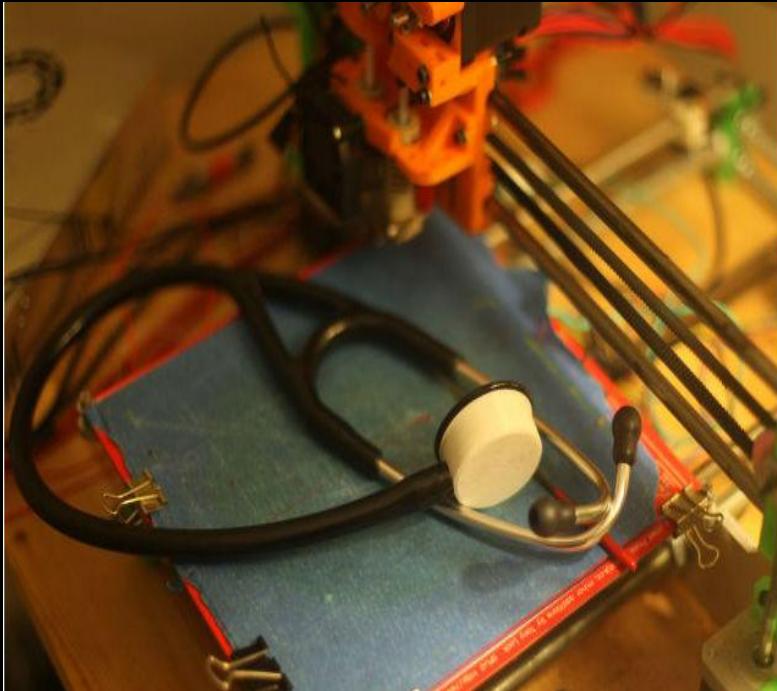
Portable

Full fledged computer

Diagnostics + experiments

Remote control

Diagnostics



3D printed esthetoscope

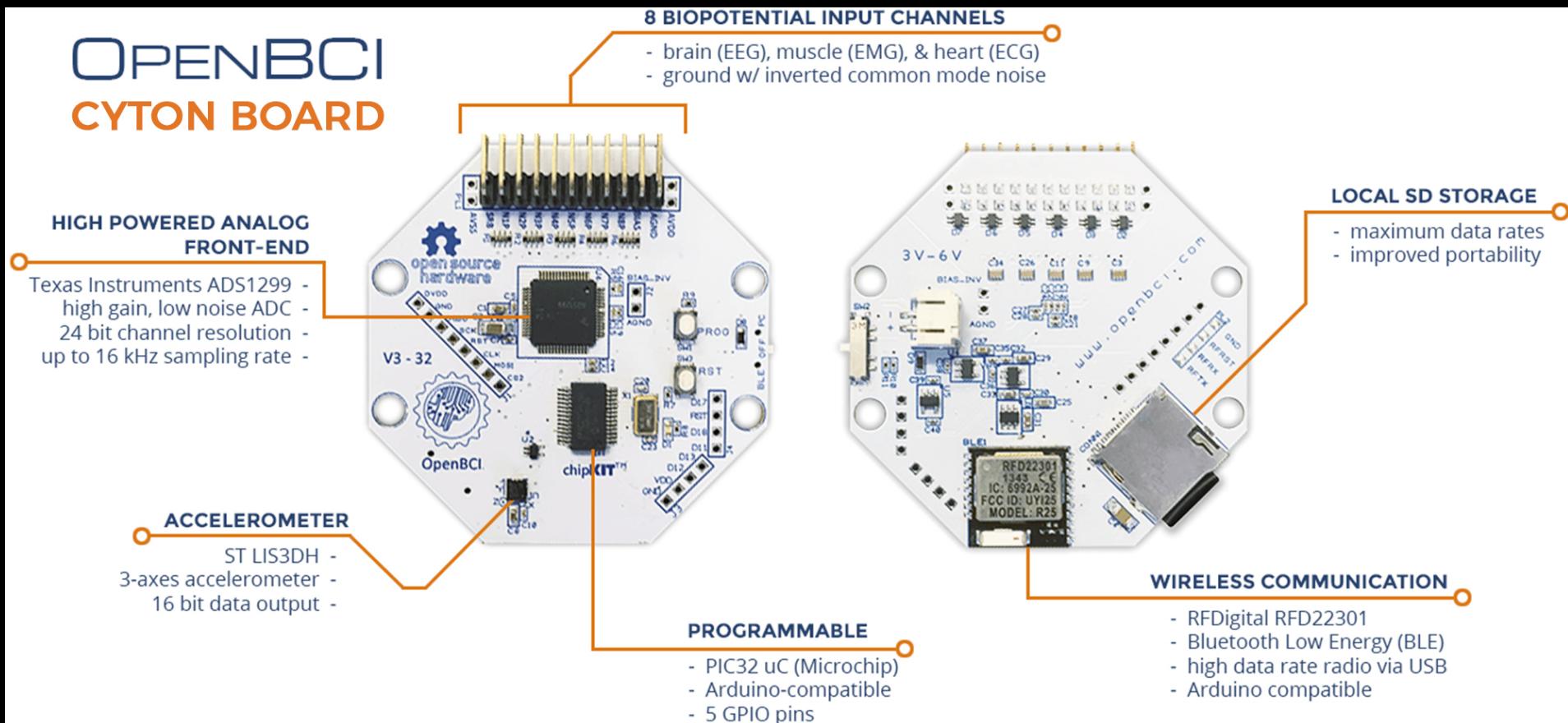
5€ in parts

3D printed parts

**Matches Littmann cardio3
(market leader)**

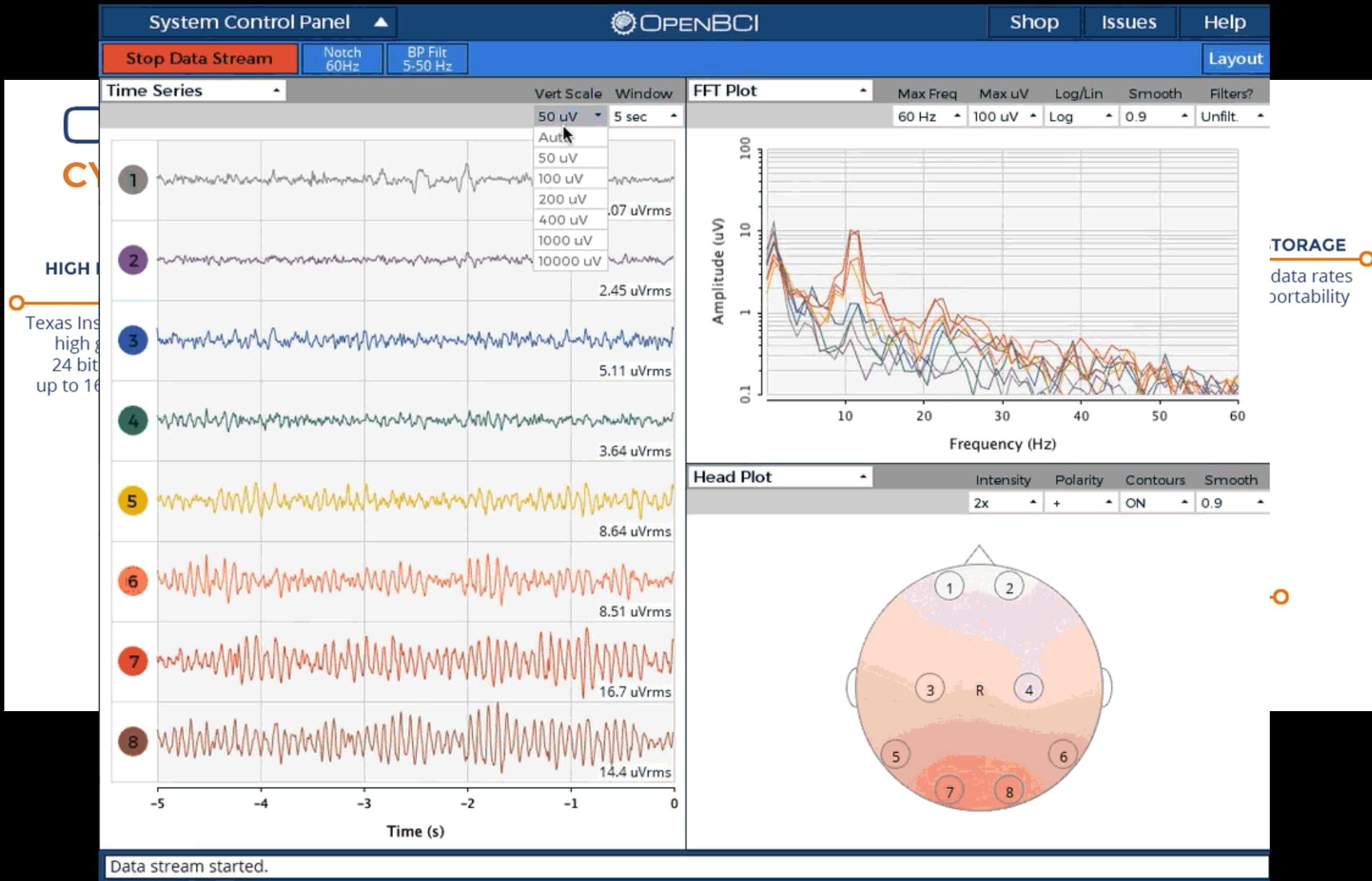
[https://github.com/
GliaX](https://github.com/GliaX)

Diagnostics



Open BCI: EEG, ECG, EMG

Diagnostics



Prostheses



Open Biomedical

Printed parts

Customizable

~10€ in materials

www.openbiomedical.org/

Prostheses

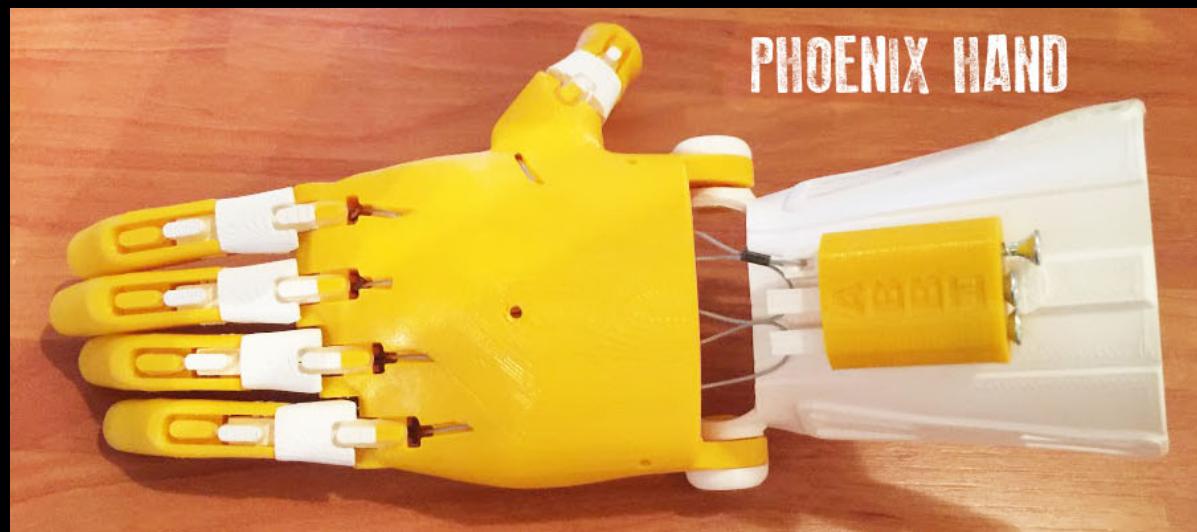


Enabling the Future

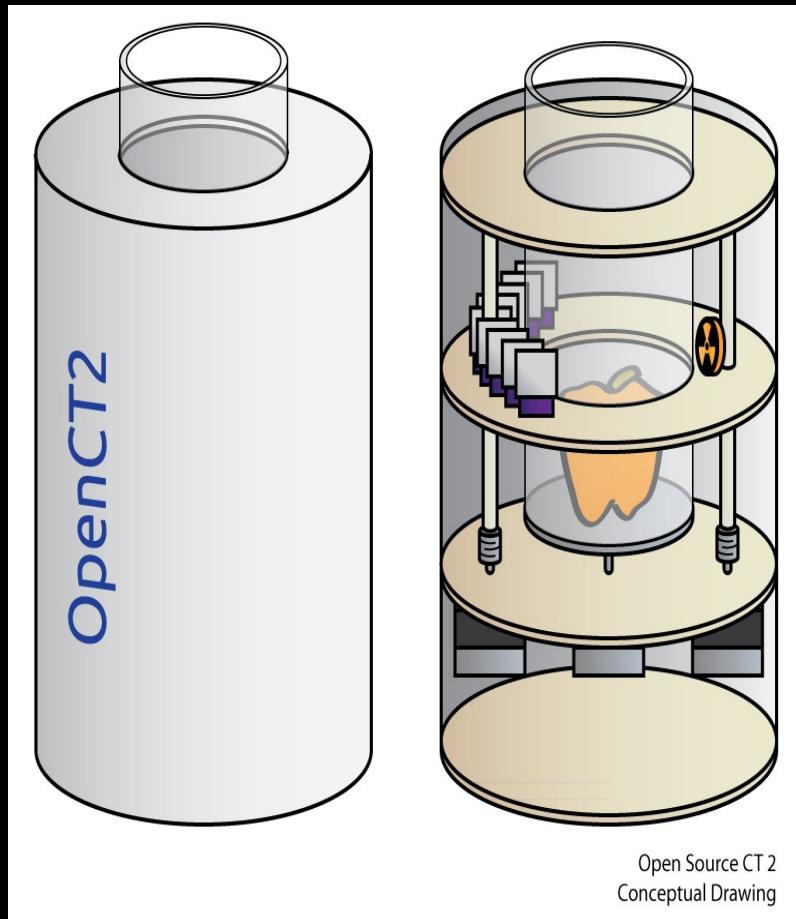
Printed parts

Customizable

3-15€ in materials



Teaching/development candidate



Low resolution CT scanner

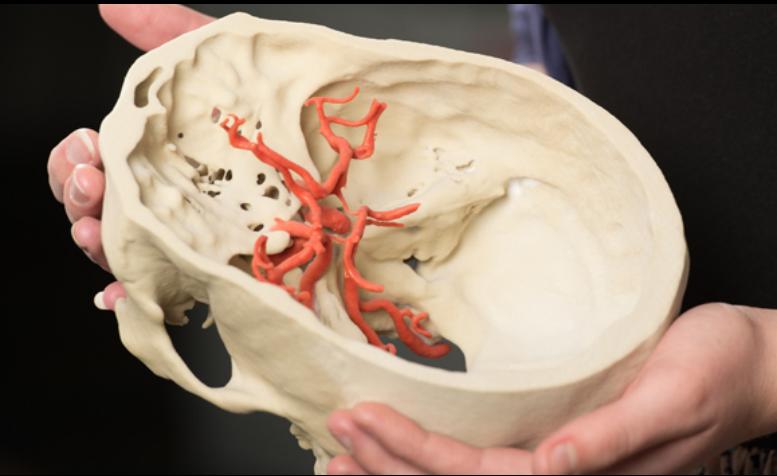
Early stages of development

Teaching tool

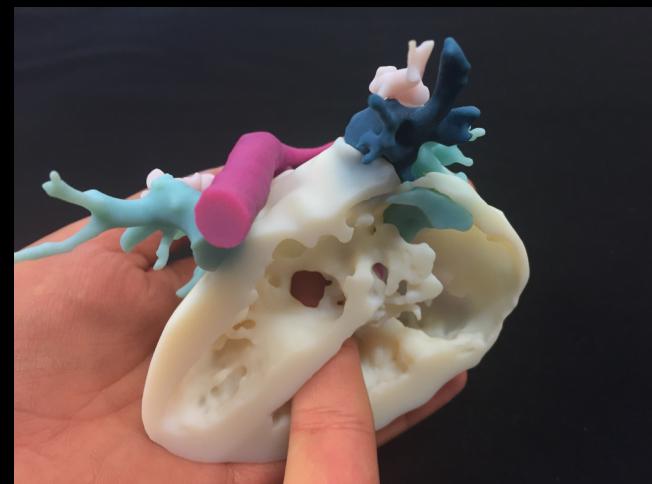
Possible OS CT scanner after
more development

<https://cdn.hackaday.io/images/5155041432430433830.jpg>

Teaching anatomy



<http://www.capinc.com/wp-content/uploads/2016/08/3d-printing-skull.jpg>



https://assets.entrepreneur.com/images/misc/1486227983_A%203D%20printed%20anatomical%20model.JPG

These and many other anatomical models NIH 3D exchange

Hardware repositories

(keywords for google)

- Hackteria
- Open Neuroscience
- PLOS open source toolkit channel
- Hackaday.io
- Thingiverse
- NIH 3D Exchange
- Docubricks
- Journal of Open Hardware
- Open source + “the name of the tool”

Summary

- Open source hardware:
 - Decentralized development
 - Customizable for specific needs/regions
 - Serviceable
 - Innovation potential
 - Business opportunity

Thank you for your attention!

Questions?