

Open

Neuroscience:

**Challenging scientific barriers with Open
Source & Open Science tools**

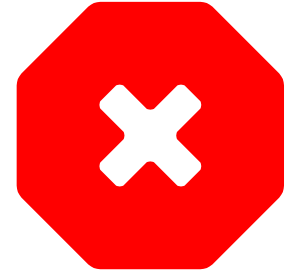
SONA & TRenD in Africa Webinar Series 12/05/2020

[Seminar recording](#)

Open Neuroscience

- Academic barriers & practical issues
- Open Solutions
- Open Solutions @ TReND in Africa
- Q&A

Academic Barriers



Cost

For tools/literature shuts many people out of research.

Lack of access

Even with necessary funds, supply chains do not reach labs/schools globally

Irreproducibility

Even when costs and access are taken care of, we are still facing a reproducibility crisis.

Cost

- Publications

Access options

Rent or Buy article

Get time limited or full article
access on ReadCube.

from \$8.99

Rent or Buy

All prices are NET prices.

Subscribe to Journal

Get full journal access
for 1 year

£198.00
only £3.88 per issue

Subscribe

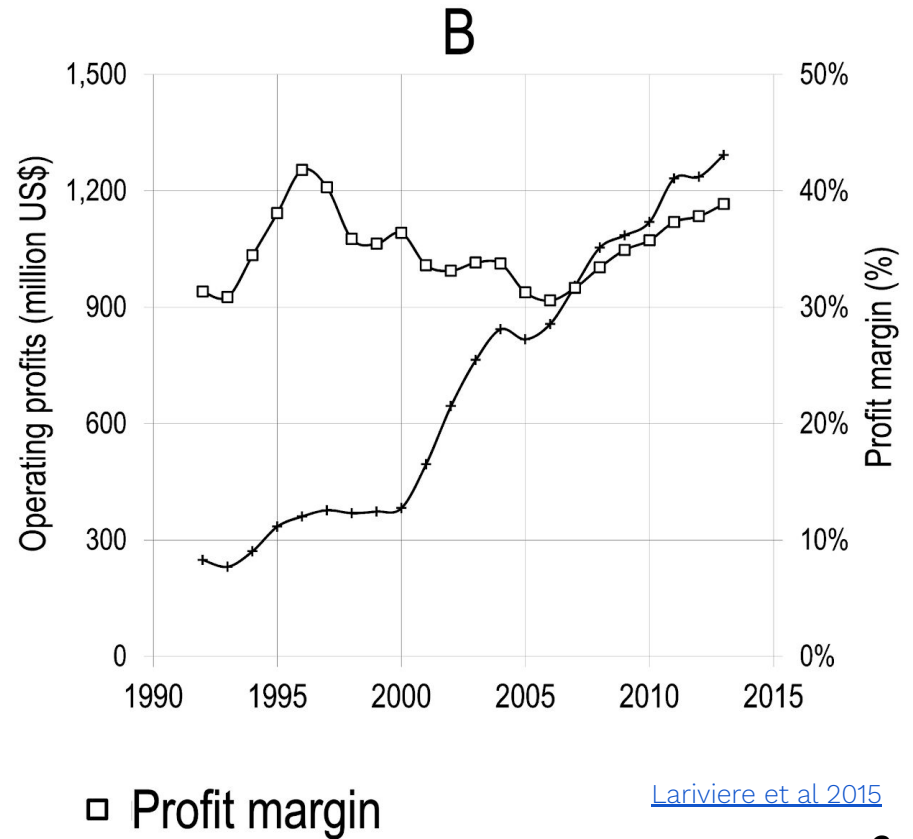
All prices include VAT for United Kingdom.

Additional access options:

- [Log in](#)
- [Access through your institution](#)
- [Learn about institutional subscriptions](#)

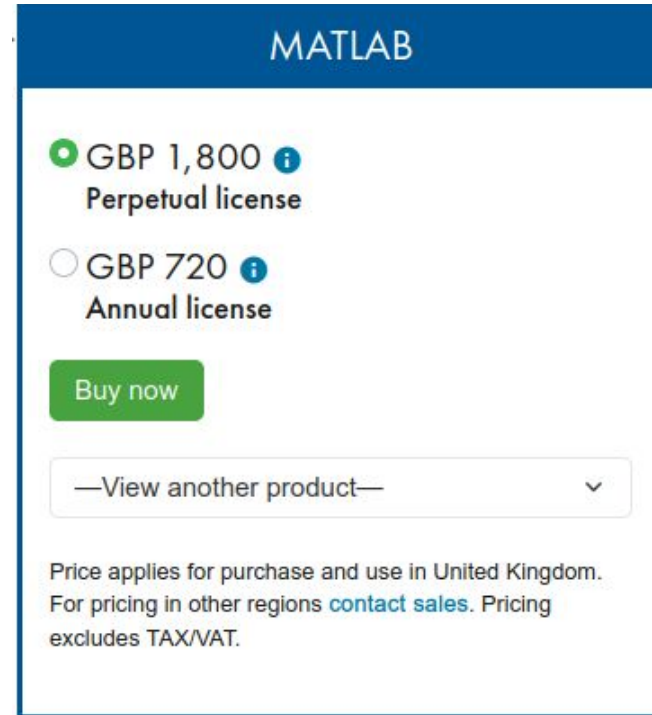
Cost

- Publications



Cost

- Publications
- **Software**



The image shows a screenshot of the MATLAB purchase options page. At the top, the word "MATLAB" is displayed in white on a blue background. Below this, there are two radio button options: "GBP 1,800 Perpetual license" (selected) and "GBP 720 Annual license". A green "Buy now" button is positioned below the options. Underneath the button is a dropdown menu with the text "—View another product—". At the bottom of the screenshot, there is a disclaimer: "Price applies for purchase and use in United Kingdom. For pricing in other regions contact sales. Pricing excludes TAX/VAT."

From MATLAB [website](#) 10/05/2020

Comment | [Open Access](#)

Gene name errors are widespread in the scientific literature

Mark Ziemann, Yotam Eren and Assam El-Osta ✉

Genome Biology 2016 17:177

<https://doi.org/10.1186/s13059-016-1044-7> | © The Author(s). 2016

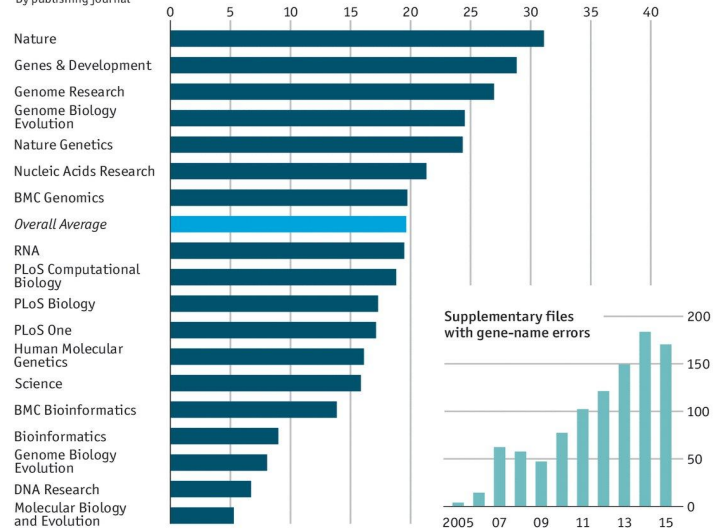
Published: 23 August 2016

Cost

- Publications
- **Software**

#VALUE! error

Genomics papers with spreadsheet errors in supplementary files, 2005-15, %
By publishing journal



Source: "Gene name errors are now widespread in the scientific literature", Ziemann, Eren and El-Osta, 2016

Economist.com

Cost / Lack of access

- Publications
- Software
- **Equipment**



[By Chad Anderson, CC BY-SA 2.0](#)



[By Zephyris at the English language Wikipedia, CC BY-SA 3.0](#)

5000£ microscope

Irreproducibility

Peer review post-mortem: how a flawed aging study was published in Nature

How could an article with numerous shortcomings be published in top-tier journal Nature? Hester van Santen reveals how the gate-keepers of science knowingly let flawed research slip through.

🔗 Hester van Santen © 9 december 2016 om 6:00

“Nature asks reviewers to look at statistics “if time is available”

Irreproducibility

NATURE | NEWS



Over half of psychology studies fail reproducibility test

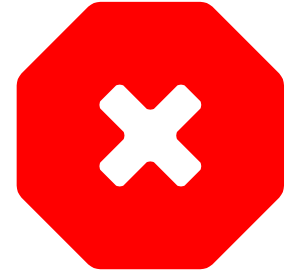
Largest replication study to date casts doubt on many published positive results.

[Monya Baker](#)

27 August 2015

100 studies

Academic Barriers



LACK OF TRANSPARENCY

**“Nothing good ever came from secrecy
(except surprise parties...)”**

OPEN SOURCE



Everything (code, hardware design, protocols, cake recipes) created and shared freely via licenses (GNU, Creative Commons, OSHWA, and many other), using any means at hand (Internet, usb sticks, recipe notes)

SECTION 1
CORPORATE USE

#FUTUREOFSS
@FUTUREOFSS



78% OF COMPANIES
RUN ON OPEN SOURCE

LESS THAN 3%
DON'T USE OSS IN ANY WAY

[source](#)

Open Source



TOTAL TRANSPARENCY

**“Given enough eyeballs
all problems become trivial”**

bioRxiv
beta
THE PREPRINT SERVER FOR BIOLOGY

arXiv.org

Ψ
A X
PsyArXiv

Open Solutions



Afric  ArXiv

Review
COMMONS

- Publications


PLOS

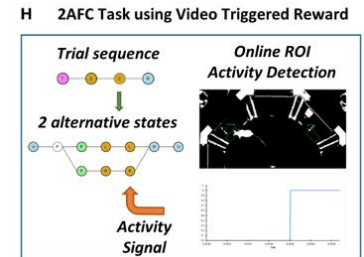
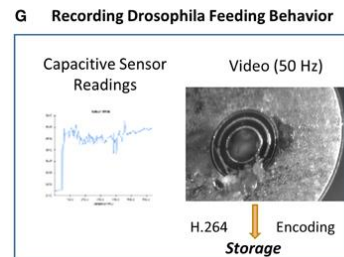
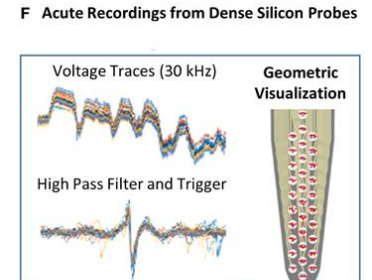
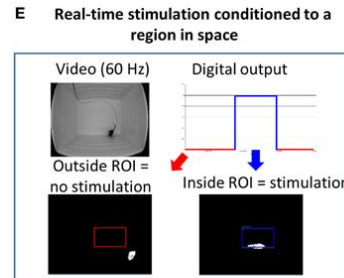
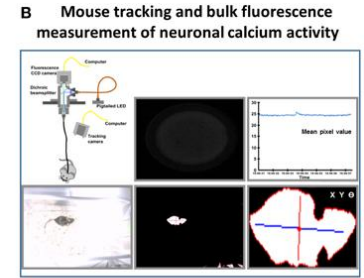
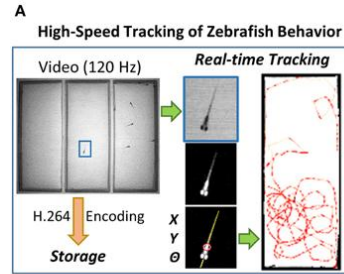
 eLIFE



Open Solutions

- Publications
- **Software**

[Lopes et al 2015](#)

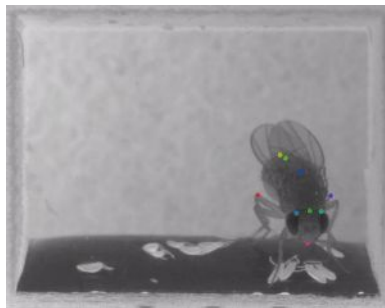


Open Solutions

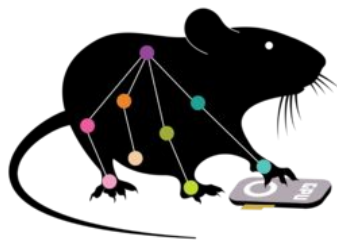
- Publications
- **Software**



DeepLabCut:
a software package for
animal pose estimation

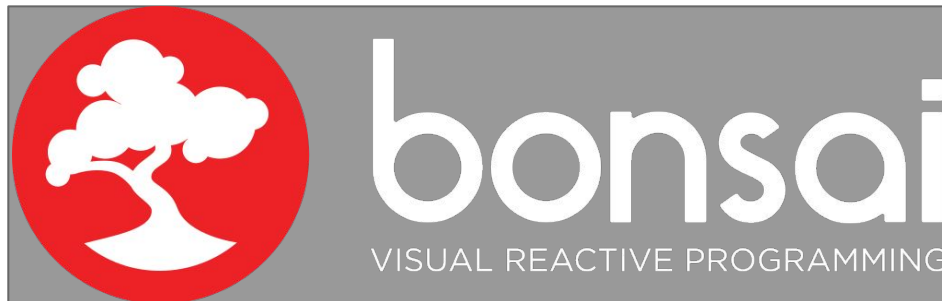


Open Solutions



DeepLabCut:
a software package for
animal pose estimation

+



- Publications
- **Software**

Open Solutions



Project Jupyter exists to develop open-source software, open-standards, and services for interactive computing across dozens of programming languages.

- Publications
- **Software**

Open Solutions

- Publications
- **Software**



Project Jupyter exists to develop open-source software, open-standards, and services for interactive computing across dozens of programming languages.



Turn a Git repo into a collection of interactive
notebooks

Have a repository full of Jupyter notebooks? With Binder, open those notebooks in an executable environment, making your code immediately reproducible by anyone, anywhere.

[mybinder](https://mybinder.org)

21

Open Solutions

- Publications
- **Software**

OpenSesame

EEGLAB

neo



GraphicsMagick

ACQ4

Psychtoolbox-3

TensorFlow™



Jupyter



eLabFTW

NeuroDebian

PsychoPy

Psychology software in Python



PyMVPA

BROCCOLI

µManager

ImageJ

Image Processing and Analysis in Java



GNU Octave

ALLEN BRAIN ATLAS

DATA PORTAL



Bonsai

BrainBrowser

v2.5.2

BRIAN

JASP

SPM

GNU PSPP

iPipet

nipy.org



neural ensemble.org



BioJS Blog

neurosynth



SpikeGadgets

Software



OpenWorm

Building the first digital life form. Open source.



BIO-TRACKING



FreeSurfer

pySPACE

Kinectotherapy

Open Solutions



General purpose language

Jackknife of packages:

- Hardware control
- Web development
- User interfaces
- Data analysis
- and much more!

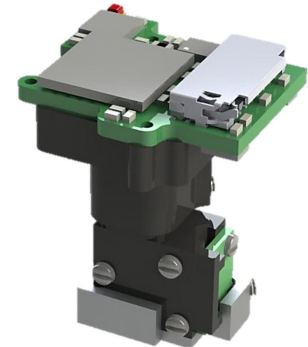
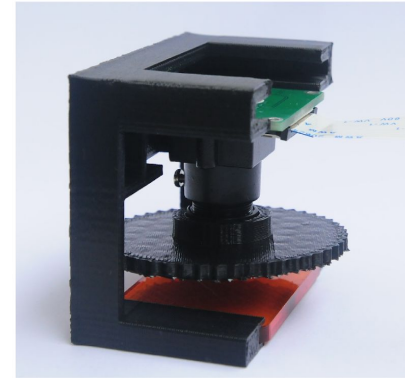


Statistics and plotting language:

- High quality plots
- Integrated environment
- Easily extendable
- Effective data handling
- and Much more!

Open Solutions

- Publications
- Software
- **Equipment**



Open Solutions



COMMUNITY PAGE

The €100 lab: A 3D-printable open-source platform for fluorescence microscopy, optogenetics, and accurate temperature control during behaviour of zebrafish, *Drosophila*, and *Caenorhabditis elegans*

Andre Maia Chagas^{1,2,3,4*}, Lucia L. Prieto-Godino^{3,5}, Aristides B. Arrenberg^{1,6}, Tom Baden^{1,3,4,7*}

1 Werner Reichardt Centre for Integrative Neuroscience, University of Tübingen, Tübingen, Germany, 2 Graduate school for Neural and Behavioural Neuroscience, University of Tübingen, Tübingen, Germany, 3 TReND in Africa gUG, Bonn, Germany, 4 Institute of Ophthalmic Research, University of Tübingen, Tübingen, Germany, 5 Center of Integrative Genomics, University of Lausanne, Lausanne, Switzerland, 6 Institute of Neurobiology, University of Tübingen, Tübingen, Germany, 7 School of Life Sciences, University of Sussex, Brighton, United Kingdom

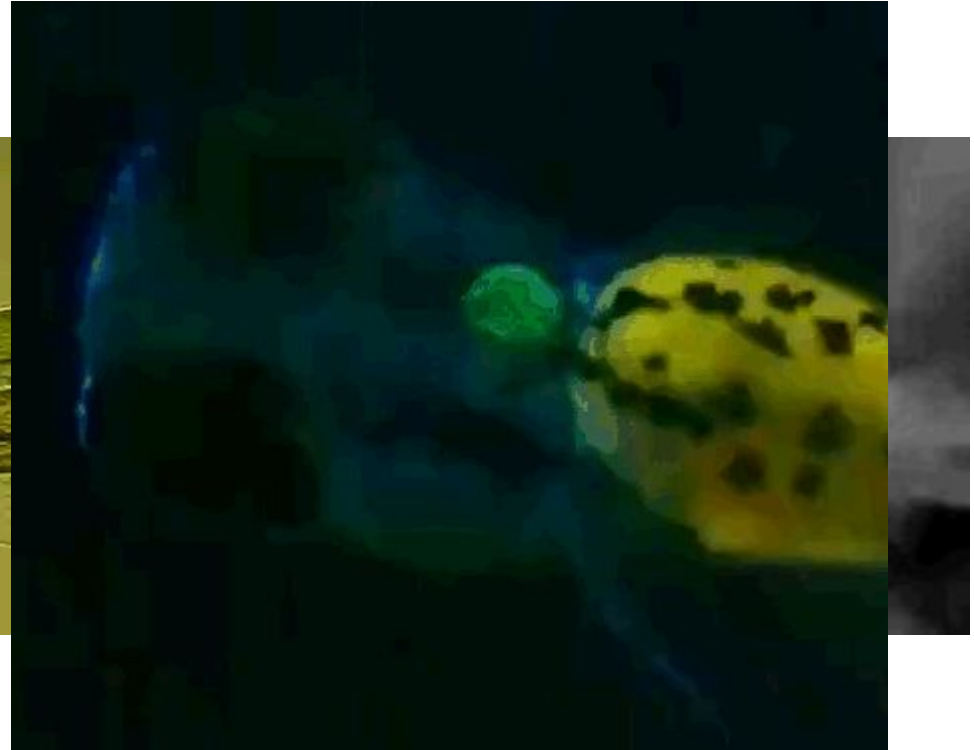
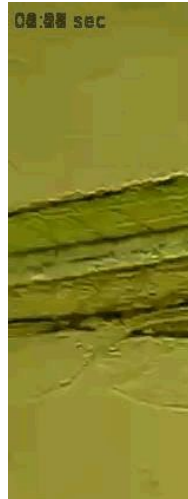
*andremaia.chagas@gmail.com (AMC); t.baden@sussex.ac.uk (TB)



 OPEN ACCESS

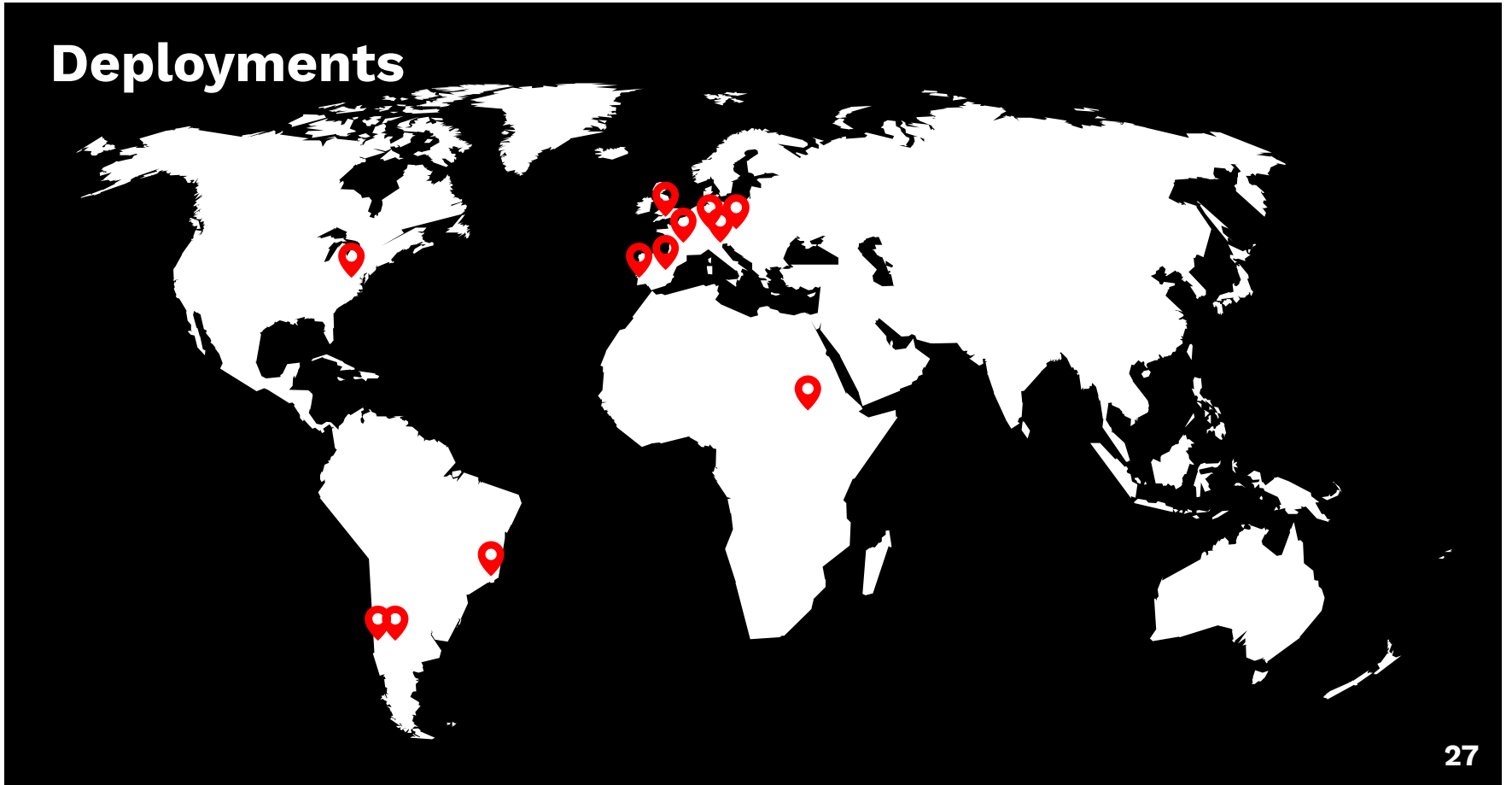
<http://bit.ly/flypipos>

Open Solutions



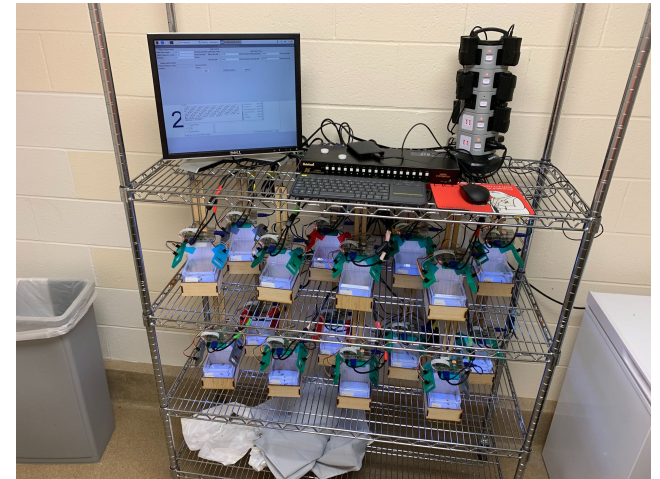
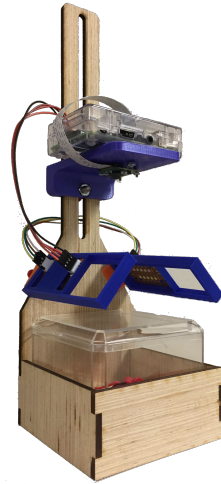
<http://bit.ly/flypipos>

Deployments



Open Solutions

FlyPi inspired:
PiSpy - A cross-disciplinary Bucknell collaboration



<http://bit.ly/flypipos>

[Images by Greg Pask](#)

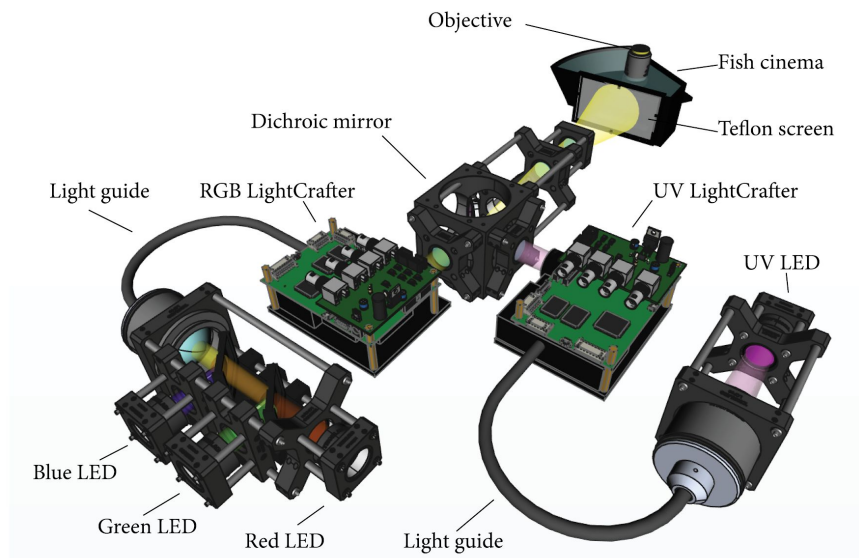
An arbitrary-spectrum spatial visual stimulator for vision research

Katrin Franke, André Maia Chagas, Zhijian Zhao, Maxime JY Zimmermann, Philipp Bartel, Yongrong Qiu, Klaudia P Szatko, Tom Baden, Thomas Euler

University of Tübingen, Germany; University of Sussex, United Kingdom

Open Solutions

- Publications
- Software
- **Equipment**



[Rendering by Maxime Zimmermann](#)

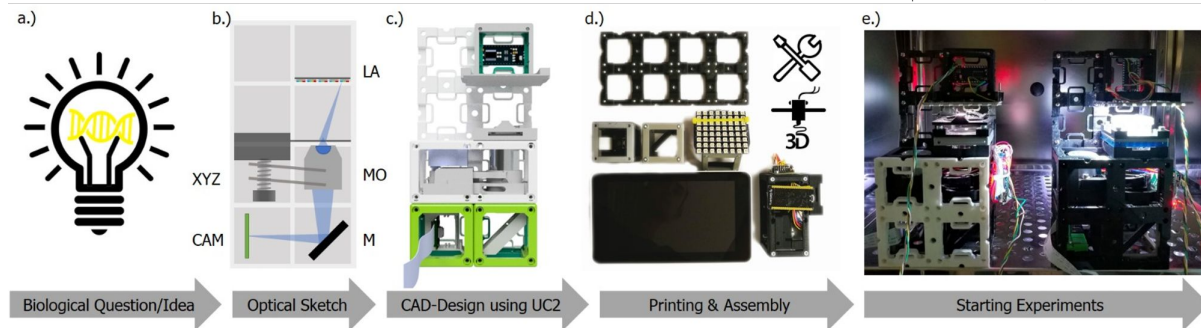
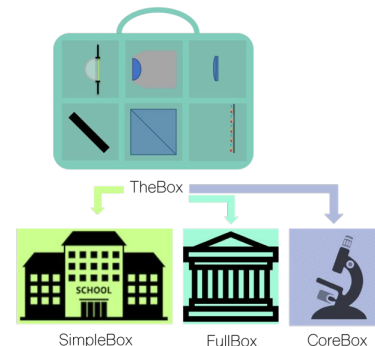
Open Solutions

- Publications
- Software
- **Equipment**



YOU. SEE. TOO.

UC2 –
Open and Modular Optical Toolbox
for Research and Education



[Repository](#)

[Preprint](#)

Open solutions @ TREND



ELSEVIER

Contents lists available at [ScienceDirect](#)

HardwareX

journal homepage: www.elsevier.com/locate/ohx



Hardware Article

Actifield, an automated open source actimeter for rodents

Victor Wumbor-Apin Kumbol^{a,*}, Elikplim Kwesi Ampofo^b, Mary Ayeko Twumasi^b

^aDepartment of Pharmacology, Faculty of Pharmacy & Pharmaceutical Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

^bDepartment of Pharmacognosy, Faculty of Pharmacy & Pharmaceutical Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

Open Solutions

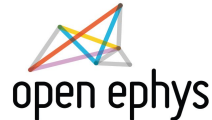
- Publications
- Software
- **Equipment**



Open Solutions

- Publications
- Software
- **Equipment**

Prometheus Science

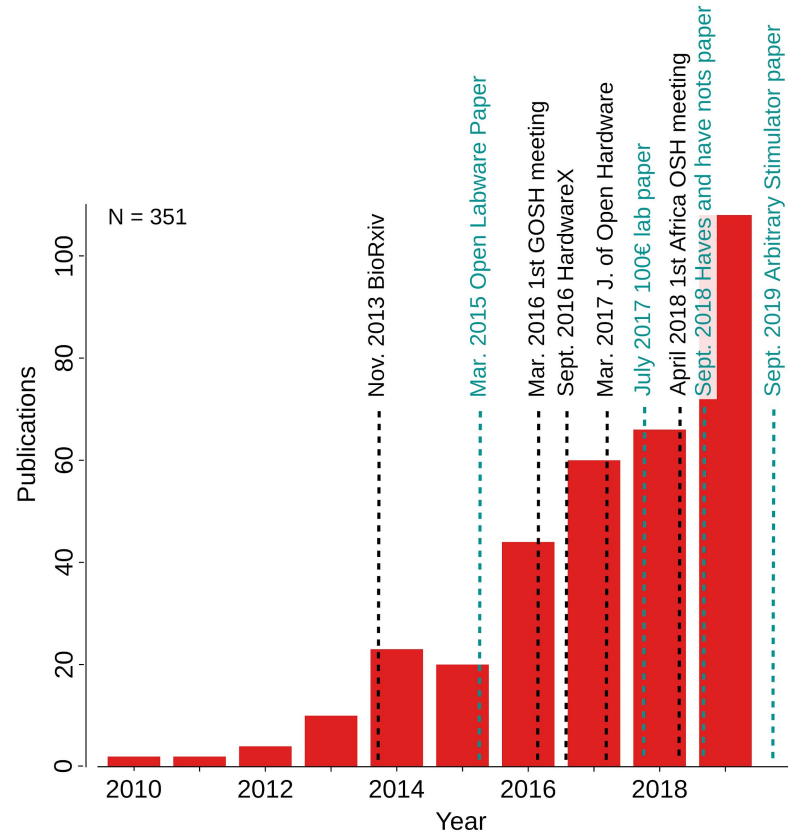


Sam and Tom industries



Open Solutions

- Publications
- Software
- **Equipment**



[Chagas et al in prep](#)

Open Solutions

- Publications
- Software
- Equipment
- **Rapid Response**

COMMUNITY PAGE

Leveraging open hardware to alleviate the burden of COVID-19 on global health systems

Andre Maia Chagas ^{1,2,3*}, **Jennifer C. Molloy** ^{3,4*}, **Lucia L. Prieto-Godino** ^{2,5,6*},
Tom Baden ^{1,2,6,7*}

1 Sussex Neuroscience, School of Life Sciences, University of Sussex, Brighton, United Kingdom, **2** TReND in Africa, Brighton, United Kingdom, **3** Gathering for Open Science Hardware, **4** Department of Chemical Engineering and Biotechnology, University of Cambridge, Cambridge, United Kingdom, **5** The Francis Crick Institute, London, United Kingdom, **6** FENS-KAVLI Network of Excellence, **7** Institute for Ophthalmic Research, University of Tübingen, Tübingen, Germany

Reach out!



DISCOVER

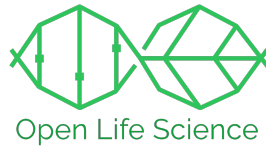
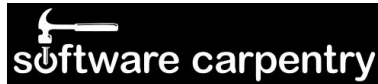
Open Source Toolkit

A global forum for open source hardware and software research and applications



[Lab on the cheap](#)

LEARN

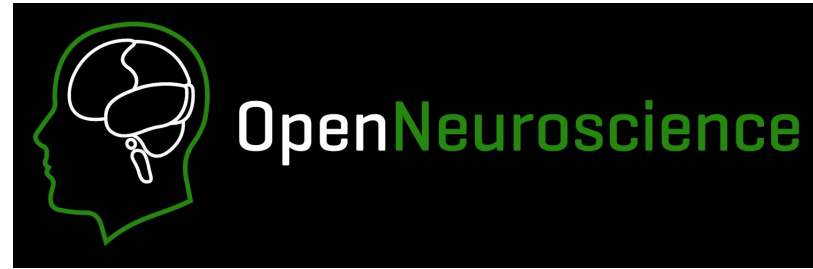


COLLABORATE



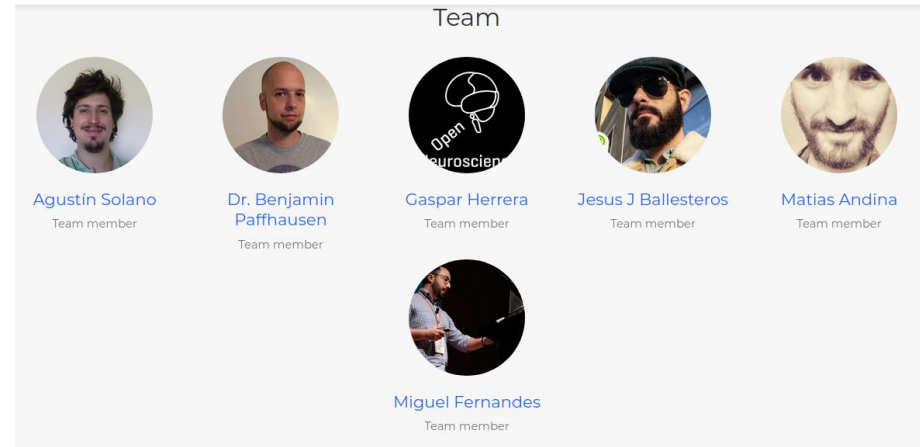
[Neuromethods Slack](#)

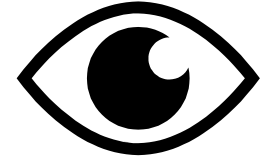
Reach out!



Form to upload projects to the website: <https://bit.ly/2LkTd2a>

Contact to contribute with the project itself:
openeuroscience@gmail.com





Open Source / Open Science tools

Open Source Software

Computer programs where all code is freely available for people to check, modify, improve and redistribute: Python, R, Deep Lab Cut,

Open Access Journals/Pre-prints

Journals and manuscripts before peer review freely available to read: PLoS, ELife, BiorXiv, AfricArXiv, PrePrints

Open Source Hardware

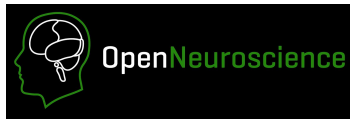
Scientific equipment where all designs/blueprints are freely available so people can learn, build, modify & redistribute: Miniscopes, UC2, Arduino

Communities

Groups tackling specific issues. Welcoming to newcomers and with a lot knowledge on a specific topic: Open Science MOOC, GOSH, Africa OSH, Software carpentry

Repositories

Portal and webpages which curate content, so it is easier for the community to find what they need: Open Neuroscience, Open Source toolkit, Open Behavior



Prometheus Science



Open Source Toolkit

A global forum for open source hardware and software research and applications



GATHERING
FOR OPEN
SCIENCE
HARDWARE



moz://a

Thanks!

Time for your questions

Find me at:

- Twitter [@chagas_am](https://twitter.com/chagas_am)
- a.maia-chagas@sussex.ac.uk