



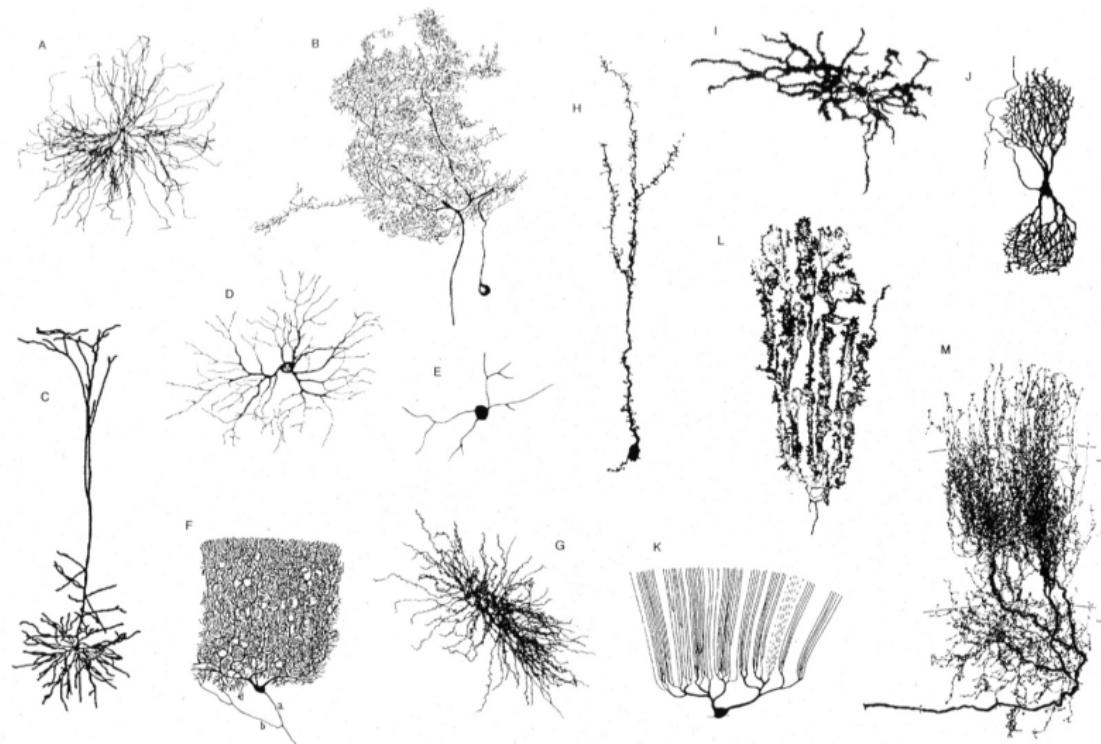
NeuroFedora

FOSS and Free/Open (neuro) Science

NeuroFedora contributors

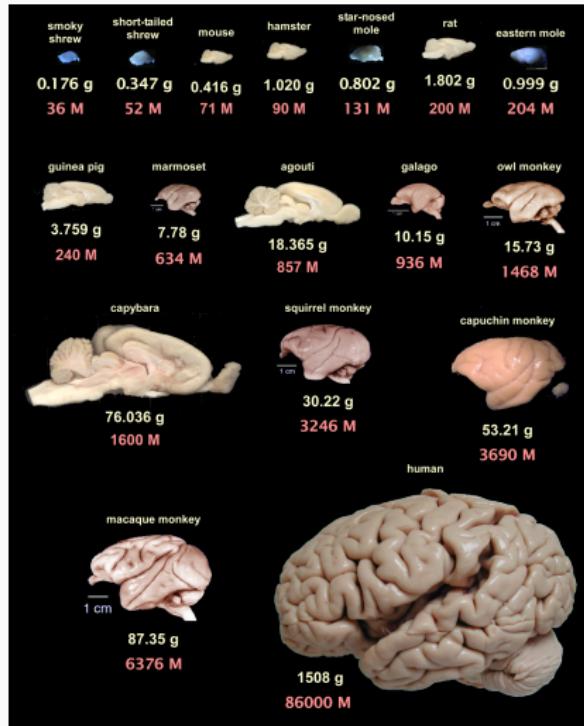
Problem statement: the brain

The brain: neurons



Dendrites, Oxford University Press, 2015; Modified from Mel, B.W. Neural Computation, 1994.

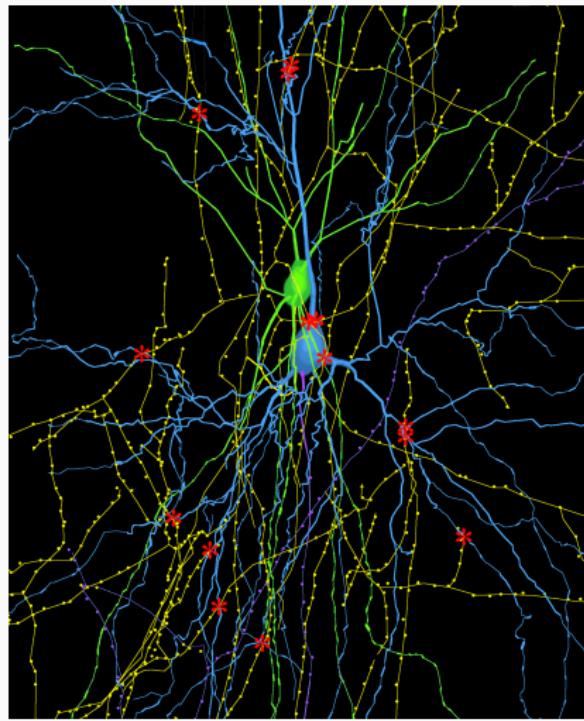
The brain: in numbers: neurons



- 86B neurons¹.

¹ Suzana Herculano-Houzel. "The human brain in numbers: a linearly scaled-up primate brain". In: *Frontiers in human neuroscience* 3 (2009), p. 31. DOI: [10.3389/neuro.09.031.2009](https://doi.org/10.3389/neuro.09.031.2009)

The brain: in numbers: synapses

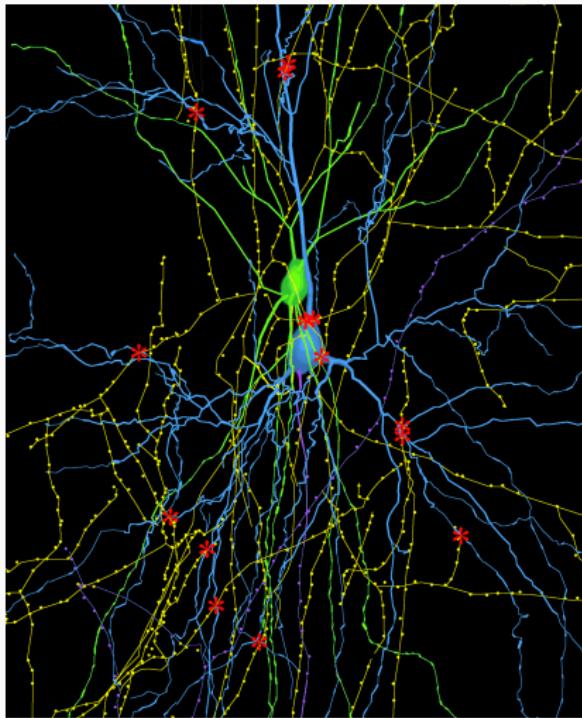


- Thousands of connections between neurons (synapses)².
- Synapses are also of different types, and serve different functions.

²Image from The Gao lab, College of Medicine, Drexel University.

³D. O. Hebb. *The organization of behavior: A neuropsychological theory*. 1949

The brain: in numbers: synapses



- Thousands of connections between neurons (synapses)².
- Synapses are also of different types, and serve different functions.
- Synapses underlie learning³.

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- how the brain functions (**physiology**),
- how it is structured (**anatomy**),
- about its chemicals (**pharmacology, biochemistry**),
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- how it is structured (**anatomy**),
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- ...
- how it processes information (**computational**),
- about behaviours, and cognition (**behavioural, cognitive**),
- ...

with the aim of applying this knowledge to

- disease prevention and treatment,
- ...

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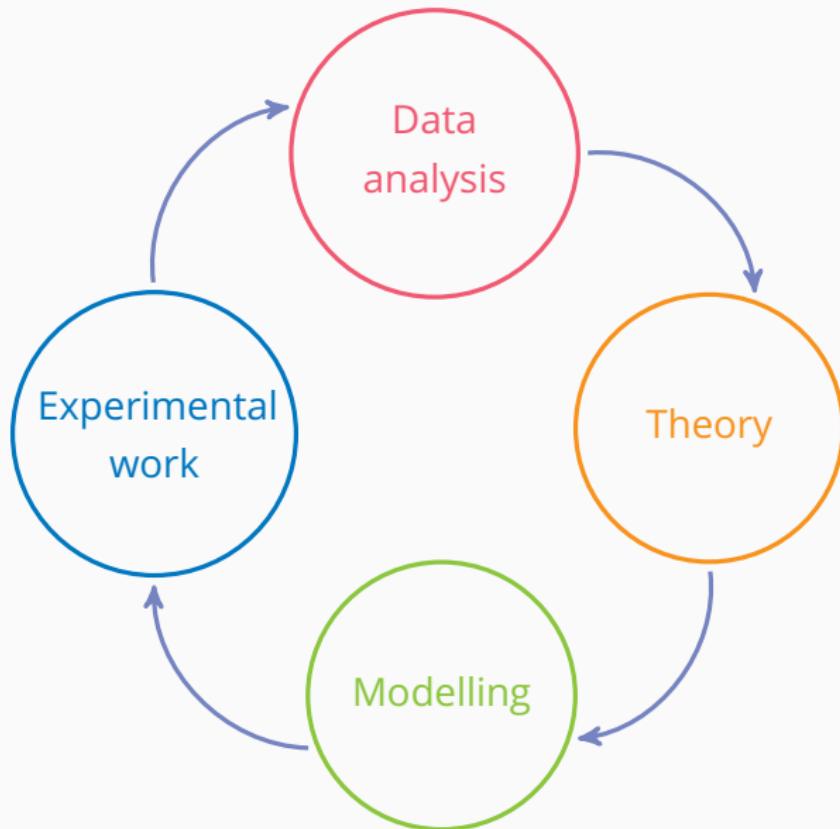
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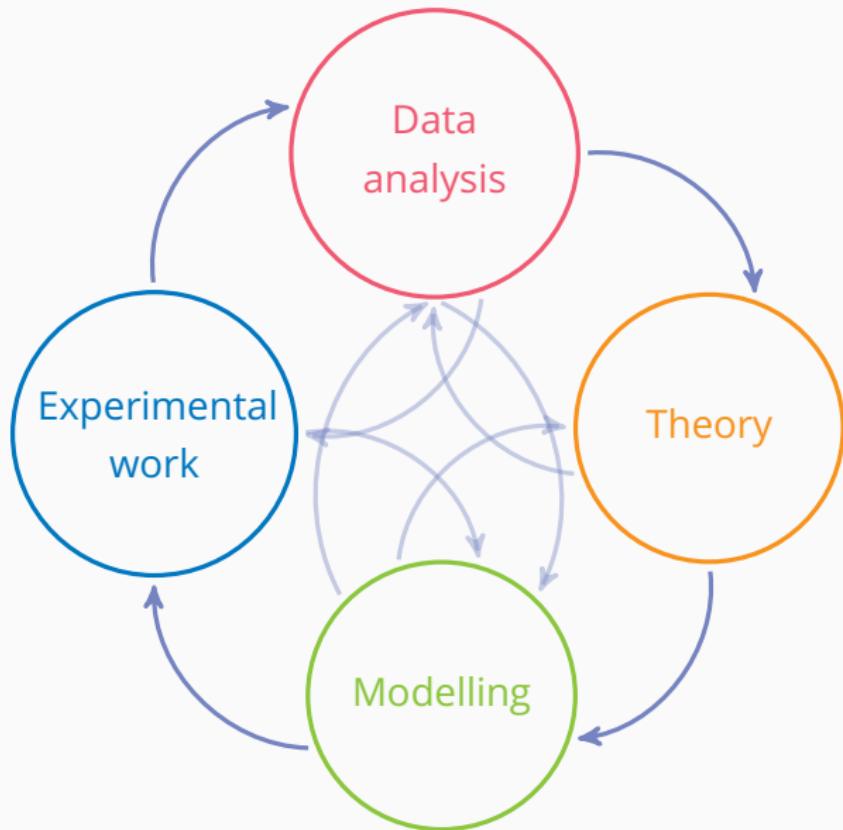
- disease prevention and treatment,
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- brain inspired computing,
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- philosophy and consciousness,

How: research pipeline

General workflow



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Tools of the trade

Experimental:

- EEG, ECoG, intracellular and extracellular single and multi neuron recording,
- CT, DOI, MRI, f-MRI, MEG, PET,

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Data analysis:

- Statistics,
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Theory and modelling:

- Simulators of all kinds,

Tools of the trade: II

Tools for the dissemination of knowledge⁴:

- visualisation,
- academic writing,
- non academic writing: blogging ... ,
- podcasting,
- video making,
- creating teaching materials,

⁴ also to a non-specialist audience.

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Collaborative tools and utilities.

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Free/Open (neuro) Science?

A familiar ideal

Free/Open science:

Everyone should have the freedom to share, study, and modify scientific material.

⁵ Free software foundation

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Free/Open Science implicitly includes, and relies heavily on FOSS.

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Now,

FOSS is becoming the standard in research⁶.

NEUROVIEW | VOLUME 96, ISSUE 5, P964-965, DECEMBER 06, 2017

A Commitment to Open Source in Neuroscience

Padraig Gleeson • Andrew P. Davison • R. Angus Silver • Giorgio A. Ascoli  

Open Access • DOI: <https://doi.org/10.1016/j.neuron.2017.10.013> •

⁶Open source for neuroscience

What can we, Fedora, do to help?

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- various specialities: biologists, mathematicians, physicists, chemists, psychologists, ... ,

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- small proportion of trained software developers,

(Anecdotal) notes on development of research software

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- complex dependency chains,
- lack of documentation and support,
- lack of community development know-how,

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- waste time and effort installing (and reinstalling) their software stacks,

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- rarely send improvements upstream,

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- we disseminate information to end-users,

So, we started NeuroFedora

Primary goal:

- Provide a ready to use, integrated FOSS platform for neuroscientists⁷.

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- make Fedora the go-to distribution for neuroscience.

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In essence,

NeuroFedora is:

- merely leveraging pre-existing community resources to a new domain of software.

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NeuroFedora is:

- merely leveraging pre-existing community resources to a new domain of software.
- taking the community model of FOSS to neuroscience research,

NeuroFedora: current metrics

- less than a year old⁸,

⁸in its second iteration

⁹src.fedoraproject.org: Neuro-SIG

¹⁰[Pagure.io](https://pagure.io): Neuro-SIG: issues

¹¹NeuroFedora blog: poster at CNS*2019

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- less than a year old⁸,
- 15 active contributors:
 - 10 package maintainers,
 - 5 designers, newcomers,
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NeuroFedora: future plans

- make more software available,
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NeuroFedora: future plans

- make more software available,
 - via modularity,
 - via containers,
- improve documentation, and support,
- increase community,
 - convert research user base into FOSS contributors,
 - convert FOSS contributor base into users,

NeuroFedora: what you can do

Anything! It's just more of Fedora!

NeuroFedora: what you can do

Anything! It's just more of Fedora!

- packaging,
- testing
- containers,
- documentation,
- evangelism,
- marketing,
- design,
-



Myths

Myth 1

(Neuro) science is all about sitting in labs and working on core research.

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NO! Core research is only one aspect of science!

For example, development of supporting infrastructure and dissemination via writing, audio-visual methods are necessary components of science.

Myth 1: example: Open Source brain

Open Source Brain - qutebrowser

OPEN SOURCE BRAIN search projects

Explore OSB Help Sign in Sign up

Modelling the brain, together

Open Source Brain is a resource for sharing and collaboratively developing computational models of neural systems.

Learn more about the OSB interface

Learn about the Hodgkin Huxley model

Simulate electrophysiologically detailed cell models

Explore more OSB projects

Or create an account to add your own models and run simulations!

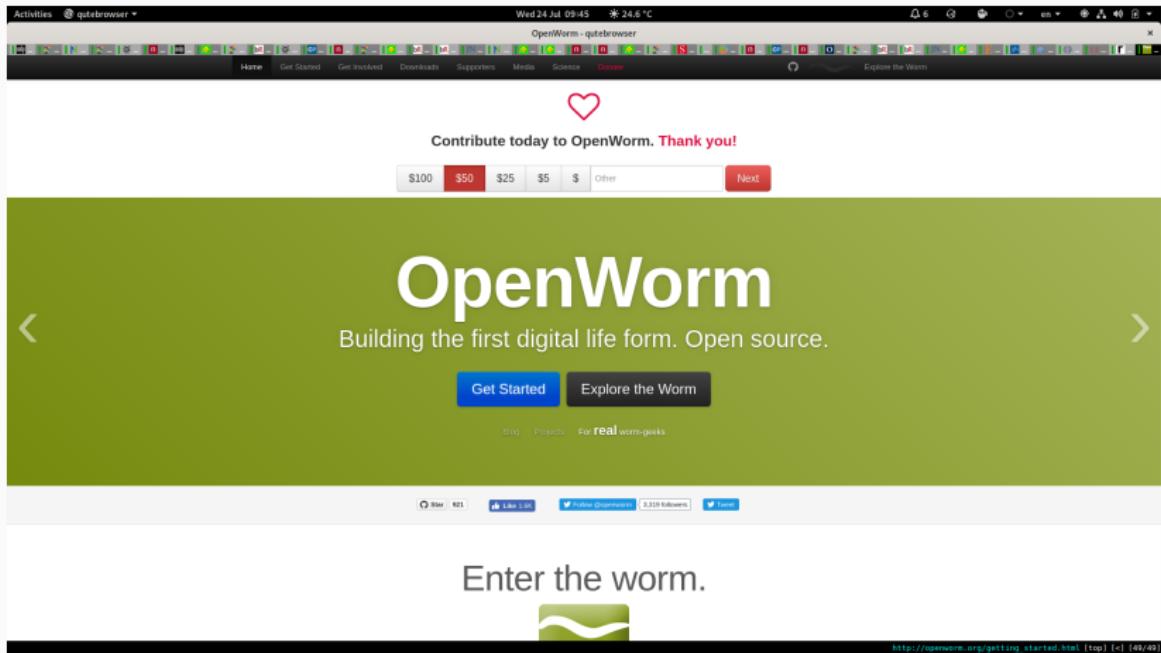
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The Open Source Brain Initiative 2019. Website powered by Redmine

Supported by <http://opensourcebrain.org/> [top] [49/49]

Myth 1: example: Openworm



Myth 1: example: Rebecca Ivatts



¹⁴ rebeccaivatts.com

Myth 2

Only researchers can do (neuro) science!
It's so hard!

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Only researchers can do (neuro) science!
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NO! Everyone can do science! Make it a hobby!