INCF at a glance

Last update: December 8, 2011


INCF
data
brain
atlases
neuroinformatics
development
activities
neuroscience
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coordinate
research
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facilitate
function
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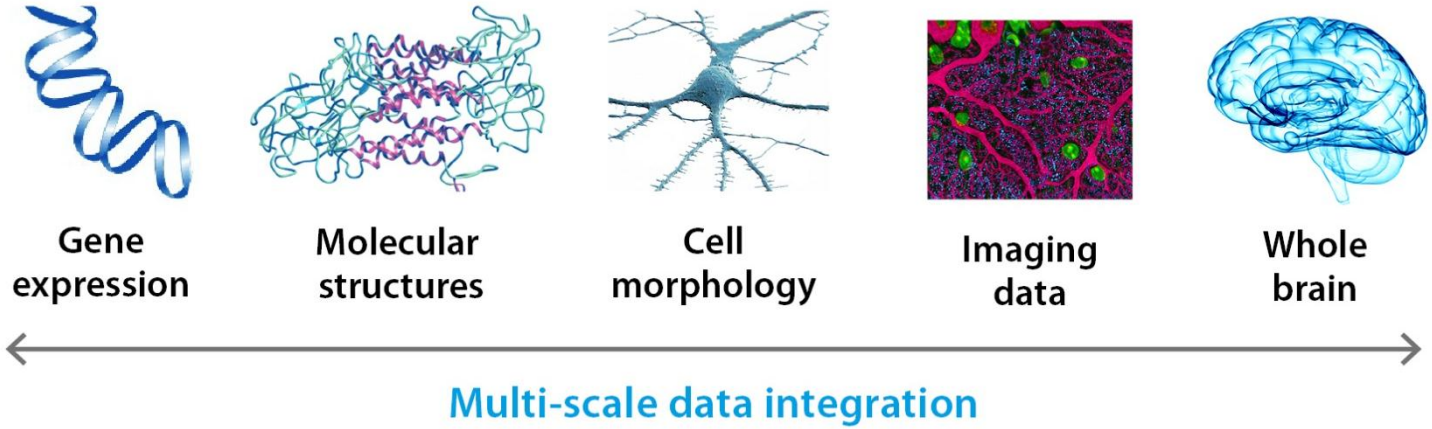
What is neuroinformatics?

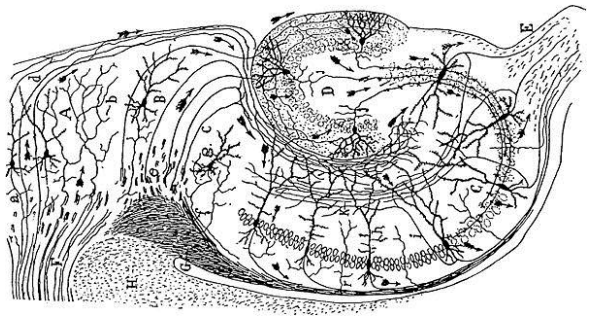
Neuroinformatics integrates information across all levels and scales of neuroscience to help understand the brain and treat disease.



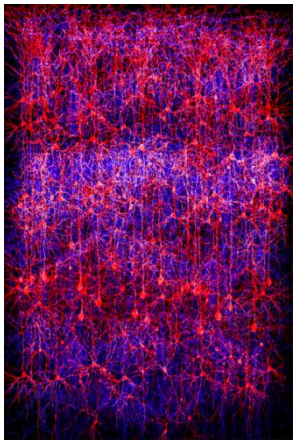
Neuroinformatics encompasses the tools and techniques for data acquisition, sharing, publishing, storage, analysis, visualization, modeling and simulation.

Scientific paradigms: the data age

- The amount and types of data available about the brain has grown at a tremendous rate

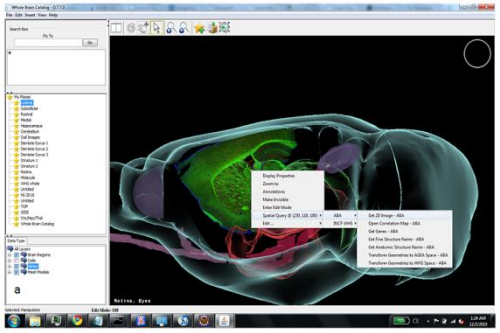


Cajal, 1911

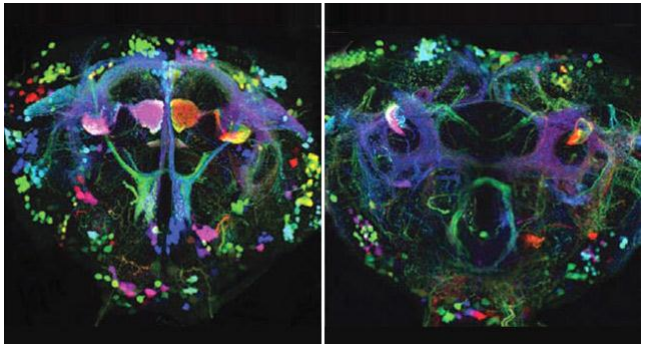


Neoortical microcircuit with known

- Cell density profile
- Cell types
- Gene expression
- Ion Channels
- Electrical behavior
- Morphologies
- Synaptic contacts
- Synaptic dynamics
- Synaptic plasticity



Brain atlas integration, Hawrylycz et al PLoS Comput Biol Feb 3 2011



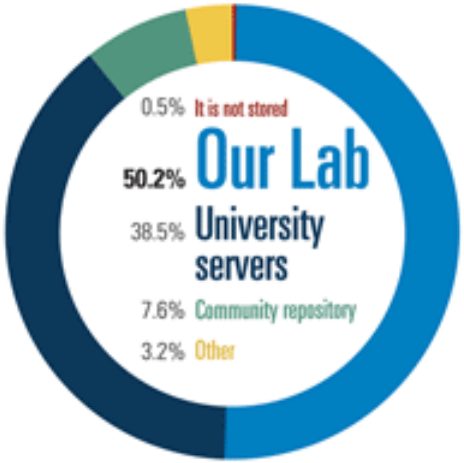
Drosophila ”Brainbow”, Hampel et al, Nature Methods Feb 6 2011

A tsunami of data

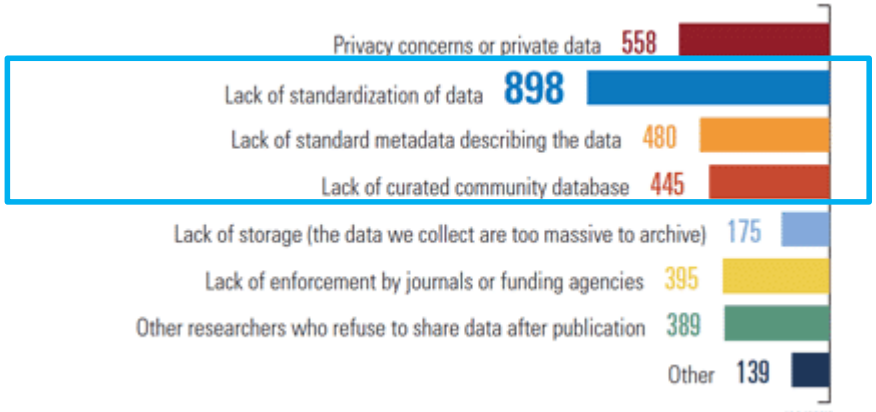
February 11, 2011. *Science* special on issues surrounding the increasingly huge influx of research data in many fields, including neuroscience.

Science asked peer reviewers about the top three barriers to data access/sharing in their fields, and about their treatment of data:

Where do you archive most of the data generated in your lab or for your research?



"Even within a single institution **there are no standards for storing data,** so each lab, or often each fellow, uses ad hoc approaches."



All images & data from the Science data special:
http://www.sciencemag.org/site/special/data/

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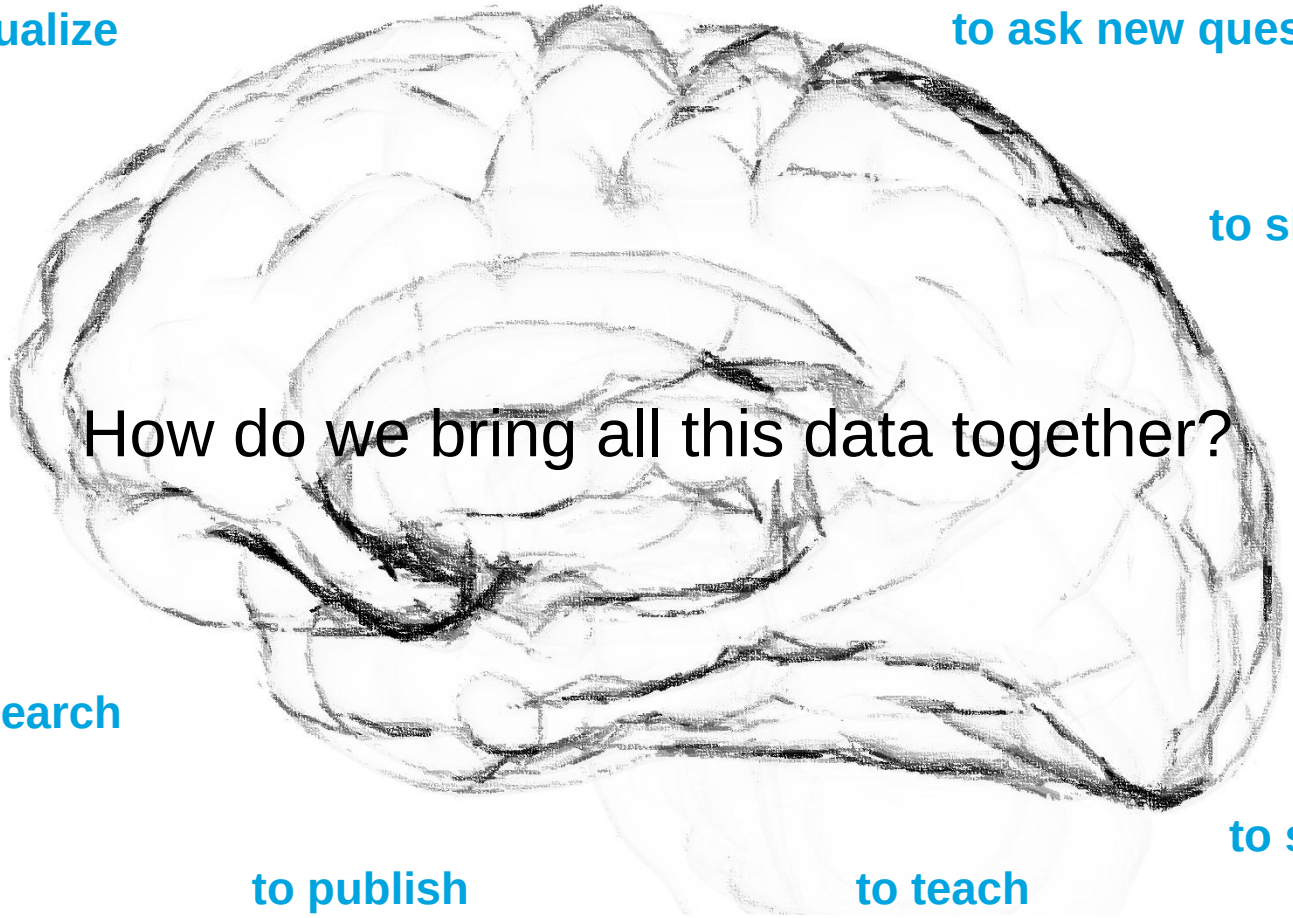
to replicate experiments

to visualize

to ask new questions



to simulate

to analyze

How do we bring all this data together?

to model

to search

to share

to publish

to teach

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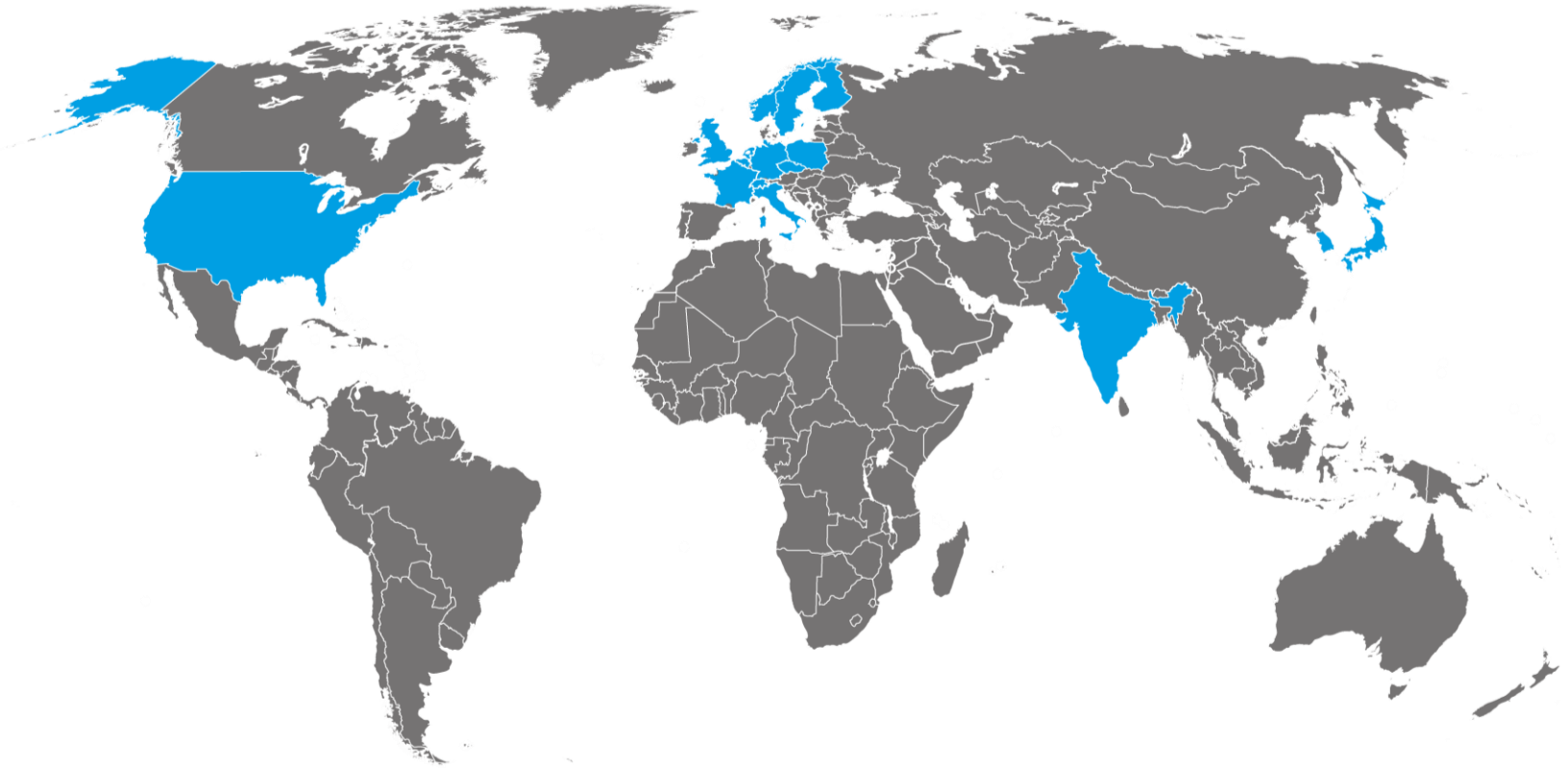
Solution: international neuroinformatics coordination



INCF **infrastructure** will help facilitate the acquisition and annotation of diverse datasets to achieve **multiscale** and **multiomic** data integration – from **genes** to **behavior**.

The International Neuroinformatics Coordinating Facility (INCF)

- **1997**: the Global Science Forum of OECD realized the need for a concerted action for developing international Neuroinformatics
- **2005**: INCF plans endorsed by the ministers of research of OECD; INCF formed in August with 7 members including Japan and the US
- **2011**: INCF has 16 members and is building an international infrastructure for digital atlasing, ontologies, modeling and data sharing.

Organization

- Each INCF member country establishes a **National Node** to further the development of neuroinformatics and to interface with the INCF Secretariat.
- The INCF **Community** consists of research groups, consortia, funding agencies and publishers in the field.
- The **Secretariat** is the central office of INCF, located in Stockholm, Sweden, and is responsible for overall scientific and administrative activities.
- The **Governing Board** is composed of representatives from the member countries, and makes collective decisions regarding INCF. The EU is represented in the Board.

The mission of the INCF

- Coordinate and foster international activities in neuroinformatics
- Contribute to development and maintenance of database and computational infrastructure and support mechanisms for neuroscience applications
- Enable access to all freely accessible data and analysis resources for human brain research to the international research community
- Develop mechanisms for the seamless flow of information and knowledge between academia, private enterprises and the publication industry

Neuroinformatics Congress

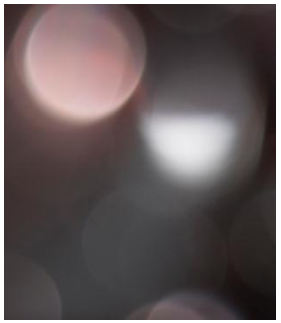
The annual INCF Neuroinformatics Congress provides an international venue for interactions across academic domains.

The Congress is held in one of the INCF member countries:

2008: Stockholm, Sweden
2009: Pilsen, Czech Republic
2010: Kobe, Japan
2011: Boston, USA
2012: Munich, Germany

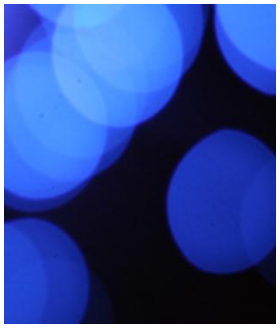
INCF Programs

Programs are set up through a multi-step process involving international experts. They are coordinated by INCF in collaboration with representatives from the scientific community. Each Program delivers *products and services*, and develops *standards and guidelines* for its particular field.



Digital Brain Atlasing

Mission: to coordinate and improve the impact of brain atlasing projects, with a focus on the rodent brain.

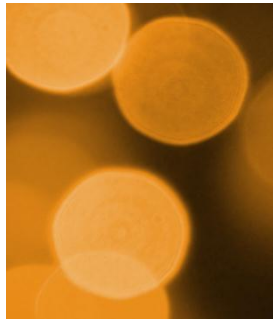


Multi-Scale Modeling

Mission: to develop tools for the reuse and portability of multiscale computational models of neurons and neural structures.

Ontologies of Neural Structures

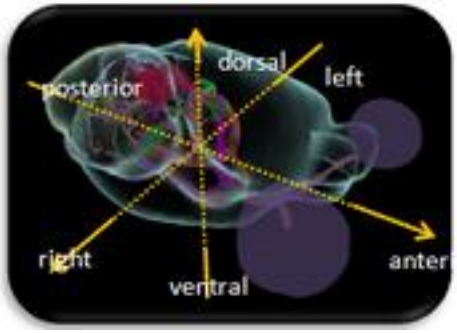
Mission: to establish a structured lexicon for the translation and definition of terms describing neural structures at multiple levels of granularity.



Standards for Datasharing

Mission: to develop generic standards and tools to facilitate the recording, sharing, and reporting of metadata; and thereby facilitate the archiving and sharing of neuroscience data

INCF Program on Digital Brain Atlasing



Mission: to coordinate and improve the impact of brain atlasing projects, with a focus on the rodent brain.

Products & Services: the Waxholm Space (WHS) and the Digital Atlasing Infrastructure (DAI) framework.

WHS: a coordinate based reference space for the mapping and registration of neuroanatomical data. Serves as a *standardization in atlas mapping*, enabling comparison and combination of data contained in different atlases.

DAI: a framework set up to *facilitate interoperability between atlases* and data sharing. A collection of distributed services that support publication, discovery and invocation of heterogeneous atlas resources.

www.incf.org/about/programs/atlasing

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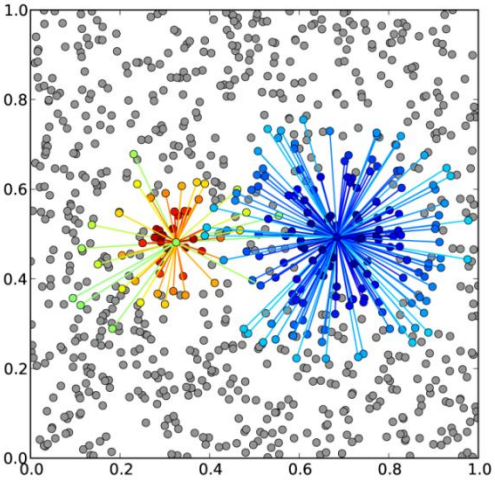
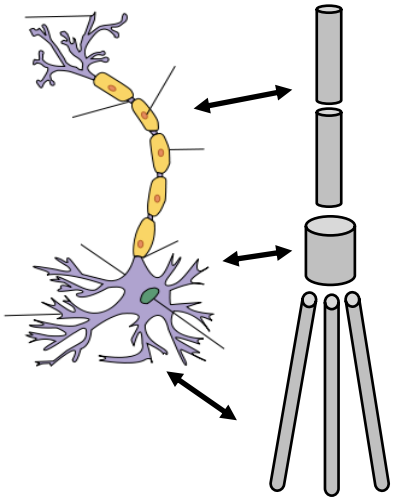
INCF Program on Multiscale Modeling





Mission: to develop tools for the reuse and portability of multiscale computational models of neurons and neural structures.

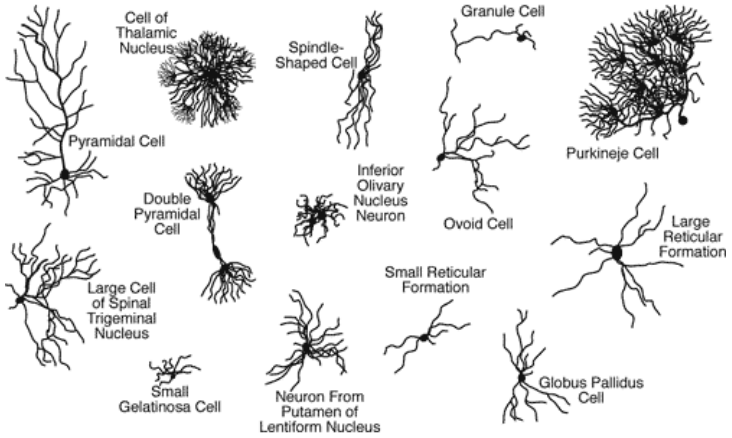
Products & Services: the Multisimulation Coordinator (MUSIC) and the Network Interchange for Neuroscience Markup Language (NineML)

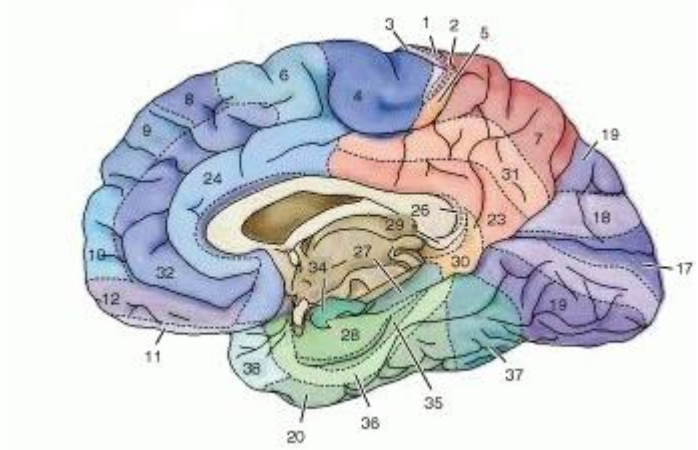
MUSIC: enables different models simulated on a cluster to exchange data during runtime; also facilitates pre-and postprocessing.

NineML: facilitates explicit declarative definition of spiking neuronal network models both conceptually and mathematically in a simulator independent manner

www.incf.org/about/programs/modeling

INCF Program on Ontologies of Neural Structures





Images: Stufflebeam B, Neurons, Synapses, Action Potentials, and Neurotransmission; Neuroscience 2nd ed, Purves D et al, Sinauer Associates 2001

Mission: to establish a structured lexicon for the translation and definition of terms describing neural structures at multiple levels of granularity.

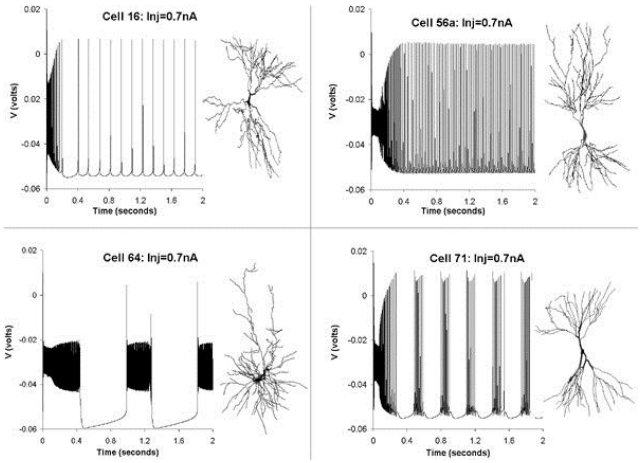
Products & Services: the Neuron Registry, the Structural Lexicon and the Scalable Brain atlas

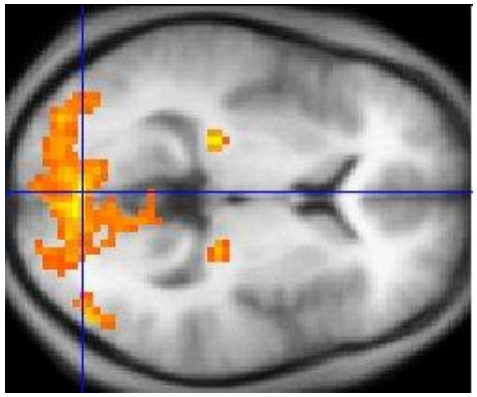
Neuron Registry: a web-based tool that provides interactive capability for entry of neuron properties to describe neuron types.

Scalable Brain Atlas: web-based display engine for brain atlases and topologies. It allows client websites to show brain region related data in a 3D interactive context.

www.incf.org/about/programs/pons

INCF Program on Standards for Datasharing





Images: Ascoli GA (1999) Anatomical Record 257(6):195-20
Washintgon Irving, in the public domain (Wikipedia)

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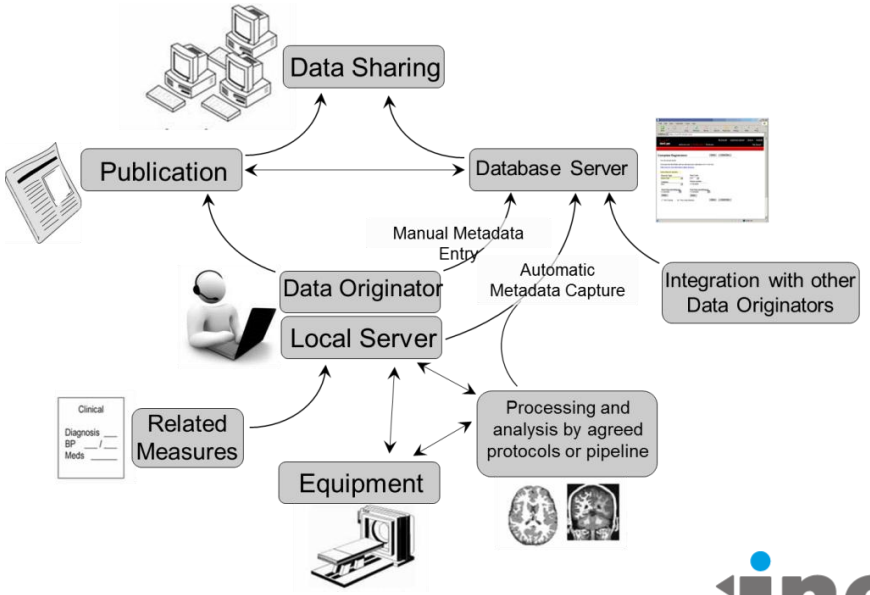
Focus areas: electrophysiology and brain imaging data (newly started)



www.incf.org/about/programs/datasharing

Further information

INCF Neuroinformatics Congress

www.neuroinformatics2012.org

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