

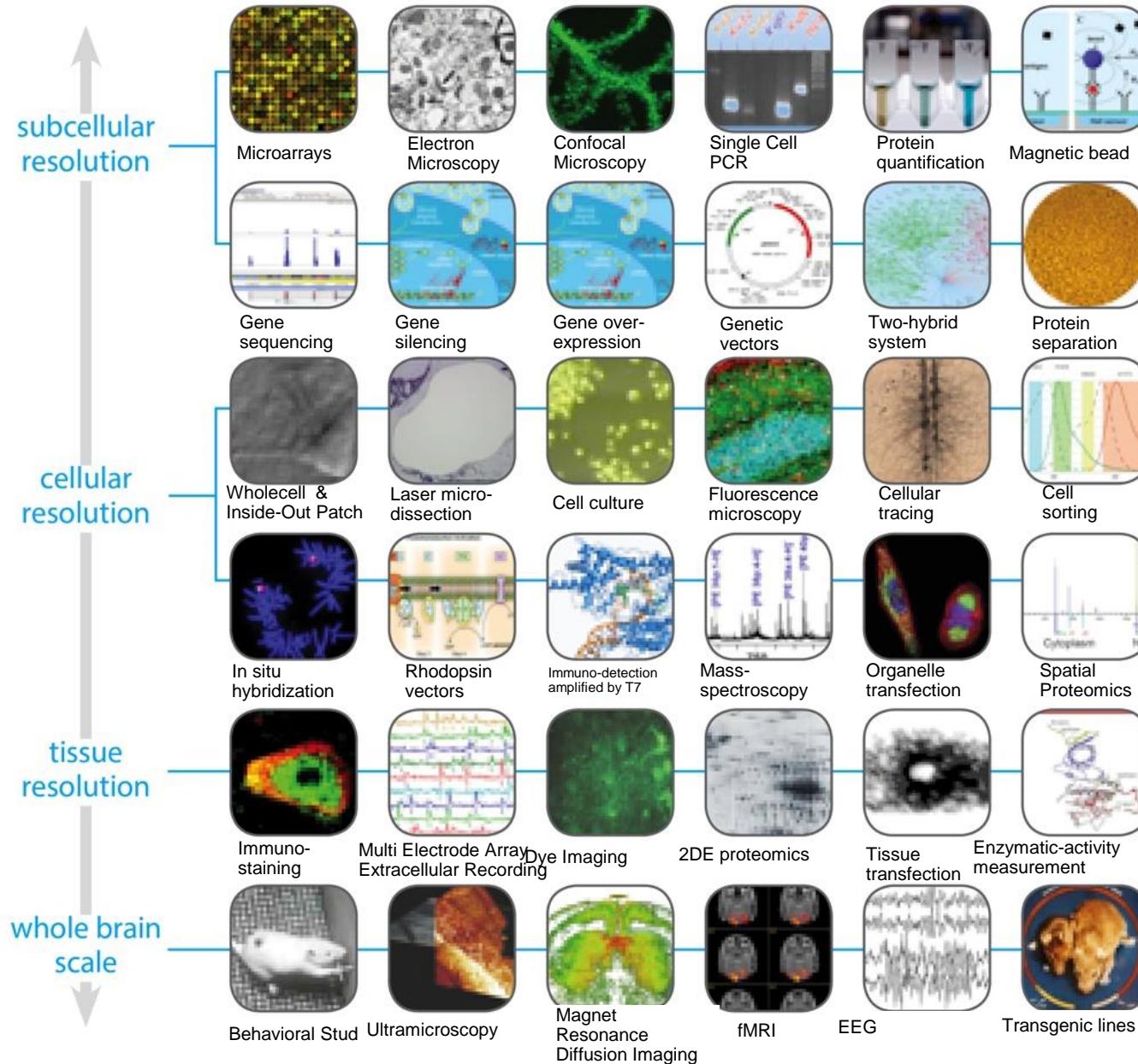
Toward globally collaborative science: the International Neuroinformatics Coordinating Facility

Linda Lanyon

Executive Director

International Neuroinformatics Coordinating Facility

Multiomic Neuroscience Data



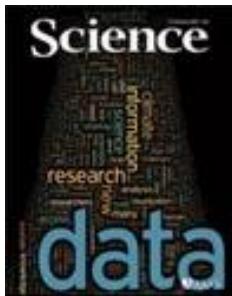
*Upon this gifted age, in its dark hour,
Rains from the sky **a meteoric shower**
Of facts . . . they lie unquestioned,
*uncombined.**

*Wisdom enough to leech us of our ill
Is daily spun; but there **exists no loom**
To weave it into fabric;*

Edna St. Vincent Millay, 1939



A tsunami of data

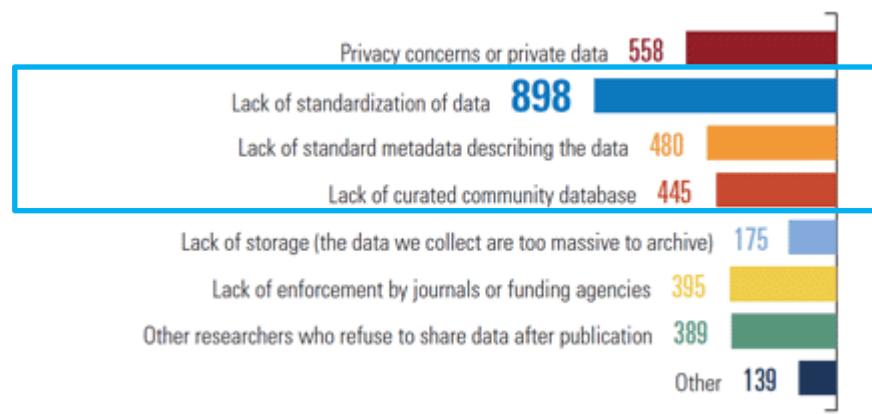
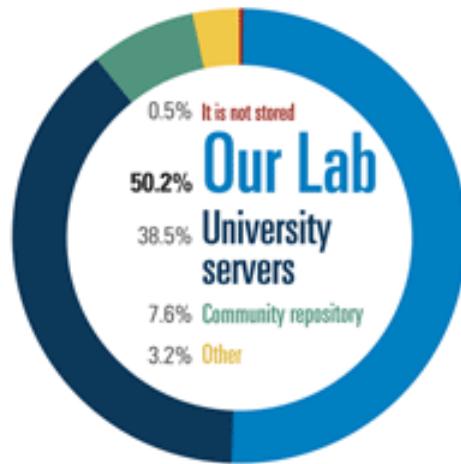


February 11, 2011. Science special on issues surrounding the increasingly huge influx of research data in many fields, including neuroscience.

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/>

Majority of scientific research is not reproducible

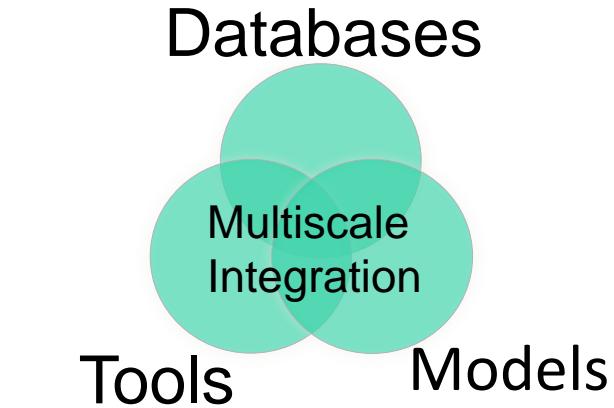
“Just so are these preachers and scholars holding various views blind and unseeing... In their ignorance they are by nature quarrelsome, wrangling, and disputatious, each maintaining reality is thus and thus”

摸象之圖
象瞽



- The Blind Men and the Elephant
13th century Buddhist writings

Transform Neuroscience into an eScience

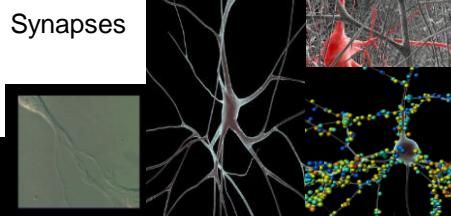


Tools Models

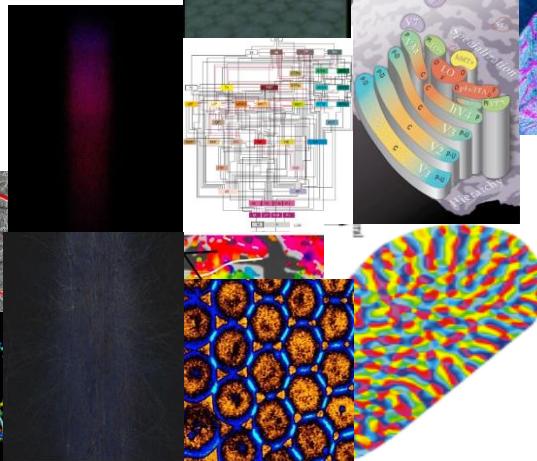


Molecules

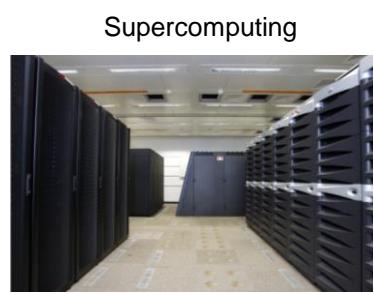
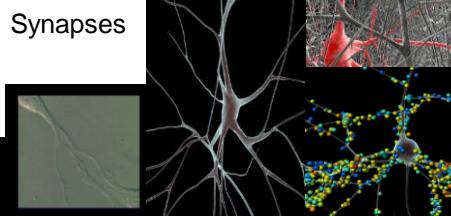
Synapses



Microcircuits



Neurons



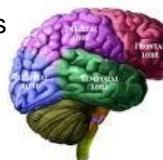
Supercomputing



Data intensive science

Data intensive science

Macrocircuits



Whole brain



Mesocircuits



- ✓ Databases
- ✓ Genomics
- ✓ Translational
- ✓ Systems Biology...
- ✓ Integrative Biology...
- ✓ Informatics...
- ✓ Neuroscience...
- ✓ Mathematical Modeling...
- ✓ Supercomputer Simulation
- ✓ Visualization...
- ✓ Analysis...



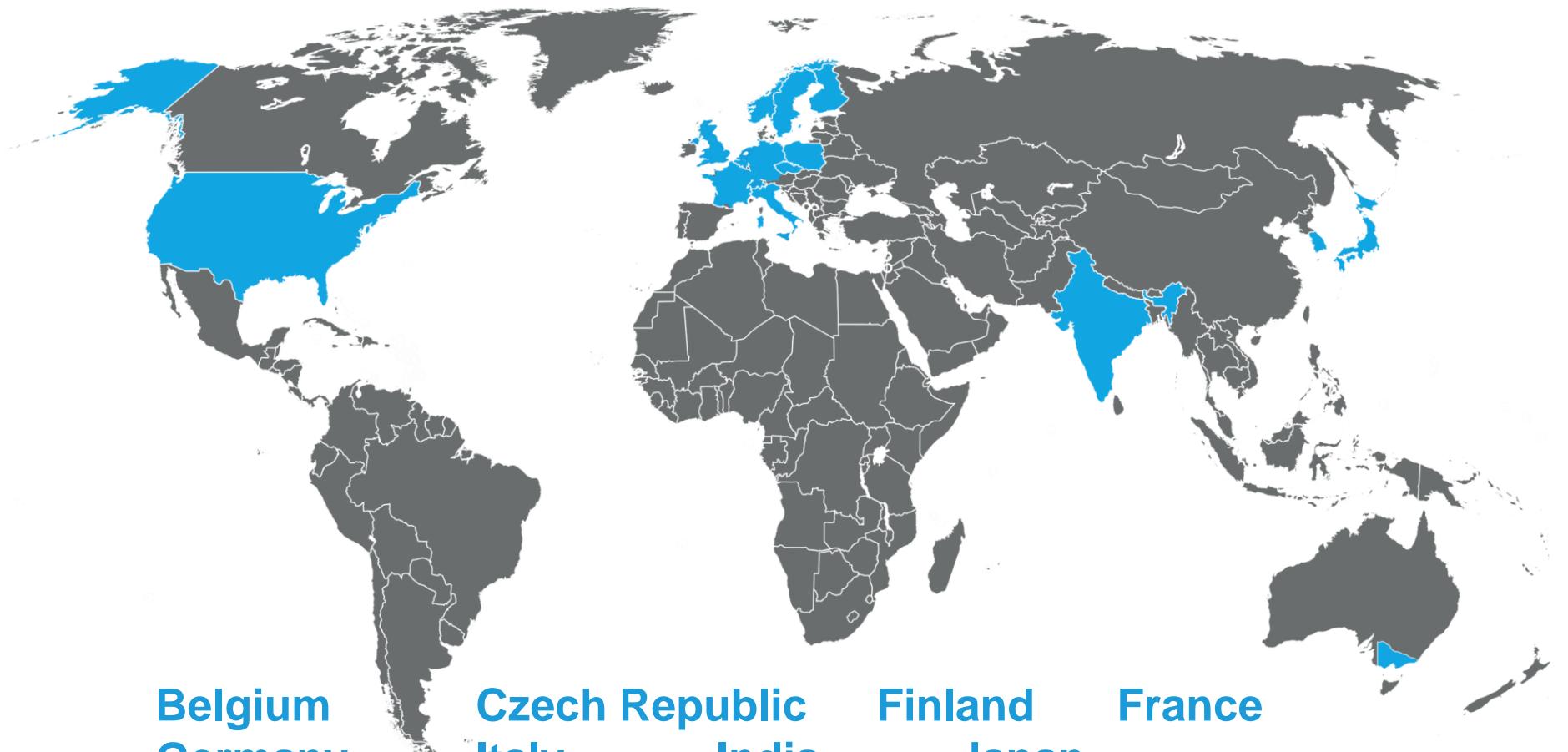
Clinical

Cognition

The Birth of the INCF

- The Global Science Forum of OECD realized the need for a **concerted action for developing Neuroinformatics on the international level**
- **2005** INCF plans endorsed by the ministers of research of OECD
- August 1st 2005 INCF **formed with 7 members** including Japan and the US

17 INCF Member Countries



Belgium

Germany

The Netherlands

Sweden

United States

Czech Republic

Italy

Norway

United Kingdom

Victoria (Australia)

Finland

Japan

Poland

United Kingdom

France

Republic of Korea



INCF Secretariat: Stockholm, Sweden

- Founded in 2006, Hosted at the Karolinska Institute
- Coordinates all Program & Node activities
- Organizes annual Neuroinformatics congress
- Advocate, work with various sectors to promote data sharing, open access, collaboration

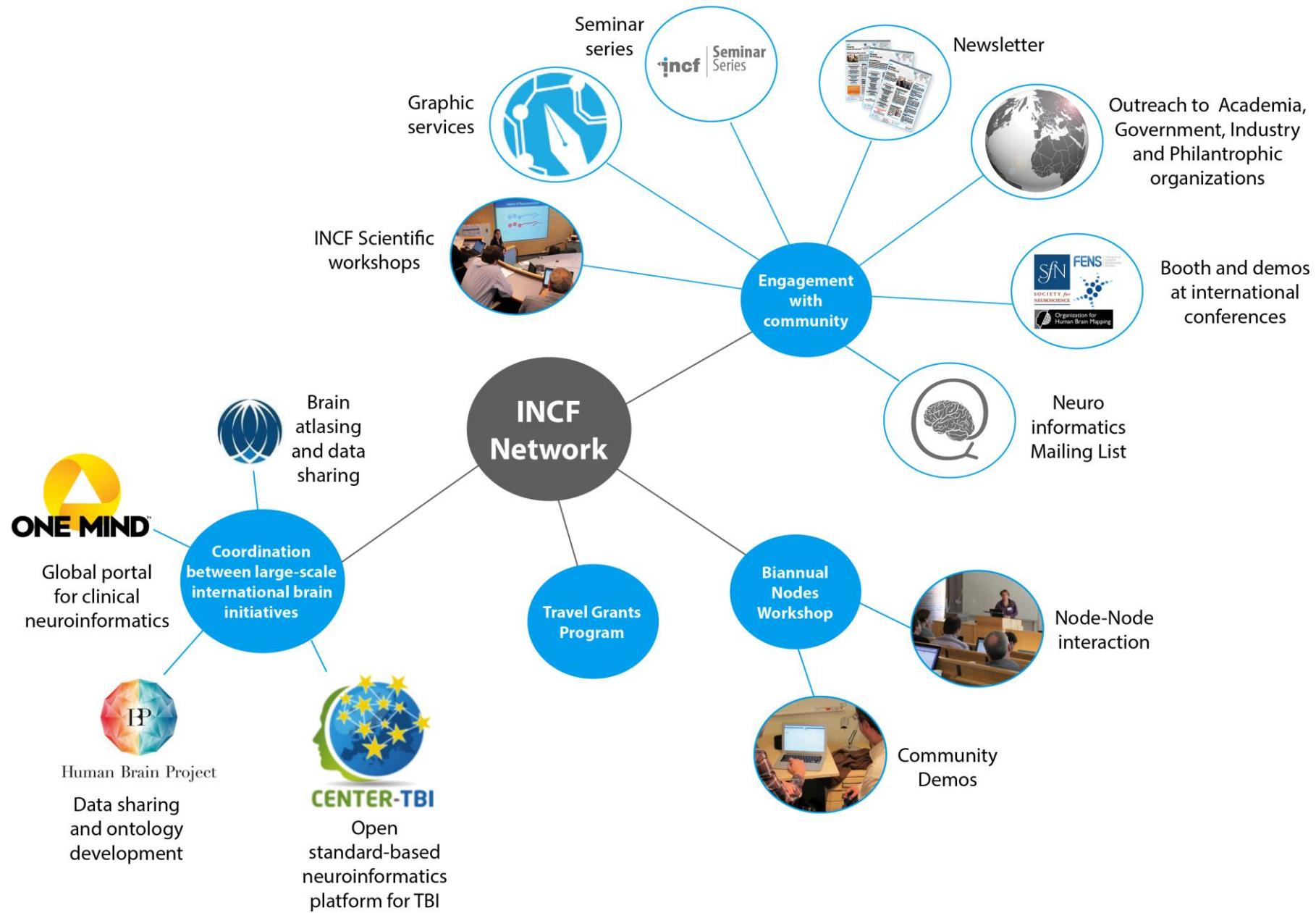




Current Strategic Plan 2011-15

2014 INCF 5 Year Review

Independent Review
Formation of new 5 year Strategic Plan



INCF Programs

Currently over 180 contributing Scientists!

Digital Brain Atlasing (DBA)

Coordinates and improves the impact of brain atlasing projects

Multiscale Modeling (MSM)

Improves interoperability and reproducibility of neural simulations

Ontologies of Neural Structures (PONS)

Establishes consistent naming and classification for all neural structures

Standards for Data Sharing (DASH)

Develops metadata and data standards for reproducible research



Mathew Abrams
Program Officer

products

services

standards

guidelines





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

Rembrandt
Bakker

Scalable Brain Atlas (SBA)

Web based display engine for brain atlases, imaging data, and topologies:

- Allows client websites to show brain region related data in 3D interactive contexts
- Provides services to look-up brain regions, generate thumbnails, download nomenclature, and delineate data

Waxholm Space (WHS)

Coordinate-based reference space:

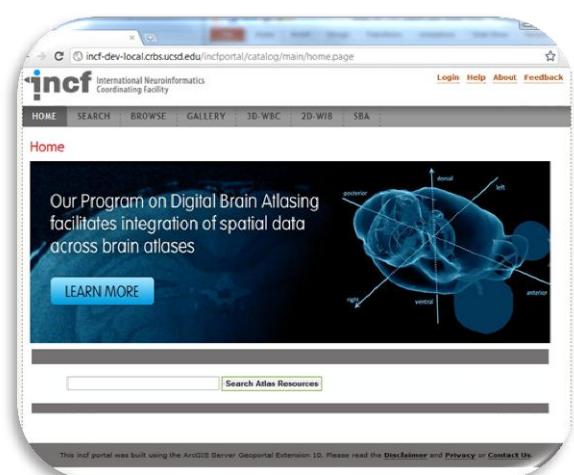
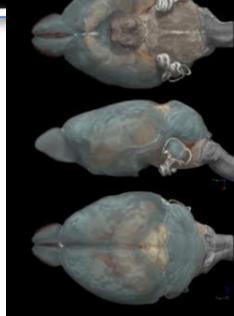
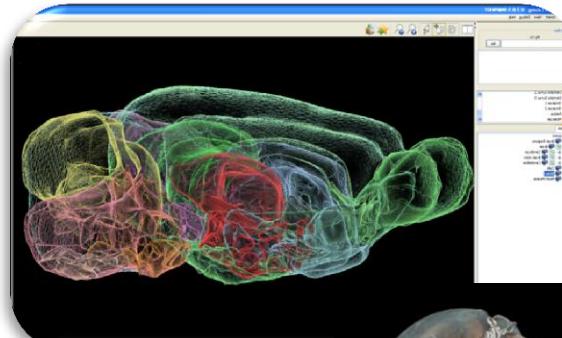
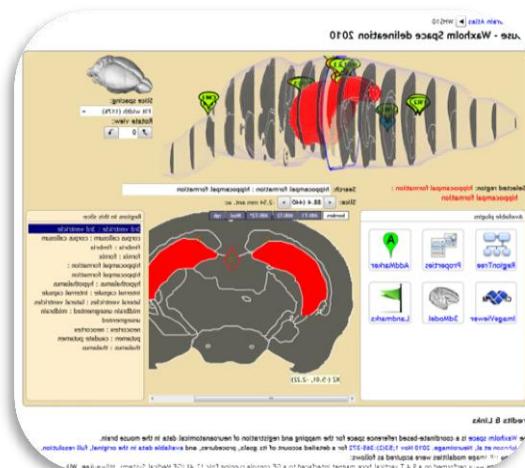
- Developed from high resolution MR and Nissl stain image stacks
- Allows mapping and registration of neuroanatomical data in the mouse brain
- Provides translations among other mouse brain atlases

Digital Atlasing Infrastructure (DAI)

Web service architecture for atlas interoperability:

- Developed to support the WHS
- Transforms images from their own data format to that of a collaborator
- Allows the simultaneous integration of different types of data

Ilya
Zaslavsky



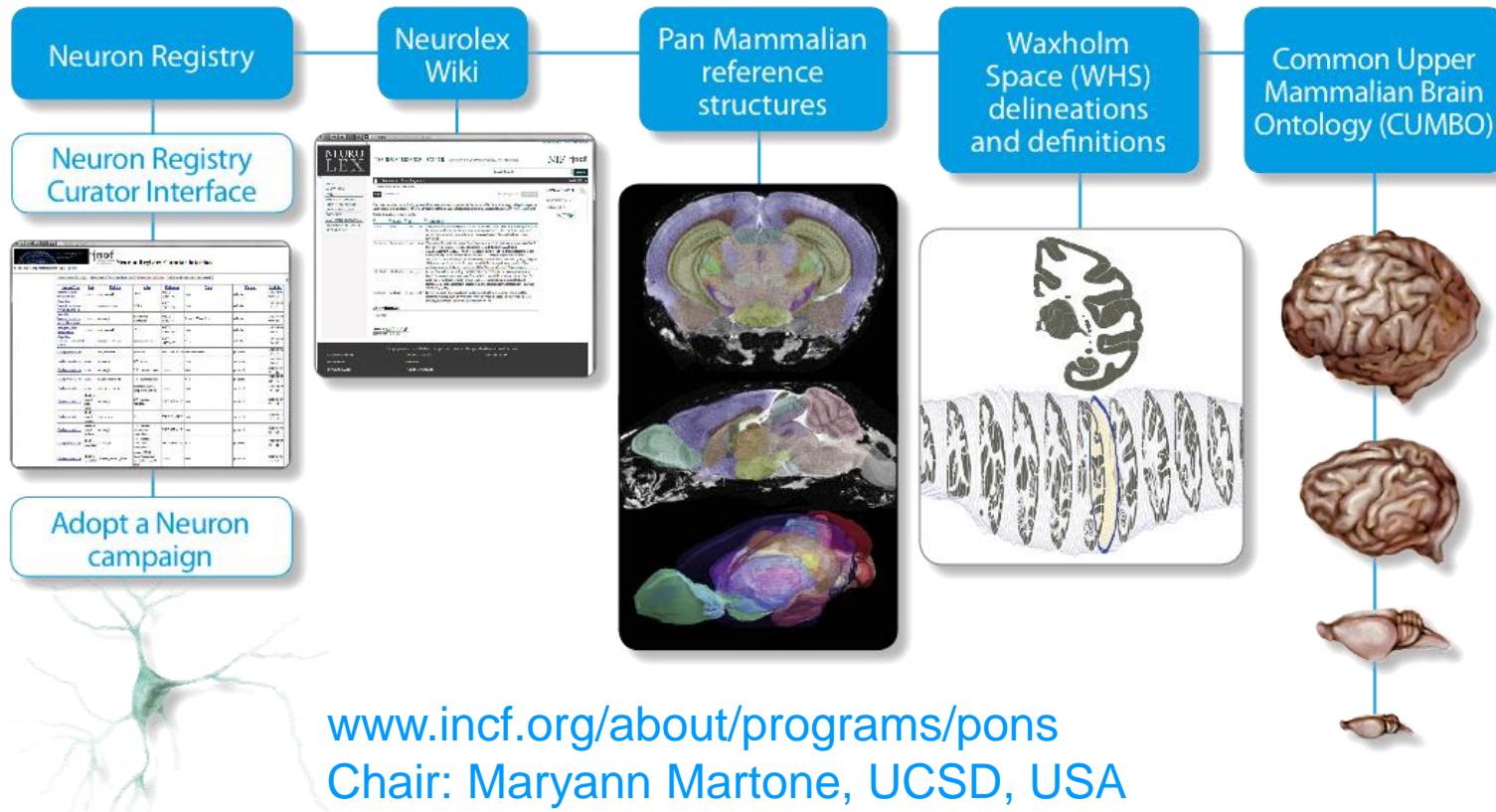
www.incf.org/about/programs/atlasing
Oversight Chair: Rob Williams, U Tennessee





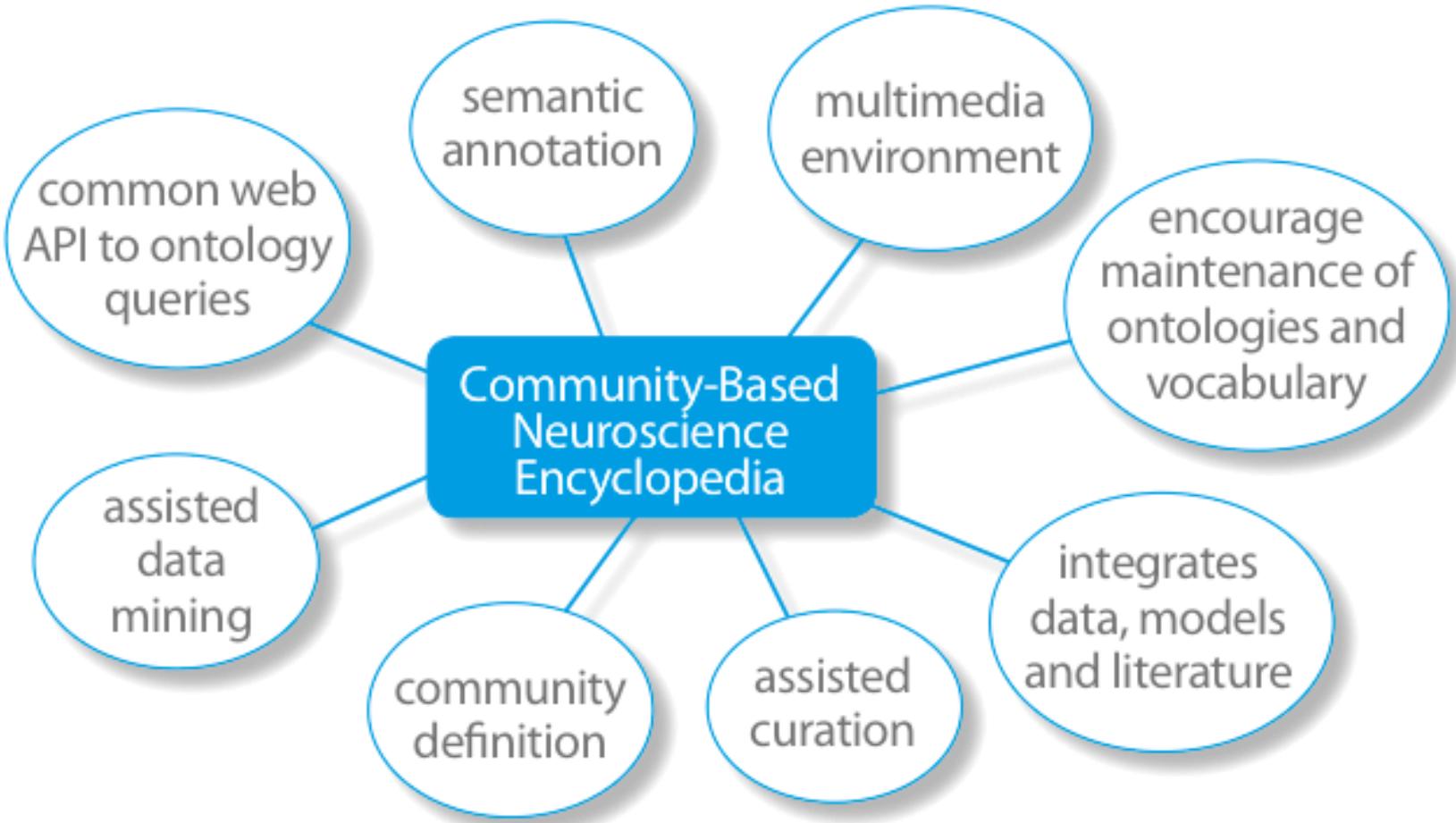
Mission: To establish consistent naming and classification for all neural structures

Key products



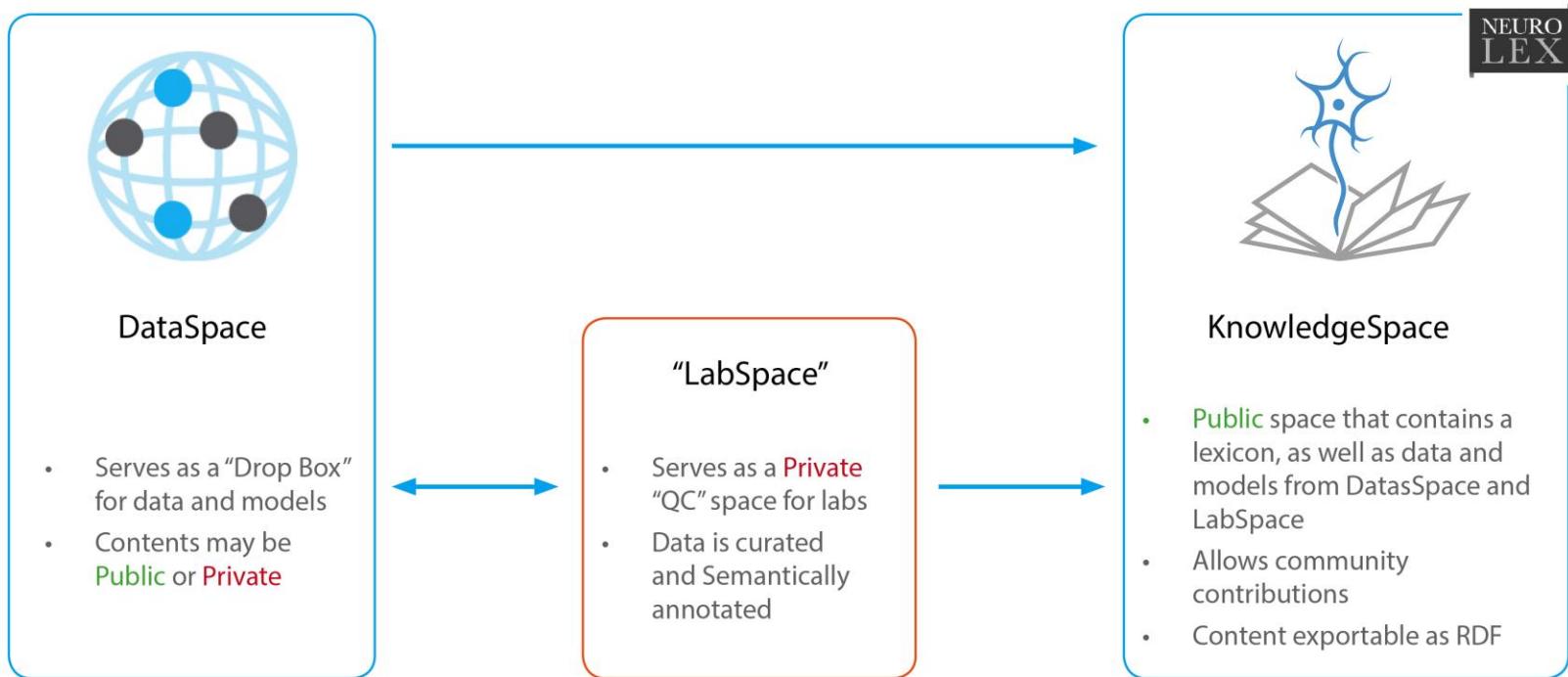


KNOWLEDGE SPACE



Human Brain Project



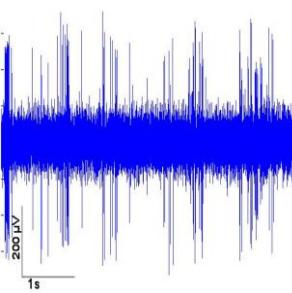
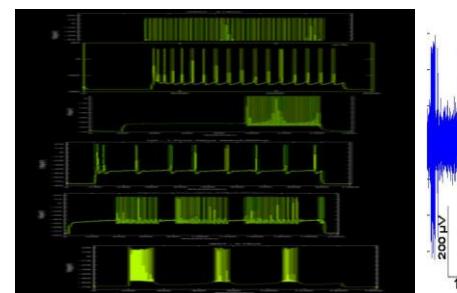
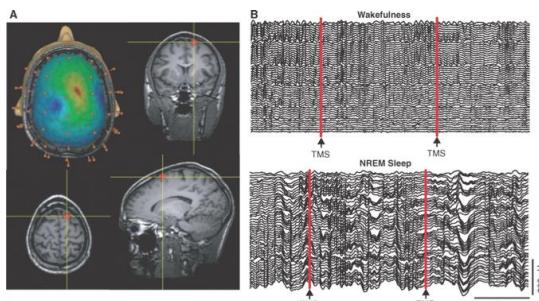
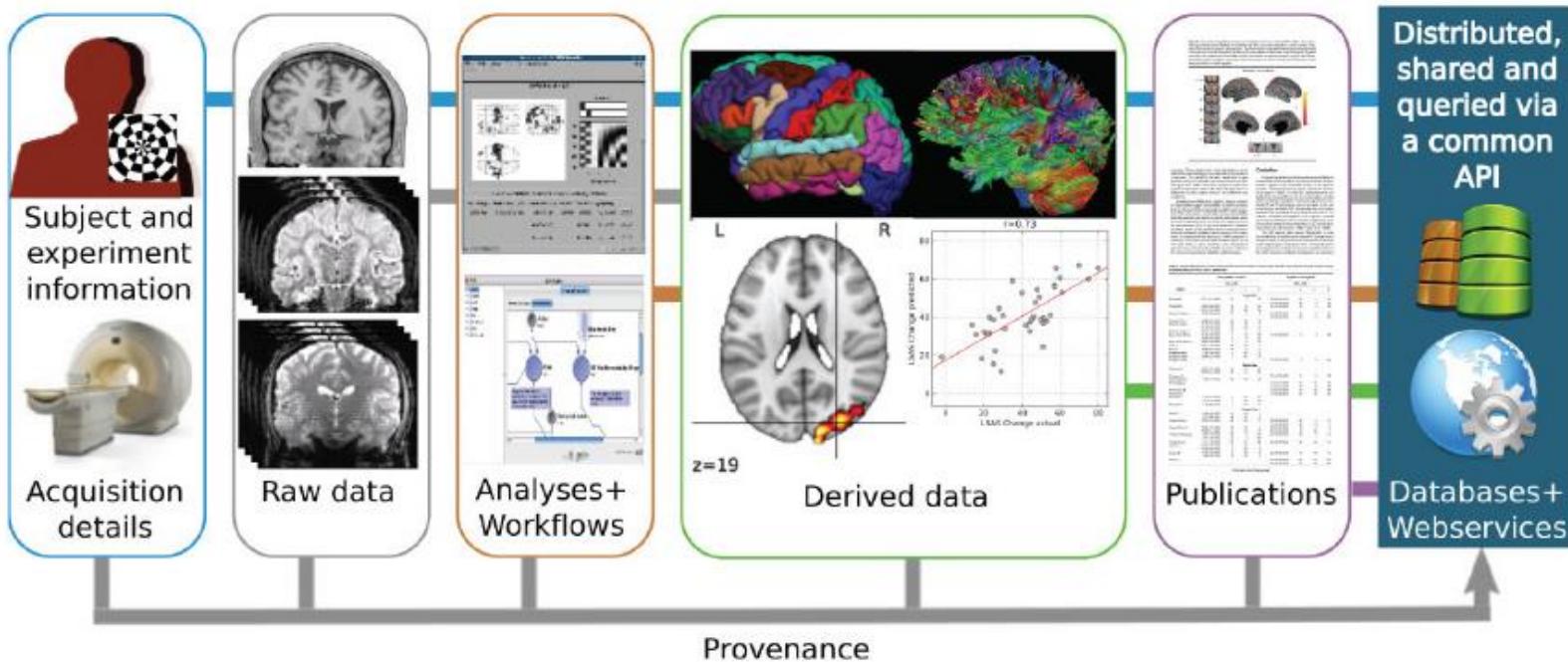


Human Brain Project





Mission: to develop metadata and data standards for reproducible research;
to develop standards for archiving, storing, sharing, and re-using neuroscience data and databases



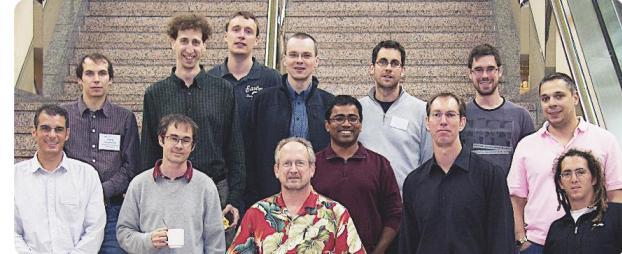


TF leads: Thomas Wachtler, Fritz Sommers



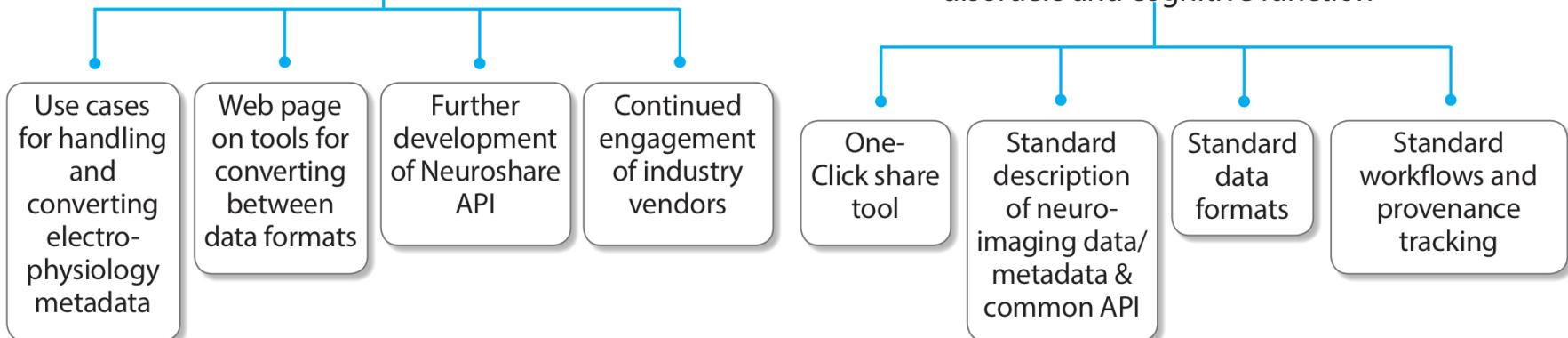
Electrophysiology Task Force

Focuses on electrophysiological data and databases



Neuroimaging Task Force

Focuses on neuroimaging data and databases of neurological/psychiatric disorders and cognitive function



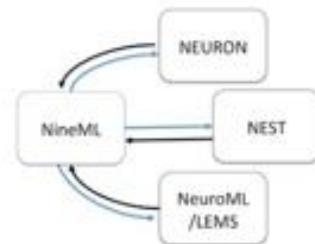
www.incf.org/about/programs/datasharing

(INCF gratefully acknowledges the work of Colin Ingram as chair 2010-13)



Mission: to improve interoperability and reproducibility of neural simulations

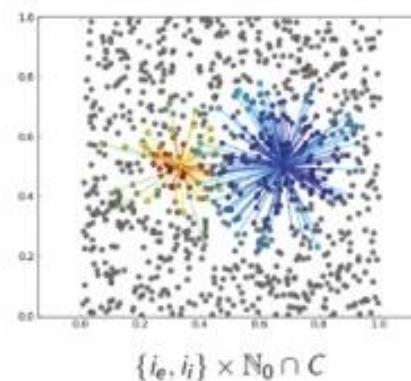
Descriptions of Neural Models:
Network Interchange format for
NEuroscience (NineML), NeuroML



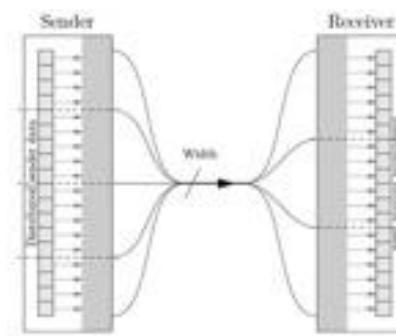
Connection Set
Algebra (CSA)

Multi-Simulation
Coordinator (MUSIC)

Computational
Neuroscience
Ontology (CNO)



$$\{i_e, i_l\} \times \mathbb{N}_0 \cap C$$



NEURON, NEST, MOOSE

Lead: Mikael Djurfeldt, INCF & KTH,
Sweden

Lead: Yann Le Franc, Paris

Oversight Chair to 2014: Erik De Schutter, Okinawa Institute
Oversight Chair from 2014: Andrew Davison, CRNS, France



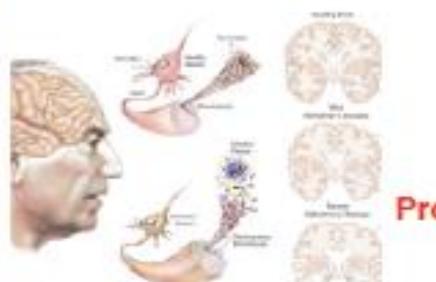
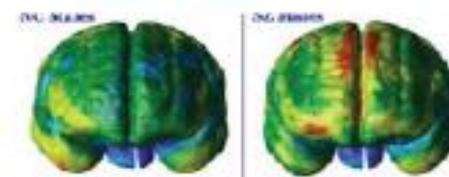
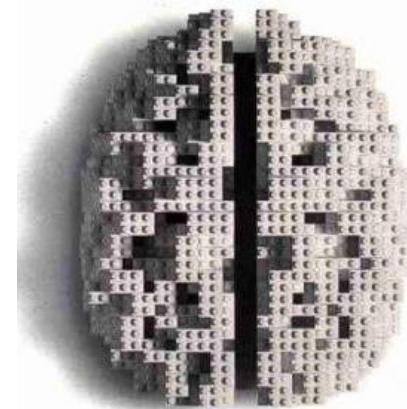
Mission: to improve interoperability and reproducibility
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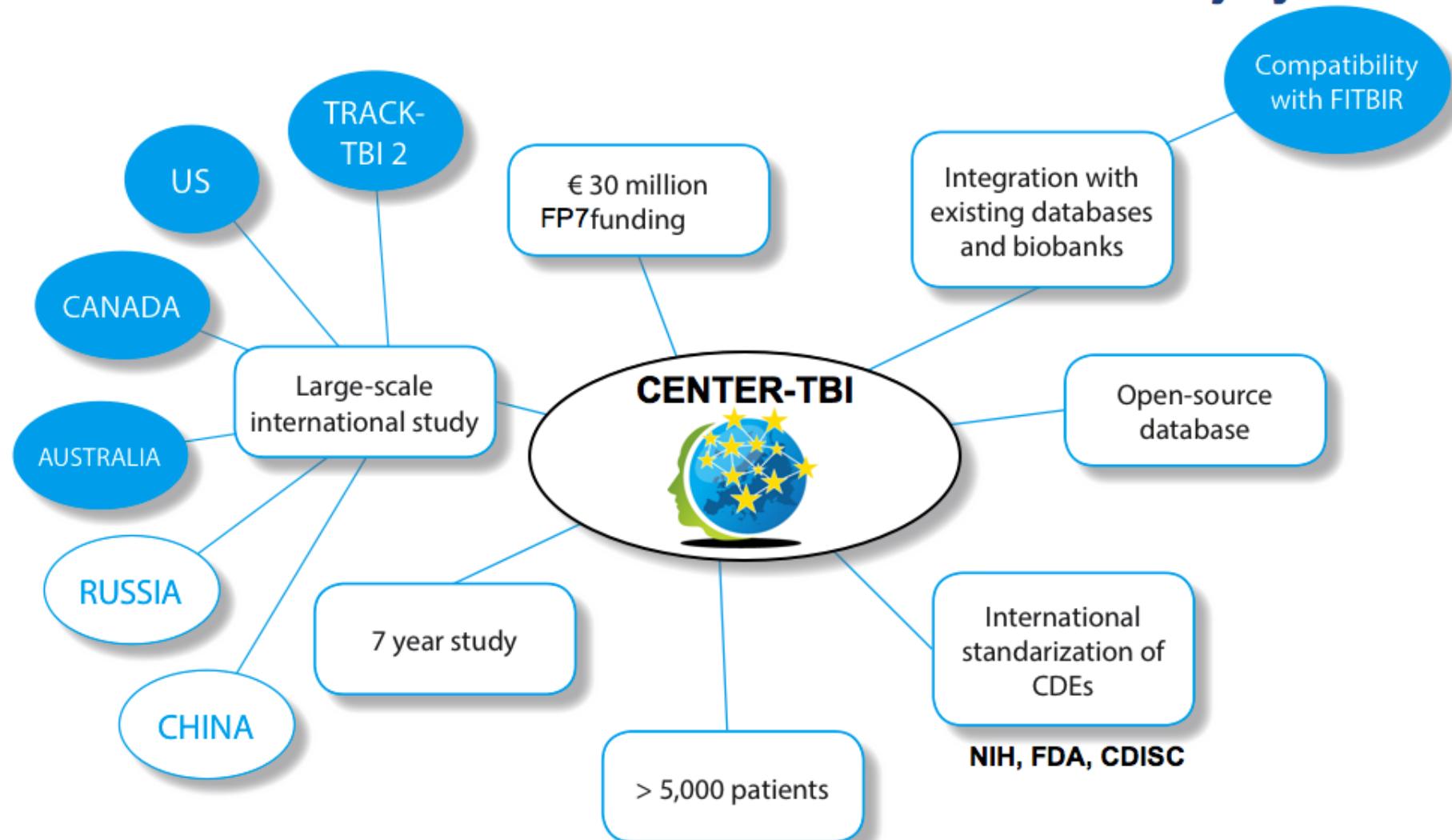
2014:

- INCF 5 Year Review; new strategic plan for INCF in formation
- Engagement of communities
- Consultation on new directions

Clinical Neuroinformatics



International collaboration on traumatic brain injury



- better characterise TBI
- identify the most effective clinical interventions



CENTER-TBI

Collaborative European NeuroTrauma Effectiveness Research in TBI
A 2020 vision: Generating knowledge for improving TBI outcomes

- 60 centers, 20 EU countries
- 5400 patients
- INCF role:
 - Data collection standards (CDEs)
 - Open standards-based informatics platform
 - Facilitate development of novel big data analytics techniques for clinical data
- Data repositories:

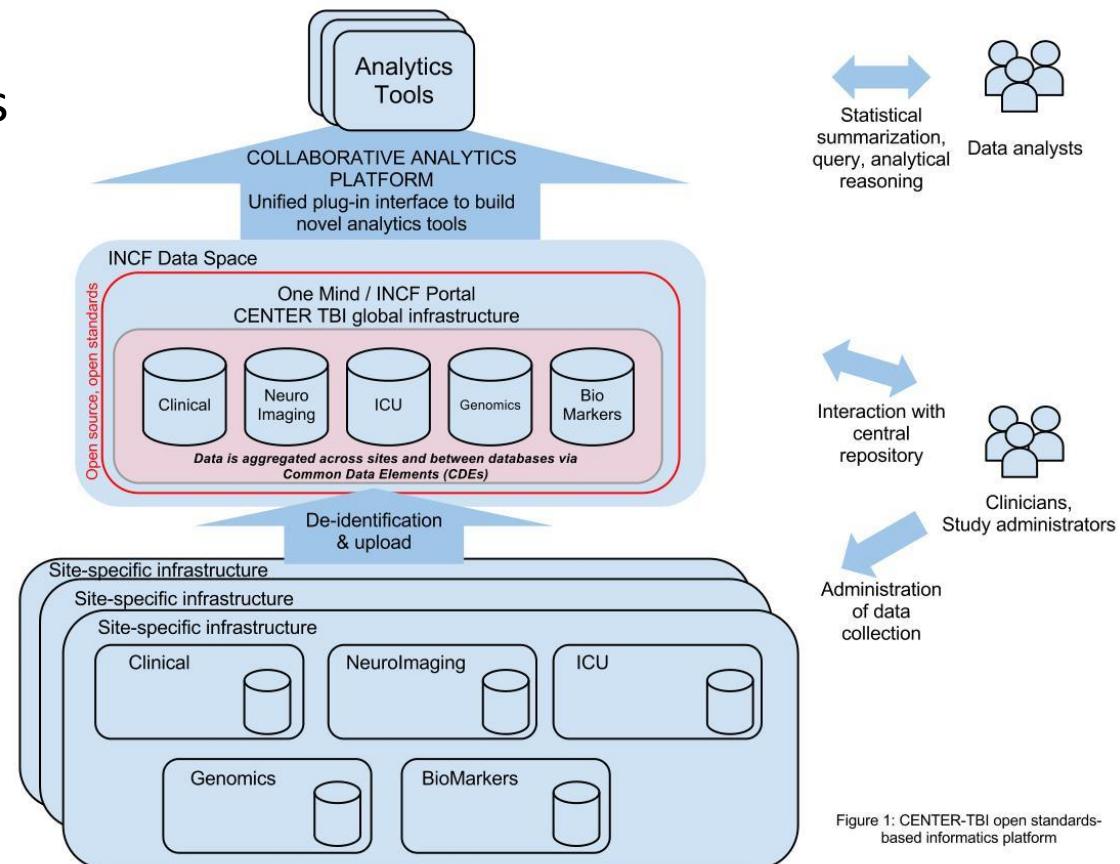
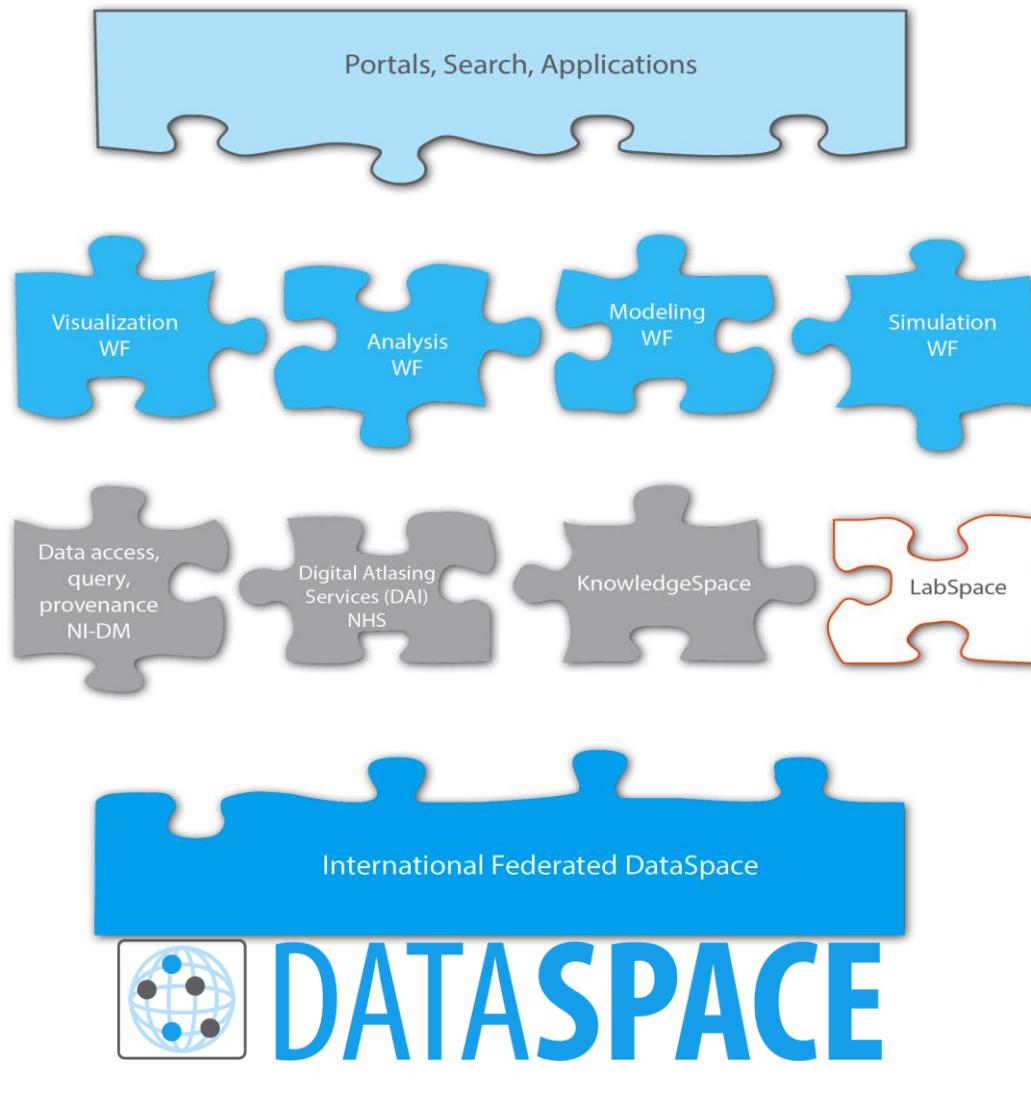


Figure 1: CENTER-TBI open standards-based informatics platform

INCF Infrastructural Vision



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Neuroinformatics integrates many kinds
of data - from genes to behavior - to help
understand the brain and its disorders

[LEARN MORE](#)

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What we do
What is Neuroinformatics?
Member countries and National nodes
Who funds us?
Contact us

OUR PROGRAMS

Digital Brain Atlas
Multiscale Modeling
Ontologies of Neural Structures
Standards for Data Sharing
Teaching and Training

23 Jul Predict Progression of ALS and Win \$25,000. Learn how to at: <http://t.co/m2LFEbAr>

[Follow us](#)

HIGHLIGHTS

Predict Progression of ALS and Win \$25,000



Prize4Life has launched a computational challenge to predict the future progression of disease in ALS. The prize run by Prize4Life in collaboration with The DREAM Project. The challenge is based on the PRO-ACT database, which upon completion will contain clinical data for more than 7,500 ALS patients from completed clinical trials.

[Learn more about the prize](#)

New European Commission Initiative



The European Commission has recently adopted a Communication and Recommendation on access to and preservation of scientific information measures to improve access to scientific knowledge produced in Europe. This will help researchers and businesses to build on the results of publicly-funded research, will boost Europe's innovation capacity and will give citizens quicker access to scientific discoveries.

[Read about the initiative](#)

GigaScience: a New Open Data Journal



BioMed Central and BGI Shenzhen have launched a new open access, open data journal covering not only the 'omic' type data and the fields of high-throughput biology currently serviced by large public repositories, but also the growing range of more difficult-to-access data, such as imaging, neuroscience, ecology, cohort data, systems biology and other new types of large-scale shareable data.

[Discover GigaScience](#)

[View all highlights](#)

INCF SUPPORTING PARTNERS

INCF receives contributions from our member countries, based on gross domestic expenditures on research and development.

Karolinska Institutet and the Royal Institute of Technology are the host institutions of INCF. Further support is also received from the Swedish Research Council, the Swedish Foundation for Strategic Research and the National Science Foundation.



INCF on github

Neuroinformatics mailing list
for the global community

[neuroinfo
@infc.org](mailto:neuroinfo@infc.org)



INCF Newsletter:
infc-info-subscribe@infc.org



incf | Neuro Informatics 2014

Leiden, The Netherlands | August 25 - 27



Keynote speakers:

- Margarita Behrens
- Dmitri (Mitya) Chklovskii
- Daniel Choquet
- Ila Fiete
- Michael Milham
- Felix Schürmann

INCF Video