Annual Report

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International Neuroinformatics
Coordinating Facility

incf

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Message from the Directors

Looking back at 2021, we would like to highlight a few of the network's major accomplishments. First and foremost, we were able to meet again as a network at this year's virtual INCF Assembly. We are proud to announce that this year's Assembly was one of our largest INCF conferences to date. Second, INCF working groups have remained dedicated and focused on delivering results; for example, the INCF Working Group on Electrophysiology Stimulation Ontology delivered the first draft of the ontology this year while the INCF-OCNS Working Group on Computational Neuroscience Software hosted several webinars to introduce the community to the different software options available for computational neuroscience research. Please checkout the INCF blog and the working group pages to see for yourselves how productive the INCF working groups have been this year! Third, the INCF governing councils and committees have been hard at work drafting policies to set the network's scientific and training agenda while developing resources to help the community-at-large implement practices that support open, FAIR, and citable neuroscience research.

The Council for Training, Science, and Infrastructure (CTSI) is currently developing a so-called FAIR roadmap for neuroscience. The objective of the roadmap is to provide the community with a resource where they will learn about and receive practical advice on how to implement FAIR data management practices in their research. The CTSI aims to launch the resource in 2022.

The Infrastructure Committee has drafted a set of neuroscience-centered selection criteria for data repositories and scientific gateways. The criteria are currently under review and will serve as the selection criteria for the planned INCF repositories and scientific gateways portfolio (2022).

The Training and Education Committee (TEC) expanded the summer coding mentorship program beyond Google Summer of Code program to include a pilot program sponsored by MathWorks. We are happy to announce that the MathWorks sponsored program will take place again in 2022. In addition to the new mentorship program, the TEC also hosted the first INCF Training Weeks–2 week long virtual courses, workshops, and tutorials on concepts ranging from cloud computing to how to implement INCF endorsed standards in your research.

The Standards and Best Practices (SBP) Committee reviewed 9 SBPs this year (2 endorsed, 3 re-endorsed, and 4 are currently under review).

Finally, the network's new membership model went into full effect this year. Now, individuals as well as institutions and companies can financially support the mission of INCF. For our US and Canadian members, the Secretariat is working to ensure that your 2022 contributions will be tax deductible as charitable gifts!

The continued challenges with in-person meetings has shown that global collaboration and open science is more important than ever, and INCF continues to be committed to facilitating this within the global neuroscience community.

Stay safe and stay engaged!

Helena Ledmyr

Director
Development & Communications

Mathew Abrams

Director
Science & Training

The INCF membership model

We have expanded the ways the community can be active participants and contributors to our mission to develop, evaluate, endorse, and implement standards and best practices that embrace the principles of open, FAIR, and citable neuroscience: INCF membership is now open to individuals, institutions, organizations, and companies who are interested in pushing reproducible neuroscience further and faster.

INCF provides:
- a forum where
  - neuroinformaticians can develop their skills, and search for others with needed skills
  - neuroscientists, informaticians, tool developers, and others can join together on common issues, and organize Special Interest Groups and Working Groups
  - infrastructure providers and tool developers can share experiences and develop their toolsets to match community needs
  - companies can take part in discussions and decisions around strategy for standards development and implementation
- neuroscience researchers with training in how to manage, share, and analyze their data
- funders with tools to implement and encourage open and FAIR practices in neuroscience projects

Detailed information about the different memberships and how to join can be found on incf.org/join
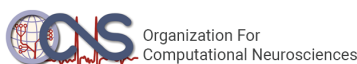
INCF members

In 2021, the INCF had 20 non-profit and 6 for-profit group members:

Addgene
Addgene is a US-based nonprofit plasmid repository. Addgene's mission is to accelerate research and discovery by improving access to useful research materials and information. Addgene facilitates the sharing of high-quality scientific materials, research reproducibility, and open science by archiving and distributing DNA-based research reagents and associated data to scientists worldwide. Addgene's repository includes special collections on CRISPR, fluorescent proteins, viral plasmids, and more. Addgene also provides ready-to-use AAV and lentiviral preparations of commonly requested plasmids. Addgene offers free online educational resources and protocols about molecular biology such as vector backbones, cloning, CRISPR, and AAV and lentivirus production.

Allen Institute for Brain Science
The Allen Institute for Brain Science is a division of the Allen Institute (alleninstitute.org), an independent, 501(c)(3) nonprofit medical research organization, and is dedicated to accelerating the understanding of how the human brain works in health and disease. Using a big science approach, the Allen Institute generates useful public resources used by researchers and organizations around the globe, drives technological and analytical advances, and discovers fundamental brain properties through integration of experiments, modeling and theory. Launched in 2003 with a seed contribution from founder and philanthropist, the late Paul G. Allen, the Allen Institute is supported by a diversity of government, foundation and private funds to enable its projects. The Allen Institute for Brain Science's data and tools are publicly available online at brain-map.org.

Australian Research Council Centre of Excellence for Integrative Brain Function
The Australian Research Council Centre of Excellence for Integrative Brain Function (brainfunction.edu.au) seeks to better understand how the brain interacts with the world by focusing on the brain's intricate structure and functions that underlie attention, prediction and decision-making. To achieve this goal, the ARC Centre is facilitating collaborations amongst Australia's leading brain researchers in the fields of brain anatomy and physiology, neuronal networks, neural circuits, brain systems, human behaviour and neurotechnologies.

Biomax Informatics
Biomax Informatics provides services and software solutions for efficient decision making and knowledge management at the intersection of life sciences, healthcare and information technologies. Biomax facilitates digital transformation within biotech, pharma, agriculture, food and chemical industries as well as research institutes. Biomax offers a range of standard products, based on the core technology knowledge management platform BioXM™, which are synergistically interrelated.
- AILANI™, the Artificial Intelligence LANguage Interface, provides unique semantic search capabilities that catalyze digital change and accelerate the innovation cycle.
- NICARA™ is the one-stop-shop to decipher brain physiology.
- The Clinical Integration System ensures access to real world evidence data, which is critical to effectively and robustly train Artificial Intelligence to support clinical decisions at the point of care.

With more than 20 years of experience and around 50 employees - including numerous life scientists, data scientists and software developers with a scientific background - Biomax is a competent partner. Participation in multinational research projects keeps the Biomax team up-to-date with the latest research and technology and ensures that Biomax delivers state-of-the-art solutions to all customers. Founded in 1997, Biomax is ISO 9001 and ISO 27001 certified and is headquartered in Planegg near Munich, Germany.

Brain SImulation Section, Charité University Medicine Berlin
The Brain Simulation Section headed by Professor Petra Ritter is located at the Charité in Berlin. It is one of the leading centers in the field of multimodal brain imaging and multi-scale computational modelling. The unit is hosted by the Dept. of Neurology at the Charité University Medicine Berlin. Charité is one of the largest

University Hospitals in Europe with close to 100 different Departments and Institutes and more than 3,700 researchers. It lays claim to several Nobel Prize winners, including Emil von Behring, Robert Koch, and Paul Ehrlich. The Brain Simulation Section is endowed by the Berlin Institute of Health (BIH) and the Foundation Charité with the mission to foster medical innovation and improve patients' health and quality of life, focusing on digitization, patient involvement, personalized medicine research, advanced therapies, innovation. The Center is leading several Neuroinformatics projects – local ones such as the Virtual Research Environment, national initiatives, such as the National Research Data Infrastructure for Neuroscience, the European Virtual Brain Cloud and international ones such as The Virtual Brain. The Center acts as an active partner in the Human Brain Project and the European Open Science Cloud.

Datajoint
DataJoint is the principal developer of the DataJoint® software framework and associated resources for shared scientific databases and computational data pipelines. The company's mission is to enable scientific research teams to solve the most complex problems in their fields by bringing scientific rigor and clarity to big data and computations. While these solutions are applicable to other domains, the company focuses on supporting research in neuroscience and artificial intelligence

F1000 research
F1000Research is an Open Research publishing platform for scientists, scholars and clinicians offering rapid publication of articles and other research outputs. All articles benefit from transparent peer review and editorial guidance on making all source data openly available.

Inria
Inria is the French national research institute for digital science and technology. World-class research, technological innovation and entrepreneurial risk are its DNA. In 215 project teams, most of which are shared with major research universities, more than 3,900 researchers and engineers explore new paths, often in an interdisciplinary manner and in collaboration with industrial partners to meet ambitious challenges. As a technological institute, Inria supports the diversity of innovation pathways: from open source software publishing to the creation of technological startups (Deeptech).

ModECI
ModECI (Model Exchange and Convergence Initiative) is a multi-investigator collaboration that aims to develop a standardized format for exchanging computational models across diverse software platforms and domains of scientific research and technology development.

Nencki
The Institute's mission is deeply rooted in its long history of excellence in basic scientific research, but it must be periodically revised in response to dynamically changing environment of scientific research and its economical and societal implications. Therefore at the beginning of the 21st century, termed by some "the age of biology", the Institute's mission and development strategy must be reevaluated. The enclosed director's note sets the context for such re-evaluation process, which should involve all the stakeholders, starting with the Institute's research and support staff, and ending with the Institute's Scientific Council and the Polish Academy of Sciences.

NITRC
NeuroImaging Tools & Resources Collaboratory is an award-winning free web-based resource that offers comprehensive information on an ever expanding scope of neuroinformatics software and data. Since debuting in 2007, NITRC has helped the neuroscience community make further discoveries using software and data produced from research that used to end up lost or disregarded. NITRC also provides free access

to data and enables pay-per-use cloud-based access to unlimited computing power, enabling worldwide scientific collaboration with minimal startup and cost. With NITRC and its components—the Resources Registry (NITRC-R), Image Repository (NITRC-IR), and Computational Environment (NITRC-CE)—a researcher can obtain pilot or proof-of-concept data to validate a hypothesis for just a few dollars.

Neurobiology Research Unit (NRU) at Copenhagen University Hospital
The Neurobiology Research Unit (NRU) at Copenhagen University Hospital Rigshospitalet in Denmark conducts translational neuroscience research with the aim to promote preventive, diagnostic, and therapeutic advances. We make use of neuropsychological and behavioral assessments combined with MRI, PET, SPECT and EEG in humans to investigate basic neurobiological mechanisms in the healthy brain and brain disorders, as well as neuropharmacological effects on the brain. Advanced image processing and statistical methods are applied to our data. We also use animal and cell models to bring pre-clinical discoveries into healthy volunteers and patients as early as possible.

Institut de Neurosciences des Systèmes (INS)
The Institut de Neurosciences des Systèmes (INS, Director Viktor Jirsa, ins-amu.fr) is a multidisciplinary research institute of Inserm and Aix-Marseille University located on La Timone Campus in Marseille, France. Inserm is the French National Institute of Health and Medical Research and its patronage prioritizes the medical orientation of INS research. Members are comprised of academic faculty and clinicians of La Timone Hospital (APHM) institutions, as well as Inserm and CNRS researchers. CNRS is the French National Institute of Scientific Research. The research program at INS is focused on understanding the complexity and dynamics of the human brain and its links to cognition, consciousness and their disorders. INS has been created with the intent to attract researchers sharing the same vision of the brain as a dynamic network and integrate experimental, theoretical and clinical approaches towards understanding brain function and dysfunction. INS researchers perform research across species ranging from the rodent to the human brain to uncover the mechanisms underlying brain function and its disorders, notably epilepsy as the paradigmatic dynamic brain disease. INS houses a wide range of state-of-the-art facilities of brain research, which includes The Virtual Brain, an important neuroinformatics platform associated with the Human Brain Project, an MEG facility, TMS-EEG with a Brain Navigation system, various electrophysiology laboratories, and an epileptic patient unit with SEEG.

Institute of Health and Analytics (IHA)
The Institute of Health and Analytics (IHA, utp.edu.my, Director Tong Boon Tang) is a multidisciplinary research institute of Universiti Teknologi PETRONAS located in Seri Iskandar, Malaysia. The core members comprise 26 academic faculty staff of three research groups (ABMMG, SMART and VISI) and one National Centre of Excellence in Neuroimaging (HICoE CISIR). The research program at IHA is focused on performing and translating health and analytics research to enhance human health and productive society. IHA positions its research centre and groups to drive three strategic thrusts, namely Multi-scale Objective Measurements, Making Sense through Data Analytics, and Intervention for Better Wellness, in addressing socioeconomical needs for good health and quality education. The niche areas of IHA include:
  • Neurotechnology for quality education
  • Neurotechnology for stress management towards productive workforce and healthy lifestyle
  • Biomedical implant manufacturing and rehabilitation
  • Stroke assessment, modelling and rehabilitation
  • Wearable and visualization technology for health and well-being
  • Computer aided analytics and diagnosis

MathWorks
MathWorks (mathworks.com) is the leading developer of mathematical computing software. MATLAB, the language of engineers and scientists, is a programming environment for algorithm development, data

analysis, visualization, and numeric computation. Simulink is a block diagram environment for simulation and Model-Based Design of multidomain and embedded engineering systems. Engineers and scientists worldwide rely on these product families to accelerate the pace of discovery, innovation, and development in automotive, aerospace, electronics, financial services, biotech-pharmaceutical, and other industries. MATLAB and Simulink are also fundamental teaching and research tools in the world's universities and learning institutions. Founded in 1984, MathWorks employs more than 5000 people in 16 countries, with headquarters in Natick, Massachusetts, USA.

MBF Bioscience

MBF Bioscience (MicroBrightField, mbfbioscience.com) provides life science researchers with tools for quantitative microscopy and big image data management. We design quantitative imaging visualization software for stereology, neuron reconstruction, brain mapping, vascular analysis, c. elegans behavior analysis and medical education. Integrated with the world's leading microscope systems, our software allows researchers to obtain accurate, quantitative, and FAIR data from brightfield, widefield fluorescence, light sheet, 2 photon, or laser-scanning confocal microscopy images.

One Mind

Launched in 1995, One Mind (onemind.org) is a leading international brain and mental health non-profit that is creating a world where those who face brain health challenges can build healthy, productive lives. By incentivizing a collaborative research culture that promotes open science and data sharing, and by convening the brightest minds in brain science and advocacy, One Mind continues to advance their portfolio of program initiatives that focus on accelerating scientific discoveries, scaling the implementation of those discoveries to enhance services, and transforming societal culture. Through such achievements as enrolling over 10,000 patients in innovative clinical studies and the One Mind at Work initiative that has brought supportive workplace mental health practices to over 5.3 million employees, One Mind continues to move forward towards their vision of 'Healthy Brains for All'. Brandon Staglin, whose own mental health experiences triggered the creation of the non-profit, now serves as its President, exemplifying the opportunities that One Mind seeks to create.

Ontario Imaging and Neuroinformatics Consortium (Baycrest, BrainSCAN, Krembil Centre for Neuroinformatics, and the Ontario Brain Institute)

The Ontario Neuroinformatics Consortium (ONiC) is a regional alliance focused on developing and promoting neuroinformatics initiatives for Ontario scientists. The group consists of the Rotman Research Institute at Baycrest, the Krembil Centre for Neuroinformatics at CAMH, BrainsCAN at Western University, and the Ontario Brain Institute. ONiC works in tandem with other national partners in the Canadian Open Neuroscience Platform to coordinate national efforts in support of INCF's mandate.

OpenBCI

OpenBCI (openbci.com) has been creating open-source tools for neuroscience and biosensing since 2014. The company's mission is to democratize access to neurotechnology by providing low-cost, high-quality, fully-transparent hardware and software. Since its inception, OpenBCI has shipped over 19,000 products to customers in 84 countries, and helped power six years of published research in multiple fields.

Organization for Computational Neurosciences (OCNS)

The purpose of the Organization for Computational Neurosciences (OCNS, ocns.org) is to create a scientific and educational forum for students, scientists, other professionals and the general public to learn about, to share, to contribute to, and to advance the state of knowledge in computational neuroscience. Computational neuroscience combines mathematical analyses and computer simulations with experimental neuroscience, to develop a principled understanding of the workings of nervous systems and apply it in a wide range of

technologies. OCNS promotes meetings and courses in computational neuroscience and organizes the Annual CNS Meeting which serves as a forum for young scientists to present their work and to interact with senior leaders in the field. *INCF representative: Leonid Rubchinsky*

NeuroPSI, Paris-Saclay Institute of Neuroscience
The main scientific goal at NeuroPSI is to understand the nature and logic of the neural circuits that govern the behavior of animals as they interact with their environment. We use various animal models and combine experimental and theoretical approaches to understand how different types of neural architectures can perform brain tasks. Our projects aim to determine how cellular interactions lead to neuronal populations, how these populations assemble into functional circuits, and how these circuits operate to integrate different sensory modalities, generate behaviors and control cognitive functions. We also investigate, through comparative and genetic approaches, how evolutionary forces shape the brain and create individual brain diversity in natural populations.

Sage Bionetworks
Sage Bionetworks is a nonprofit health research organization that was founded in Seattle in 2009. We use open practices that increase the reliability of scientific claims to speed the translation of science to medicine. We support responsible data sharing, objective evaluation of methods and results across researchers, and the empowerment of participants to be active partners in research.

Sainsbury Wellcome Centre
The Sainsbury Wellcome Centre (SWC) brings together world-leading neuroscientists to generate theories about how neural circuits in the brain give rise to the fundamental processes underpinning behaviour, including perception, memory, expectation, decisions, cognition, volition and action. Funded by the Gatsby Charitable Foundation and Wellcome, SWC is located within UCL's School of Life and Medical Sciences and is closely associated with the Faculties of Life Sciences and Brain Sciences.

SciCrunch
SciCrunch (scicrunch.org) adds value to existing scientific resources by increasing their discoverability, accessibility, visibility, utility and interoperability, regardless of their current design or capabilities and without the need for extensive redesign of their components or information models. Unlike more general search engines, SciCrunch provides deeper access to a more focused set of resources that are relevant to its communities, provides search strategies tailored to its communities, and also provides access to content that is traditionally "hidden" from web search engines. *INCF representative: Anita Bandrowski*

SPARC
The NIH Common Fund's Stimulating Peripheral Activity to Relieve Conditions (SPARC) program supports a consortium of international researchers working to accelerate development of therapeutic devices and identification of neural targets for bioelectronic medicine--modulating electrical activity in nerves to help treat diseases and conditions by precisely adjusting organ function. By visiting the SPARC Portal the research community can access freely available high-value datasets, maps, and computational studies with the potential to help transform our understanding of nerve-organ interactions and advance bioelectronic medicine towards treatments that change lives. *INCF representative: Jeff Grethe*

Endorsement of FAIR community standards and best practices

INCF has implemented a formal procedure for evaluating and endorsing community standards and best practices in support of the FAIR principles. Our mission is to make neuroscience more open and FAIR, to ensure that research funds and efforts are well invested, and that neuroscientific findings are robust and replicable.

Quality community standards are necessary to make FAIR resources and processes work, but too many neuroscience communities lack robust standards or have competing incompatible standards. The rapid development of new techniques also means that there is a continuous need for new and updated standards, and that old standards need an active developer and user community keeping them up to date.

The INCF network is working to provide the community with a framework for training, disseminating, understanding, and adopting standards and best practices that support FAIR data management and sharing of neuroscience research data. The INCF Standards and Best Practices Committee was established to coordinate the INCF standards and best practices endorsement framework. This framework is based on established practices employed by international standards organizations such as W3C, IEEE, and ISO. The SBP endorsement process is designed to ensure that the standards are in a form where they can be consumed by their target community, e.g., researchers, technical developers, and industry. The formal review process was instantiated in 2018 and includes community nomination, evaluation against a consistent set of criteria, followed by open posting of the review for a period of 60 days with active solicitation of community feedback. If the committee does not have the requisite expertise, outside expert reviewers are recruited, including from industry. Endorsed SBPs are made available through a catalog on the INCF portal and promoted to the community, journals, industry and funders through INCF's training and outreach efforts.

By endorsing standards, INCF wants to
  • make it easy to find the best, most reliable standard appropriate for your research
  • ensure recognition for community members investing their time and effort in standards

The INCF SBP endorsement process enables the community to propose
  1. an existing SBP
  2. the extension of an existing SBP, for example to support additional data types, or
  3. the development of a new SBP

INCF supports the FAIR (Findable Accessible Interoperable Reusable) principles, and endorsed SBPs are required to comply with these principles. INCF seeks to serve the global neuroscience community by providing materials, expertise, training, and SBPs for:
  • scientists seeking to improve their science through neuroinformatics, who will benefit from a coordinated network of tools and expertise
  • current infrastructure providers so they can do their jobs better and participate in the global network
  • those seeking to add new capacity to the network

Contact: standards@incf.org, more info: incf.org/activities/standards-and-best-practices

Endorsed standards and best practices in 2021

DAQCORD

The Data Acquisition, Quality and Curation for Observational Research Designs (DAQCORD) Guidelines are the first comprehensive set of data quality indicators for large, clinical observational studies. They were developed around the needs of neuroscience projects, but we believe they are relevant and generalisable, in whole or in part, to other fields of health research, and also to smaller observational studies and preclinical research. The DAQCORD Guidelines provide a framework for achieving high-quality data, a cornerstone of health research.

The Five Recommendations for FAIR Software

The Five Recommendations for FAIR Software aim to encourage the greater adoption of FAIR principles by providing a set of starting recommendations that researchers can use to improve the quality, reach, and reproducibility of their software.The FAIR principles are a concept which originated in data management. The acronym stands for Findable, Accessible, Interoperable and Reusable. They have served as a flagship for promoting good data management practices, but until recently they were not directly applicable to software. FAIR principles aim to have a positive effect in research software development.

Re-endorsed standards and best practices in 2021

The INCF endorsement process for standards and best practices includes a re-endorsement step every two years because rapid development of new techniques brings a continuous need for updated standards. Re-endorsement is meant to encourage developers to keep standards updated and relevant, and give recognition to community members investing their time and effort in standards.

In 2021, INCF re-endorsed the model description language NeuroML, BIDS (the Brain Imaging Data Structure), and PyNN.

INCF Working Groups

Working Groups are composed of users and developers from across the INCF network working collaboratively to develop, refine, and/or implement community standards. The groups are composed of members working on short-term funded projects that aim to achieve a concrete deliverable. In late 2020, it was decided to include INCF SIGs (Special Interest Groups) under the umbrella term INCF Working Groups. INCF currently has the following Working Groups:

ARTEM-IS

The newly founded ARTEM-IS Working Group aims to develop tools for the ARTEM-IS standard for electrophysiological methods reporting. ARTEM-IS stands for an Agreed Reporting Template for EEG Methodology - International Standard. Read more on the INCF blog.The WG collaborated with the eCOBIDAS WG on an OHBM hackathon project.

eCOBIDAS

The newly founded eCOBIDAS Working Group will turn the COBIDAS recommendations and guidelines into a series of checklists hosted on a website, to let users report information faster and with more detail. The WG collaborated with the ARTEM-IS WG on an OHBM hackathon project.

INCF/OCNS Computational Neuroscience Software

The INCF/OCNS Computational Neuroscience Software Working Group has held regular developer sessions with tool developers presenting their tools. So far, sessions have been held on Brian, GeNN, NeuroFedora, neurolib and sciunit - more are coming. On November 22, there will be a session on "Software citation principles" to be presented by Daniel S. Katz and Neil Chue Hong from FORCE11.

Neuroimaging Data model (NIDM)

The NIDM Working Group held the course Practical Training on Using NIDM Tools to Annotate General Tabular Data and BIDS Datasets during the INCF Training Weeks. In October, they held a presentation of NIDM-terms for participants from the eCOBIDAS and ARTEM-IS Working groups, as well as representatives for HED, OSIPI (ISMRM) and BIDS/OpenNeuro PET. The WG also participated as a project in the OHBM hackathon.

Neuroimaging Quality Control (NIQC)

The INCF Neuroimaging Quality Control (NIQC) Working Group has started a webinar series on quality control. More than 10 webinars have been held. Read more here on WG Chair Pradeep Ramaana's blog, or see past webinars on YouTube. Follow this Google Calendar for new webinars.

Neuroinformatics in Aging

The Neuroinformatics in Aging Working Group held their yearly BrainConnects workshop online on October 21. The theme was Advanced Neurotechnology and Personalized Modeling for Brain Diseases. The first articles have been published in the WG's Frontiers Research Topic Neuroimaging and Informatics for Successful Aging.

Neuroshapes: Open SHACL schemas for FAIR neuroscience data

The Working Group on Neuroshapes: Open SHACL schemas for FAIR neuroscience data has been in hiatus during the last half of 2021, but are planning to take up activities again in 2022. The group is drafting a paper describing Neuroshapes.

Standardized Data

The Standardized Data Working Group's main current project is a BIDS extension proposal dedicated to animal electrophysiology (aka "BIDS-ephys"). They are also planning to have a "BIDS-ephy conversion sprint" during the Brainhack Global in December.

Standardized Representations of Network Structures

Members of the INCF Working Group on Standardized Representations of Network Structures were involved with the NeuroML development workshop at the October 2021 COMBINE meeting, including representatives from NeuroML, NetPyNE and PyNN, where future plans for network specification in NeuroML (centred around NeuroMLlite) were discussed.

Training

TrainingSpace

TrainingSpace, training.incf.org, is an online hub that makes multimedia educational content from courses, conference lectures, and laboratory exercises from some of the world's leading neuroscience institutes and societies more accessible to the global neuroscience community. It was developed in collaboration with the partners listed above. TrainingSpace provides users with study tracks for self-guided study, tutorials on tools and open science resources for neuroscience research, a Q&A forum Neurostars (neurostars.org), and access to publicly available datasets as well as links to literature references.

TrainingSpace currently serves as the major repository of training materials for INCF, HBP, and The Virtual Brain. Topics currently included in TrainingSpace include general neuroscience, clinical neuroscience, computational neuroscience, neuroinformatics, computer science, data science, and open science. All courses and conference lectures include a summary, topics covered, links to prerequisite courses if applicable, and links to software described in or required for the course, as well as links to the next lecture in the course or more advanced related courses/lectures.

in 2021, 80 new resources (bringing the total to 507 resources) have been added to the TS catalog in the fields of neuroethics, FAIR, BCI, and AI. A neuroethics study track was also added bringing the total number of study tracks to 4. In terms of user base, TS has welcomed 24,054 users conducting 82,686 pageviews in 2021.

In comparison, TS received 3.980 and 12.264 users in 2019 and 2020 respectively.

1. United States
2. India
3. Germany
4. United Kingdom
5. Canada
6. China
7. Pakistan
8. France
9. Italy
10. Japan

Geographic distribution of TrainingSpace users

2021 user statistics for TrainingSpace

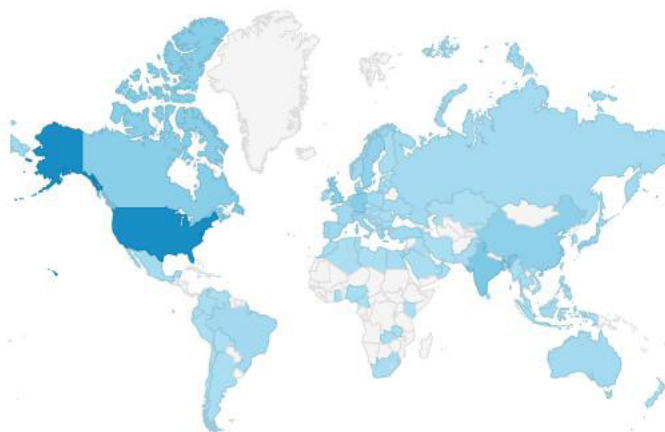| Sessions	Pageviews	Users
35,232	82,686	24,054

KnowledgeSpace

KnowledgeSpace is a community-based encyclopedia that links brain research concepts to data, models, and literature. It provides access to anatomy, gene expression, models, morphology, and physiology data from different neuroscience data/model repositories, such as Allen Brain Map and the Human Brain Project. It is an open project and welcomes participation and contributions from the global research community.

KnowledgeSpace aims to be a globally-used, community-based, data-driven encyclopedia for neuroscience that links brain research concepts to data, models, and the literature that support them. Further it aims to serve as a framework where large-scale neuroscience projects can expose their data to the neuroscience community-at-large. KnowledgeSpace is a framework that combines general descriptions of neuroscience concepts found in wikipedia with more detailed content from NeuroLex. It then integrates the content from those two sources with the latest neuroscience citations found in PubMed and data found in some of the world's leading neuroscience repositories. KnowledgeSpace is a joint development between the Human Brain Project (HBP), the International Neuroinformatics Coordinating Facility (INCF), and the Neuroscience Information Framework (NIF).

During 2021, a new UI and enhanced search functionality have been implemented. UI upgrades include new dataset cards which provide users with a summary as well as expanded descriptions of the datasets. The enhanced search enables users to view search results through dataset- and literature- only views as well as the traditional view through the encyclopedia. In addition, users can now receive search returns across all data sources (provides users with a list of all datasets available across repositories) in the dataset view; previously, users had to go through each data source individually to see a list of the datasets available from that data source. KS now ingests data from HBP, BRAIN, BrainMINDS, and CONP; and discussions are underway with IBI to leverage KS as the backend for the IBI data catalog of the large-scale brain projects.

1. United States
2. India
3. Germany
4. Canada
5. United Kingdom
6. China
7. Sweden
8. Italy
9. Japan
10. Switzerland

*Geographic distribution of KnowledgeSpace users*

2021 user statistics for KnowledgeSpace

Sessions	Pageviews	Users
2,718	8,935	1,990

Neurostars

Neurostars is a question and answer site that serves the INCF network as a forum for knowledge exchange between national nodes and beyond; as a point of interaction between neuroscientists, software developers, and infrastructure providers; and as an integral resource in the network's training and mentoring initiatives. As part of the TrainingSpace suite, it provides community interaction and Q&A access to experts for students and teachers from around the world. During 2021 Neurostars grew to over 100,000 users.
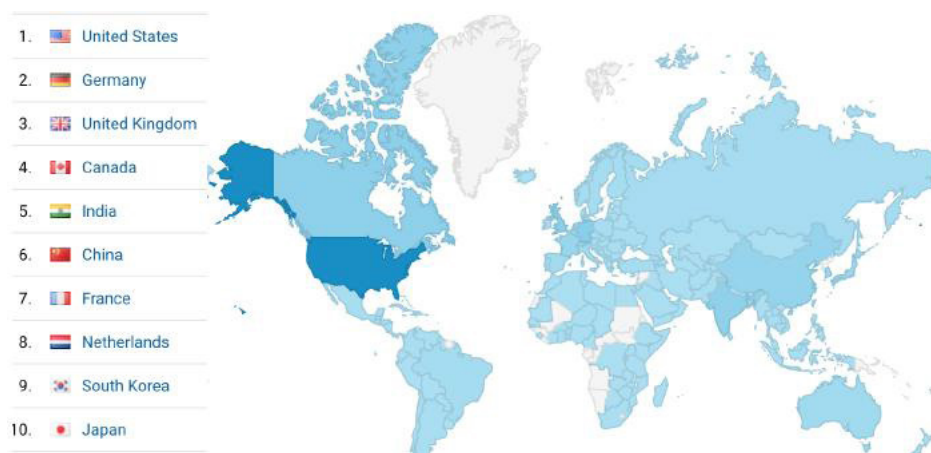
Geographic distribution of Neurostars users

2021 user statistics for Neurostars

Sessions	Pageviews	Users
195,743	371,085	103,443

INCF Assembly 2021

The 2021 INCF Neuroinformatics Assembly was hosted virtually with great success. The meeting welcomed 234 participants and was sponsored by 6 companies and organizations. The two-week program covered aspects of FAIR neuroscience in 15 live-streamed sessions and two shorter live-streamed sponsor breaks. Participants had the ability to ask questions via a chat function within the virtual platform, and INCF staff communicated all questions to the presenters so they could be responded to in the live stream. There was also a virtual poster hall including sponsor and INCF booths and an INCF breakout room where participants were encouraged to socialize with each other and INCF Secretariat staff. A selection of the videos have been posted on INCF TrainingSpace for all who would like to increase their knowledge on these topics.

Google Summer of Code

INCF participated for the 11th time as mentoring organization in the 2021 Google Summer of Code. This year 21 projects were mentored by participants recruited from INCF members and the wider community.

More info: incf.org/activities/training/google-summer-of-code

Project titles of completed projects in 2021:

Title	Student	Mentor(s)
Adding more functionality to AnalySim: a data sharing and analysis platform	Nga Tran	Cengiz Gunay, Anca Doloc-Mihu
SOVABIDS: A python package for the automatic conversion of MEG/EEG datasets that makes the most out of metadata	Yorguin Mantilla Ramos	Aswin Narayanan, Tom Johnstone, Steffen Bollmann, Oren Civier
A Django platform for comparing scientific methods for analyzing neural time series analysis methods	Diptanshu Mittal	Ben Fulcher
Maxima demo and documentation tool	Aditya Wagh	Dimiter Prodanov
Conversion of public neurophysiology datasets to NeuroData Without Borders format	Steph Prince	Ankur Sinha, Padraig Gleeson
Measure the quality of CerebUnit validation tests	Harsh Khilawala	Lungsi Ngwua
Improving test coverage and implementing CI/CD in BrainBox	Aditya R Rudra	Katja Heuer, Anibal Solon, Roberto Toro
Eye tracking	Dinesh Sathia Raj	Vineet Gandhi, Suresh Krishna, Tiago Falk, Reza Farivar
LORIS Codebase maintenance and automated testing	Viet Hoang	Christine Rogers
Population-specific tractography bundle atlas creation	David Romero Bascones	Bramsh Q Chandio
Upgrading DevoLearn	Mainak Deb	Bradly Alicea
Decentralized storage of versioned BIDS datasets with IPFS, Datalad and Ceramic	Kinshuk Kasyap	Anibal Solon, Shady El Damaty
Re-creating the Leech Heartbeat Network Model Tutorial using the Neuron Simulator in Python and NeuroML	Psyogi Soma	Cengiz Gunay, Padraig Gleeson
Input/Out workflows for Active Segmentation Platform	Piyumal Demotte	Dimiter Prodanov, Sumit Kumar Vohra
Analyzing stimulus prediction capabilities of neurons: predictive information estimation methods	Shiven Tripathi	Sarah Marzen, Joost le Feber
Times series classification of EEG Data with Sktime	Svea Marie Meyer	Markus Löning, Martina Vilas
TVB for Jupyter and Collaboratory	Ishan Vatsaraj	Lia Domide, Paula Prodan
SciUnit: integration with NetPyNE and other simulation environments	Evgeniia Karunus	Rick Gerkin
Building a working prototype of the AutSPACEs website	Anoushka Ramesh	Lotty Coupat, Kirstie Whitaker
A Python toolbox for computing high-order information in neuroimaging	Pranav Mahajan	Daniele Marinazzo, Fernando Rosas
Support of the simulation-based inference with the model fitting toolbox	Ante Lojic Kapetanovic	Marcel Stimberg

International Brain Initiative, IBI

The International Brain Initiative, a consortium of researchers working on brain initiatives around the world, was established in recognition of the fact that the individual initiatives are engaged in an effort so large and complex that even with the unprecedented efforts and resources from public and private enterprise, no single initiative will be able to tackle the challenge to better understand the brain. The initial members of the consortium include the U.S. BRAIN Initiative, the E.U. Human Brain Project, the Korea Brain Project, the Japan Brain/MINDS Project, Israel Brain Technologies, and the Australian Brain Alliance. The Consortium is coordinated by the Kavli Foundation, assisted by INCF, the Australian Brain Alliance, and IBRO.

INCF community members and Secretariat staff participate in IBI Coordinating Body meetings and are involved in the following IBI Working Groups:

- Maryann Martone, INCF Governing Board chair: Datasharing Working Group (co-chair)
- Mathew Abrams, INCF Director: Inventory Working Group (participant)
- Helena Ledmyr, INCF Director: Communications and Outreach Working Group (co-chair)

DAQORD

Based on the experience gained from managing the CENTER-TBI data, in an effort to promote high quality data and improve the data sharing for the future, a new initiative called Data Access Quality & Curation for Observational Research Designs (DAQCORD) has been started. DAQCORD is initiated from the International Initiative for Traumatic Brain Injury Research (InTBIR) where INCF is an active participant. The goal is to capture key information about data acquisition, quality control measures, and curation in a tool that is linked to the dataset so that potential research collaborators can determine if the data meets their needs and expectations.

DAQCORD tool aims: to provide a framework/toolkit for robust study design (and electronic case report form- eCRF- design in particular) and quality management; to provide a framework by which early study plans can be systematically appraised (for example by funding organisations) in terms of their approach to data quality; and to provide a reporting framework with which to describe the steps taken to ensure data quality.

Resources

INCF provides several resources for facilitating neuroscience research: training in neuroinformatics, publications services, and an online community-developed, data-driven encyclopedia for neuroscience. Many further tools and resources are available from the INCF portal at incf.org/resources

Standards and best practices portfolio

The current portfolio contains 14 data and metadata standards and best practices that facilitate open and FAIR neuroscience research. Read more on page 10. incf.org/resources/sbps

Tools and infrastructure portfolio

This porfolio contains tools, infrastructure, and services developed by the INCF network and its collaborators that facilitate open and FAIR neuroscience research. Currently the portfolio contains

- TrainingSpace (see page 13)
- KnowledgeSpace (see page 14)
- Neurostars (see page 15)
- Neurobot: a web based application for simplifying data sharing and metadata management for research. Most clinical data management tools are designed for efficient data acquisition and data processing; however, they often lack a usable data access interface. Neurobot, a lightweight data sharing application, was developed to provide a user-friendly data access interface that can be used for sharing a wide variety of versioned datasets. The data model behind Neurobot has a scalable backend and has been optimised for faster queries on large datasets. By separating data publishing and sharing tools from the data management platform, Neurobot provides the flexibility required for clinical and non clinical studies. Neurobot has been released as a product that can be used for data sharing in clinical and pre-clinical studies, and has a Resource Identifier (RRID) to include in the publications related to Neurobot: INCF-Neurobot, RRID:SCR_017004. incf.org/resources/tools/neurobot

Publication services

INCF works with publishers and journals to facilitate and improve the process of publishing research results.

Neuroscience Peer Review Consortium, NPRC

INCF manages NPRC, a cross-publisher alliance of neuroscience journals that accept manuscript reviews from other NPRC journals. NPRC is open to any neuroscience journal that is indexed by MEDLINE and provides a payoff in reduced work for authors, reviewers, and editors. At the time of this report, 65 neuroscience journals have signed the NPRC agreement.

F1000 channel

INCF has a community channel on the F1000 platform, which provides an affordable, open publishing channel to capture research from the INCF Assembly and workshops, plus research articles from the neuroinformatics field. Articles are published using F1000Research's immediate publication and transparent peer review model, without limitation on article size, type, or perceived impact.

Resource Identification Initiative

The Resource Identification Initiative is designed to improve scientific reproducibility by helping researchers sufficiently cite the key resources used to produce the scientific findings reported in the biomedical literature, using unique Research Resource Identifiers (RRIDs) that are consistent across publishers and journals. A diverse group of collaborators are leading the project, including NIF and the Oregon Health & Science University Library, with the support of the NIH and INCF.

Outreach

The INCF community comes together at the INCF Neuroinformatics Assembly, workshops and meetings, and at various other international conferences in neuroinformatics and neuroscience. In 2021 most meetings were still cancelled due to the Covid-19 pandemic and INCF staff participated in those meetings that were moved to a virtual format.

Presence at international meetings in 2021

- Brainstorms Festival, virtual, March 17-19
- NIH BRAIN Investigators' meeting, virtual, June 15-17
- OHBM Annual Meeting, virtual, June 21-25
- Brain Imaging Conference, Stockholm, Sweden, Sept 30
- Human Brain Project Summit, virtual, Oct 12-13
- African Neuroscience Showcase, virtual, Nov 2-3
- Global Brain Consortium Annual Meeting, virtual, Nov 22-23

INCF portal

The INCF portal incf.org, contains information about our activities and how to get involved in the network, it's also the place where the community can find a standard or best practice for a specific use case, submit their own standard for endorsement, or apply to form a working group to develop a new standard or extend an existing one. There's also information about our training activities and related services, and a blog where the community can submit their own content.

1. United States
2. India
3. China
4. Canada
5. Germany
6. United Kingdom
7. Japan
8. Sweden
9. France
10. Morocco

Geographic distribution of INCF portal users

Portal		
Users:	20,322	+25%
Sessions:	37,455	+27%

INCF newsletter and social media

The INCF newsletter is distributed 3-4 times per year and had 1,092 subscribers with an open rate of 38% at the end of 2021. INCF also uses several other platforms for active outreach: Twitter, Facebook, LinkedIn and YouTube.

Platform	Followers	
Newsletter	1,092	+13%
Twitter	5,451	+12%
Facebook	3,104	+21%
Youtube	1,855	+11%
LinkedIn	1,286	+29%
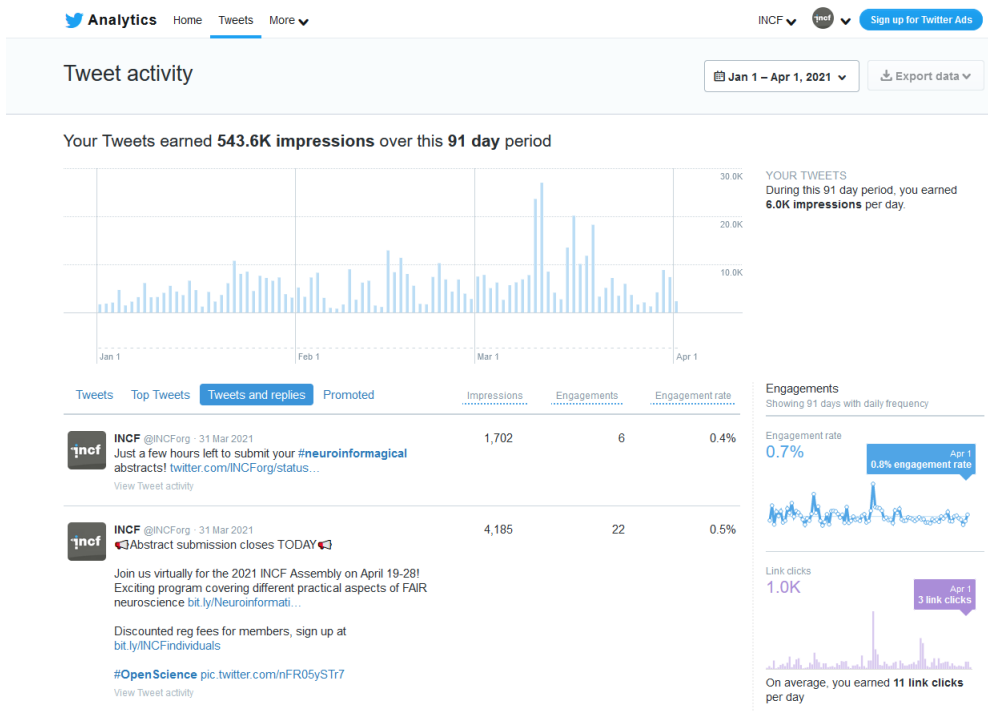
Plans for 2022

- Convene meetings of the INCF Governing Coouncils

- Develop the scope and activities of the INCF Industry Advisory Council

- Recruit new academic and commercial members

- Continue to endorse community standards and best practices for neuroscience

- Develop the content of the INCF TrainingSpace and continue the development of training-related initiatives, especially in neuroethics

- Continue the development of KnowledgeSpace

- Support interactions within the international community and encourage global collaboration

- Support dissemination of the outcomes and deliverables of the INCF network

- Support the development of Node funding proposals

- Host the INCF Assembly 2022 and plan the organization of the INCF Assembly 2023

- Highlight the work of INCF and the global neuroinformatics community at international meetings

- Continue to develop INCF outreach actions to increase visibility and build community, with special reference to the development and endorsement of standards and best practices

- Promote INCF's new Portal and maintain INCF's online presence in social media and other channels

- Continue the development of strategic partnerships with synergistic and complementary organizations that can further the mission of INCF

The chair of the Governing Board, Maryanne Martone and the chair of the CTSI, JB Poline

INCF Governance

The INCF Governing Members have decision-making power for the organization through the INCF Governing Board. The governance structure also includes a Council for Training, Science, and Infrastructure (CTSI), a Training and Education Committee (TEC), and an Infrastructure Committee (IC).

Governing Board

The INCF Governing Board comprises representatives from the Governing Members and is the means by which collective decisions regarding INCF are made. The European Union is also represented on the Board as an observer.

Members

USA	Maryanne Martone (Chair), University of California San Diego
Australia	Gary Egan (Deputy Chair), Monash University
OINC	Randy McIntosh, Baycrest, Canada
OCNS	Leonid Rubchinsky, Indiana University School of Medicine, USA
Brain Simulation Section	Petra Ritter, The Charité, Germany
Sweden	Jeanette Hellgren Kotaleski, Karolinska Institutet and Royal Institute of Technology
European Commission	Mark Goldammer, Andreas Holtel (Observers)

Council for Training, Science, and Infrastructure (CTSI)

Members (Nodes)

Canada	JB Poline (Chair), McGill university
Sweden	Jeanette Hellgren Kotaleski (Deputy Chair), Royal Institute of Technology
Australia	Wojtek Goscinski, Monash University
Australia	Marcello Rosa, Monash University
Belgium	Wim Vanduffel, KU Leuven
Canada	Samir Das, McGill University
Canada	Stephen Strother, Rotman Research Institute, Baycrest Hospital
Czech Rep	Roman Moucek, University of West Bohemia
Finland	Marja-Leena Linne, Tampere University of Technology
France	Andrew Davison, CNRS
Germany	Thomas Wachtler, Ludwig Maximilian University of Munich
India	Prasun Roy, National Brain Research Centre
Italy	Luciano Milanese, Institute of Biomedical Technologies
Japan	Teiichi Furuichi, Tokyo University of Science
Korea	Soo-Young Lee, KAIST
Netherlands	Paul Tiesinga, Radboud University
Norway	Jan Bjaalie, University of Oslo
Norway	Gaute Einevoll, Norwegian University of Life Sciences
Poland	Daniel Wojcik, Nencki Institute of Experimental Biology
Sweden	Erwin Laure, Royal Institute of Technology
UK	Marcus Kaiser, University of Nottingham
USA	David Kennedy, University of Massachusetts

Members (organizations)

Addgene	Joanne Kamens
Allen Institute	Amy Bernard
Australian Research Council Centre of Excellence for Integrative Brain Function	Wojtek Goshinsky, Marcello Rosa
Biomax Informatics	Markus Butz-Ostendorf
Brain Simulation Section	Petra RItter
DataJoint	Dimitri Yatsenko
F1000	James Barker
IHA	Ibrahima Faye
INS	Michael Woodward
Inria	Camille Maumet
Mathworks	Vijay Iver
MBF Bioscience	Sue Tappan
ModECI	Jonathan Cohen
NeuroPSI	Andrew Davison
Nencki Institute	Daniel Wojcik
NITRC	David Kennedy
NRU, Rigshospitalet	Cyril Pernet
OneMind	Mona Hicks
OCNS	Sharmila Venugopal
OINC	Brad Buchsbaum, Ali Kahn
OpenBCI	Joe Artuso
Sage Bionetworks	Anna Greenwood
SciCrunch	Anita Bandrowski
SPARC	Jeff Grethe
Sainsbury Wellcome Centre	John Pelan

Industry Advirosy Council (IAC)

Industry Advisory Council (IAC) serves as an advisory body to the Governing Board and CSTI by providing input on the strategic directions and activities of the network. The IAC also works to increase the link between INCF members working in industry and academia, and promotes INCF within the business sector with interests in neuroinformatics.

Members

MathWorks	Vijay Iyer (Chair)
F1000	James Barker
SciCrunch	Anita Bandrowski
MBF Bioscience	Susan Tappan
OpenBCI	Joseph Artuso

Training & Education Committee (TEC)

The INCF Training and Education Committee (TEC) recommends INCF strategic direction in relation to training. The TEC is composed of representatives from INCF National Nodes and from representatives from our strategic alliance partnerships with IBRO, FENS, iNeuro Initiative, HBP, OHBM, and the BD2K Training Initiative.

Members

Canada	Jane Roskams (Chair), University of British Columbia/CONP
France	Stephanie De La Rochefoucauld (Deputy Chair), IBRO
Austria	Alois Saria, Innsbruck Medical University/HBP
Germany	Thomas Wachtler, Ludwig Maximilian University of Munich
Lithuania	Ausra Saudargiene, Vytautas Magnus University
Norway	Gaute Einevoll, Norwegian University of Life Sciences
Poland	Daniel Wojcik, Nencki Institute of Experimental Biology/FENS
USA	William Grisham, University of California, Los Angeles/iNeuro Initiative
USA	Ariel Rokem, University of Washington
USA	Jack Van Horn, University of Southern California/BD2K Training Initiative
USA	Reza Abbasi-Asl, Allen Institute for Brain Science/IEEE
USA	Carlos Aizenman, Brown University/SfN

Infrastructure Committee (IC)

The Committee oversees INCF's infrastructural activities including development standards and best practices that promote interoperability between platforms, and facilitating community infrastructure and portal initiatives.

Members

Australia	Wojtek Goscinski (Chair), Monash University
Germany	Thomas Wachtler (Deputy Chair), Ludwig Maximilian University of Munich
Canada	Tristan Glatard, Concordia University
Norway	Jan Bjaalie, University of Oslo
Sweden	Erwin Laure, Royal Institute of Technology
USA	David Kennedy, University of Massachusetts
USA	Mona Hicks, OneMind

Standards and Best Practices Committee

The Standards and best practices (SBP) committee is one of the governing bodies of INCF. It consists of scientific representatives from both Governing and Associate Nodes. The SBP committee is responsible for coordinating the INCF standards and best practices endorsement scheme and has oversight over working groups funded by the network to develop, harmonize, and/or refine community standards and best practices.

Members

USA	Maryann Martone (Chair), University of California, San Diego
Australia	Wojtek Goscinski, Monash University
Canada	Samir Das, McGill University
Germany	Thomas Wachtler, Ludwig Maximilian University of Munich
Malaysia	Eric Tatt Wei Ho, Universiti Teknologi PETRONAS
Norway	Trygve Leergaard, University of Oslo
Sweden	Jeanette Hellgren-Kotaleski, Royal Institute of Technology
USA	David Kennedy, University of Massachusetts

Secretariat staff

During 2021, the INCF Secretariat employed the following persons.

Director, Science and Training
Mathew Birdsall Abrams, Ph.D. MPH

Director, Development and Communications
Helena Ledmyr, Ph.D.

TBI Project Manager
Pradeep George, MBA

Community Engagement Officer
Malin Sandström, Ph.D.

Bioinformatics System Integrator, TBI Project
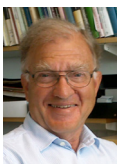Visakh Muraleedharan, M.Sc.

Financial Accountant
Henrik Lindström

Project Assistant
Heather Topple

Affiliated researchers

INCF Special Advisor
Sten Grillner, MD. Ph.D.

Neuroinformatics Professor
Jeanette Hellgren Kotaleski, Ph.D.

Neuroinformatics Researcher
Mikael Djurfeldt, Ph.D.

Publications

- A Standards Organization for Open and FAIR Neuroscience: the International Neuroinformatics Coordinating Facility, *Neuroinformatics*, doi.org/10.1007/s12021-020-09509-0
- Neuromatch Academy: Teaching Computational Neuroscience with Global Accessibility, *Trends Cogn Sci* doi.org/10.1016/j.tics.2021.03.018
- Teaching computation in neuroscience: notes on the 2019 Society for Neuroscience professional development workshop on teaching, *J Undergrad Neurosci Educ.*
- Revisiting diversity, equity, and inclusion commitments and instituting lasting actionable changes in the faculty for undergraduate neuroscience, *J Undergrad Neurosci Educ.*
- Brainhack: Developing a culture of open, inclusive, community-driven neuroscience, *Neuroview*. doi.org/10.1016/j.neuron.2021.04.001
- Core principles for the implementation of the neurodata without borders data standard, J Neuroscience Methods doi.org/10.1016/j.jneumeth.2020.108972
- Development of prognostic models for Health-Related Quality of Life following traumatic brain injury
- Brain Temperature Influences Intracranial Pressure and Cerebral Perfusion Pressure After Traumatic Brain Injury: A CENTER-TBI Study
- Primary versus early secondary referral to a specialized neurotrauma center in patients with moderate/severe traumatic brain injury: a CENTER TBI study
- The burden of traumatic brain injury from low-energy falls among patients from 18 countries in the CENTER-TBI Registry: A comparative cohort study.
- Questionnaires vs Interviews for the Assessment of Global Functional Outcomes After Traumatic Brain Injury
- Extended Coagulation Profiling in Isolated Traumatic Brain Injury: A CENTER-TBI Analysis
- Relationship of admission blood proteomic biomarkers levels to lesion type and lesion burden in traumatic brain injury: A CENTER-TBI study
- INCF Annual Report 2020
- INCF Newsletter

Summary financial report 2021 in kSEK, kUSD, and kEUR
Income statement December 31, 2021

Financial summary

Summary financial report 2021, in kSEK, kUSD and kEUR

	kSEK	kUSD	kEUR
Income			
Platinum Members	2 113	234	207
ORG./Inst. Contributions	1 346	149	132
Industry Contributions	93	10	9
Individual Memberships	68	8	7
INCF Events	185	20	18
Other Income	301	33	29
External Projects	1 998	221	195
Total Income	**6 103**	**675**	**597**
Accured Income			
Valuation completed grants	0	0	0
Valuation contributions	1 631	180	159
Total Accured Income	**1 631**	**180**	**159**
Financial Income	27	3	3
Total Income	**7 761**	**858**	**759**
Expenditure			
General Administration	-7 406	-819	-724
Secretariat Running Expenses	-288	-32	-28
Governance	0	0	0
Training & Education	-160	-18	-16
INCF Products	-172	-19	-17
Community Engagement	-98	-11	-10
Total expenditure	**-8 123**	**-898**	**-794**
Depreciation	-75	-8	-7
Total expenses	**-8 198**	**-906**	**-802**
Financial Costs	-14	-2	-1
Change in capital according to Income Statement	-451	-50	-44
Avarage exchange rate*		9,0437	10,2269

Financial contributions

In addition to its members under the new membership model, INCF is financially supported by its host country to sustain coordination activities around global development of neuroinformatics.

Sweden
Financial contribution provided by The Swedish Research Council

Vetenskapsrådet

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