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Introduction

Understanding the human brain and its function in health and disease represents one of the greatest scientific challenges of our time. In the post-genomic era, an overwhelming accumulation of new data, at all levels of exploration from DNA to human brain imaging, has been acquired. This accumulation of facts has not given rise to a corresponding increase in understanding of integrated function in this vast area of research involving a large number of fields extending from genetics to psychology. Neuroinformatics is uniquely placed at the intersection between neuroscience and information technology, and emerges as an area of critical importance to facilitate the future conceptual development in neuroscience by creating databases that transcend different organizational levels, and allow for the development of different computational models from the subcellular to the global brain level.

Neuroinformatics is interdisciplinary and the development of the field requires international concerted efforts. Accordingly, under the aegis of the Global Science Forum, Organization of Economic Cooperation and Development (OECD), the International Neuroinformatics Coordinating Facility (INCF) was established in August 2005 to cooperate and coordinate global activities and infrastructures, in particular to guide and oversee the important development of standards, guidelines, ontologies, and other unifying activities in neuroinformatics. The 1st phase of 5 years has witnessed the buildup of a global organization with 15 member countries across Asia, Europe, and North America. The INCF operates with a Secretariat, hosted by Karolinska Institutet and the Royal Institute of Technology in Stockholm, and a network of distributed National Nodes in the member countries.

After the appointment of a director and decision of the location of the Secretariat, INCF started to operate in 2006 and it was fully staffed one year later. The INCF Secretariat was reviewed in May 2009 by a committee led by Kathie Olsen, former Deputy Director of US National Science Foundation, with Masao Ito (Japan), Paul Messina (US), Richard Morris (UK) and Klaus-Peter Hoffmann (Germany).

The review panel report ends with the following statement: “In conclusion, the review team felt that the INCF has made remarkable progress, exhibited an exciting vision, and recommends continued support of this enterprise for the next five years”.

The organization of INCF includes three main components. The Governing Board is the means by which the participating countries make collective decisions on all matters relating to INCF. The National Nodes are facilities, networks, or other mechanisms, funded by national sources, established in order to coordinate and facilitate activities within a country, to provide an interface with the Secretariat, and to participate in the formulation and implementation of INCF work programs. The Secretariat is the central facility of INCF, responsible for the execution of administrative activities, establishment of strategic partnerships and implementation of INCF scientific programs and technical services. Currently, there are 4 programs covering key domains of neuroinformatics and a number of technical services rendered through INCF Neuroinformatics Portal, a “portal of portals” to serve as the premier channel for accessing resources and information.
Mission and Values

The clear understanding within INCF of its role as a coordinator but not a competitor has led to the identification of areas where INCF is needed for facilitation and to avoid duplication of efforts of existing activities. With the formation of suitable process for strategic planning and mechanisms for implementing initiatives, significant scientific programs, technical projects, educational and outreach activities have been launched. The effectiveness of the governance structure and the operation of the organization has been applauded.

For the 2nd phase of 2011 – 2015, INCF will continue pursuing the INCF mission with the established organizational structure and mechanisms for carrying out actions. The value of INCF will be further leveraged.

Mission

- To foster scientific interaction for discovery and innovation and facilitate the flow of information and knowledge between researchers in both academia and industry
- To serve as a credible and sustainable global network for developing, maintaining, and evaluating internationally coordinated neuroinformatics activities and infrastructures for standards, guidelines and references
- To facilitate training for producing highly skilled neuroinformatics researchers worldwide

Values

- Openness – INCF activities are open to all researchers who can contribute to neuroinformatics at the international level
- Neutrality – INCF priorities and directions are based solely on the collective benefit of science and research, with global brokerage being an important function of INCF
- Stability and Lasting Accountability – INCF-participating countries value and directly invest in sustainable products, services, and programs
- Result Orientation – INCF criteria for action are results and deliverables to fulfill the mission
- Global Excellence – INCF benchmarks for all activities are state-of-the-art and best-practice in both academia and industry
- Leadership and Innovation – INCF innovative approaches help to gain and maintain international leadership in supporting neuroscience research
Objectives 2011 – 2015

In line with the Strategic Goals established since the inauguration of INCF, the objectives for the next 5 years are:

1. Advance the launched INCF Programs with 1st wave of deliverables, which were projected in the first phase, published in journals and disseminated from INCF Portal, and milestones for 2nd phase of action determined and reached, by continuing implementation of established objectives for each program

2. Launch INCF Programs in well-defined areas to facilitate the utilization of neuroinformatics in a spectrum of neuroscience research and engineering areas through the process established by INCF to initiate programs

3. Expand the INCF Neuroinformatics Portal on both content and function by significant curation of the Resource and Community sections as well as strategic installment of IT infrastructure and service, in coordination with synergetic initiatives worldwide

4. Spearhead strategic actions on sustainability of key neuroscience databases

5. Strengthen INCF action on training the next generation of neuroinformaticians by thorough information provision and strategic studies

6. Develop further the integration of INCF National Nodes and coordinate the development of neuroinformatics at both global and national levels by enhanced mechanisms for interactions among all components of INCF network

7. Investigate synergies with initiatives in other domains of biomedicine and engineering by communication with targeted scholarly organizations

8. Extend INCF strategic partnership with journals by new cooperative initiatives

9. Elevate the visibility of INCF by elevation of INCF communication and outreach endeavors

10. Explore the possibility of an internationally collaborative funding mechanism through philanthropic funding bodies and non-profit organizations, as well as public-private partnerships for coordinated support of development in Neuroinformatics

11. Promote new INCF memberships by targeting countries with strategic strengths
Objective 1. Advance the launched INCF Programs with 1st wave of deliverables, which were projected in the first phase, published in journals and disseminated from INCF Portal, and milestones for 2nd phase of action determined and reached, by continuing implementation of established objectives for each program.

INCF programs represent long-term strategic undertakings to address issues of importance to the neuroscience community. They are multidisciplinary and organized under specific domain areas of neuroinformatics. Within each program, diverse actions are carried out, including products and services provision, standards establishment and compliance, and forum and community development.

Since 2008, four INCF programs have been initiated: Digital Brain Atlasing, Ontologies of Neural Structures, Multi-scale Modeling, and Minimal Metadata Standards. With the achievement of the 1st major breakthrough in coordination through developing the “Waxholm Space” in 2009, INCF programs have become the most visible in the activity portfolio. The unique role of the organization as a coordinator and not a competitor is increasingly appreciated particularly for developing international standards and guidelines, which in turn enables a remarkable enlistment of key international leaders to serve on various working groups within each INCF program.

The overall aims of the launched programs are:

Digital Brain Atlasing: To build up actions for fostering and coordinating interoperability, accessibility and global sharing of reference databases. Chair: Robert Williams

Digital brain atlases are an essential tool in neuroscience research. They function as references, as analytical tools, and provide a stable data integration framework to investigate normal and abnormal brain structure and function. The INCF Digital Brain Atlasing Program began with the creation of a standardized reference atlas for the mouse brain, based on international agreements reached at a meeting in Waxholm, Sweden, and accordingly termed as “Waxholm Space”. Release of the initial Waxholm framework was achieved in 2009.

The Waxholm Standard Space (WHS).

Extensions to this effort are planned and can be expected over the next several years including the key tasks to link the Waxholm Space to all major mouse atlases, including the Allen Brain Atlas (Allen Brain Inst, Seattle), data from the GENSAT program (USA-NIH), the Mouse Developmental Atlas (Edinburgh, UK), CortexDB (Munich, MPI, Germany) and the Whole Brain Catalog (Waitt Family Foundation, UCSD, USA). INCF will also collaborate with...
national and international groups to assure the availability of web-based tools for scientists, educators and students to use for exploration of these brain data and for addition of new data. The future development of this foundational anatomical framework/repository system can be anticipated to include links to all anatomically registered molecular labeling and expression data as well as results from modeling and simulation data that represent explorations of correlated anatomical areas.

**Ontologies of Neural Structures**: To develop and evolve a program for harmonizing semantics and ontologies as the fundamental framework connecting neuroscience research worldwide. Chair: Maryann Martone

Controlled vocabularies are necessary for the useful and practical sharing and re-use of data. Ontologies in neuroscience are formal representations of the set of terms used within a domain area of research and the relationships between the terms, i.e. a platform for translation and clarification of terminologies. By the end of the first 5 year period, the INCF Program on Ontologies of Neural Structures has advanced into full operation with three task forces to develop (a) a structural lexicon defining structural entities for the nervous system; (b) a neuronal registry serving as a key knowledge base; and (c) representation and deployment of infrastructures providing IT platforms and support. Milestones and key deliverables of all three task forces are expected in 2010.

Closely coordinated with the spatial frameworks developed under the INCF Atlasing Program, the goals for this key program of knowledge integration for the next phase are:

1) to provide ontological structures for navigating across scales and across species

2) to provide a consistent and powerful framework for identifying and describing newly discovered neuronal and glial cells and their properties in the nervous system

3) to provide a consistent and well defined cross scale structural lexicon that can serve as a unifying framework for neuroscience research including computational modeling

4) to develop formal ontologies for cross species anatomy that can be used by computer programs to integrate data across species

**Multi-Scale Modeling**: To establish integrated activities for promoting interoperable multi-scale model construction and simulation sharing in neuroinformatics. Chair: Erik De Schutter

Multi-scale modeling is a tool of critical importance for neuroscience. As computational modeling techniques become integrated with experimental neuroscience, more knowledge can be extracted from existing experimental data. Quantitative models assist in generating experimentally testable hypotheses and in selecting informative experiments. One major challenge in the field is that because of a wide range of simulation tools being used in the community it is unlikely that one laboratory can reproduce the results obtained by another group, even if the model is deposited in an openly accessible database. The lack of standards for model description also hampers efforts to make existing programs more compatible, reduce opportunities for innovative software development and for benchmarking of existing simulators.

The INCF has started two projects within this program that tackle the challenge from different aspects, developing practical community standards for future model and software construction, and generating tools to connect existing key simulators to enable interoperability for existing models. During the 1st phase of INCF both projects have released initial versions of their output. During the next phase these will first be further refined.
and consolidated, and subsequently their functionality will be expanded to cover a wider range of applications spanning multiple scales. Work is also needed to support the reproducibility of results in computational neuroscience, for example by the implementation of a standard simulator test suite. More in general, the INCF will continue to support the establishment of an infrastructure for computational modeling in neuroscience, including the encouragement of model repositories and of simulator software development, verification and distribution.

The first project develops a standard markup language for model description. Based on lessons learned with previous efforts in computational neuroscience and in other fields like systems biology, a concerted effort is made to develop a well-defined but flexible syntax for a self-documenting markup language that will be easy to extend and that can form the basis for specific implementations covering a wide range of modeling scales. The initial effort focuses on describing a growing area of computational neuroscience, spiking networks. During the 1st phase of INCF, an oversight committee and a taskforce were established. They are now in the process of defining the syntax of the new markup language and of developing language semantics and an ontology for spiking neural network models. It is expected that the initial products of the program will be delivered in 2010 together with prototype software implementations.

The approach of this INCF program is viewed as the first large cooperative activity in computational neuroscience aimed to bring consensus, establish suitable cooperative work processes and uplift the technical underpinning for a sub-domain of modeling and simulation.

During the next phase these initial products will be improved by incorporating community feedback and by expanding the coverage of different spiking network models. Based on this experience new efforts will be launched in later years using the same language syntax to cover other areas of computational neuroscience, including compartmental models, synaptic microphysiolog, cellular mechanics and electrodynamics to name just a few. Additionally, special attention is given to interoperability issues relevant to multi-scale modeling where many separate model descriptions may have to be combined and data interfaces need to be defined.

While the action to establish standards will evidently assist the interoperability and sharing for future modeling work, many existing models would benefit from software tools for integration and interaction between different simulators in order to fully harness their usefulness. Accordingly, a project to develop a simulator interoperability interface tool, the Multi-simulation Coordinator (MUSIC), was launched during the 1st phase of INCF. MUSIC enables different large-scale parallel simulators to exchange data on-line, between each other or with other applications, within a computer cluster. It is usually difficult to move models between simulators, at least in the absence of a standard model description language as described above. MUSIC provides a solution in that it allows multi-simulations where the different models can be simulated by different simulators but still interact as one system. In this sense, MUSIC promotes interoperability and also enables the development of reusable tools, for example post-processing of simulation results.

MUSIC allows large-scale simulations to exchange data during runtime.

MUSIC was released early 2009 as open source software, which can be downloaded together with a user manual from the INCF software center and is also available in common Linux distributions. During the 1st phase of INCF three simulators in the community have added a MUSIC interface: NEST, Neuron and MOOSE.

For the next phase, the adoption of MUSIC in scientific projects should be supported, through direct assistance and through maintenance of the code base. A Python binding will be provided and the development of MUSIC-enabled post-processing tools encouraged. Benchmarks will assess MUSIC performance and, if needed, optimizations be implemented. In order to better support multi-
scale modeling. MUSIC will be extended to allow for tight coupling of models through improved integration of solvers of distinct simulators. Another ongoing development which will extend into the next phase of INCF is support for real-time interaction with robots. The possibility of using MUSIC to interface a cluster with neuro-morphic analog VLSI hardware has created interest in the community.

The implementation of a standard simulator test suite hosted by the INCF could support reproducibility of results within computational neuroscience by allowing simulators to be cross-validated. While the main purpose of the test suite would be to verify correctness of computation, it could also serve as a standard for simulator performance, spurring development and use of efficient algorithms.

In summary, for the next phase the program on Multi-scale Modeling will build on the early success and further develop standards, tools and resources to facilitate building and sharing models, codes and computing resources among researchers of the global computational neuroscience research community.

**Minimal Metadata Standards:** To facilitate international consensus and collaborations for metadata reporting and archiving, and consequently advance data reuse and further analysis. Chair: Colin Ingram

Neuroscience data, particularly those in neuroinformatics related areas, are associated with a rich set of descriptive information that is often called metadata. For data archive, storage, sharing and re-use, metadata are of equal importance to primary data, as they define the methods and conditions of data acquisition, and for analyzed data, the statistical procedures. A further challenge for metadata is the rapidly evolving nature of investigative methods and scientific applications. This INCF program addresses key issues to establish minimal metadata standards such as

1) how should metadata be organized and made accessible with the primary data?

2) how should these metadata be structured to handle the large diversity, and in certain instance complexity, of existing descriptors?

3) how can databases adapt to handle new forms of metadata as new methods and/or applications emerge?

The initial scientific focus areas are neuroimaging and electrophysiology. There are large initiatives involving related work in INCF member countries (e.g. CARMEN, UK; Bernstein Centers, Germany; and Human Brain Mapping, US) and at many of the laboratories directly associated with the INCF National Nodes. Capitalized on this advantage, by 2009, INCF has gathered world leading experts to craft international agreements regarding minimal metadata standards in the two fields, respectively. The first version of the standards for metadata in electrophysiology is anticipated at the end of the 1st phase of INCF.

In the next 5 years, the use of neuroinformatics tools and approaches like standard machine readable markup languages will be investigated as a part of this INCF endeavor because such methods may increase the likelihood of usefully connecting data. The agreements on minimal metadata standards should in turn also facilitate the construction of tools that make it easier to apply software programs for analyzing electrophysiological and neuroimaging data to larger aggregates of pooled data. In addition, INCF will expand the Program further in two directions:

(a) extending from electrophysiology to time series data management ranging from molecular interactions to the life span of organisms, and evolving to include all data types that have a time-based component, with a focus on interoperability at the level of data and analysis tools

(b) broadening the domain coverage particularly for clinical areas where longitudinal data are of extraordinary value and thus facilitation of their reuse through standardized metadata is urgently called for.

These aims of the four INCF Programs represent a major enterprise and INCF will make a foremost effort in bringing these target areas from initial plan to implementation and a useful outcome for the community. A high priority for INCF will be to further the ongoing programs in all the different aspects mentioned above according to a defined road map. The milestones already achieved during the first phase demonstrate that INCF has built an adequate process for successfully pursuing the projected outcomes.
Objective 2. Launch INCF Programs in well-defined areas to facilitate the utilization of neuroinformatics in a spectrum of neuroscience research and engineering areas through the process established by INCF to initiate programs

One of the most important developments of INCF during the 1st phase has been the formation of a step-wise procedure for planning scientific activities using topical workshops with major stakeholders in a given area, providing recommendations as the basis for further actions. This has been followed by appointment of a program chair, an oversight committee and particular task forces. The Secretariat provides a program officer to aid in the program development. This sequential structure has been found to be particularly useful when establishing standards and guidelines where broad involvement of the community is required.

In the 2nd phase, INCF will explore additional areas in particular where the need of neuroinformatics is emerging, and where direct medical and clinical relevance is evident. This includes not only the fields related to the existing programs like time-series data in general and electrophysiology but also new areas such as genetic animal models for human diseases (workshop in December 2009), development of high-throughput behavioral analysis and models of ion channel for drug/therapy development. Abiding by the established principle, the focus of INCF actions would be to seek coordination for promoting data sharing and reuse at a global level in order to elicit added value to INCF stakeholders.

Objective 3. Expand the content and function of the INCF Neuroinformatics Portal by significant curation of the Resource and Community sections as well as strategic installment of IT infrastructure and service, in coordination with synergetic initiatives worldwide

During the first phase, a major achievement of INCF has been to build a Neuroinformatics Portal with the aim to become a major tool for the entire neuroinformatics community for both research use and public dissemination of information. Based on a careful analysis of the different types of users who might access the portal, the basic structure, function and presentation have been designed to be professional and user-friendly. Information about all aspects of the INCF activities and projects is currently available. The INCF Neuroinformatics portal is planned to be a “portal of portals” to serve as the premier channel for accessing resources and information. Therefore, it provides not only comprehensive information on available software and other services, but also events, activities, training opportunities and relevant projects worldwide.

A priority for the next 5 years is to transform the portal from primarily an information provider/pointer to a major resource for information as well as technical infrastructure and service that can be used online by software engineers and research scientists. Key actions include expanding the repository of neuroinformatics resource and inventory of INCF community index; integrating with major complementary initiatives such as BrainInfo, Neuroscience Information Framework, and NeuroGlobe; implementing references, standards, and tools developed through INCF Programs; and installing software development support functions at INCF Software Center. The concrete goals may also comprise to establish a role for INCF in monitoring quality of data in databases and evaluating value/usefulness of neuroinformatics tools/software as certifying authority. Such a line of development for the INCF Neuroinformatics Portal will provide a valuable service to the global neuroscience community with only a modest investment of resources.

The core aspects of neuroinformatics: interoperable databases, shared tools, and environments for theoretical analyses.
Objective 4. Spearhead strategic actions on sustainability of key neuroscience databases

Neuroscience databases broaden and extend the scope of both published and non-published data by making them widely available. Information organized in these fashions, including raw and meta-data, analytical tools and computational models, are searchable, viewable, and suitable for secondary exploration and thus additional values may be obtained through the data in databases far beyond the purpose of their original collection.

The continued availability of key neuroscience databases is of paramount importance to fulfill this potential. Nevertheless, how these databases sustain their activities in the long term remains a question without a clear or satisfactory solution, although many variables have come into play to date.

As an international organization coordinating global neuroinformatics infrastructures, INCF is uniquely positioned to examine how databases can maximize their lasting sustainability, attract users, and provide linkages to other data resources in such a way to make each one an indispensable component of a larger whole. Accordingly, INCF organized a topical workshop in 2007 to discuss relevant issues, discover key problems and propose possible solutions. One important objective for INCF is to identify proper mechanisms to provide sustainability for neuroinformatics tools and databases. In the 2nd phase, therefore, INCF will further instigate the strategic discussions on issues pertinent to sustainability from the aspects of standardization, technology, research community, scientific publishing, governmental agencies support, and commercial potential. Foresight exercise may be carried out to identify the trends of needs and challenges vs benefits to the society. INCF will also endeavor to raise enhanced awareness for the importance of sustainability with its stakeholders in INCF member countries.

Objective 5. Strengthen INCF action on training the next generation of neuroinformaticians by thorough information provision and strategic studies

INCF has spearheaded the investigation on strategic issues for training in neuroinformatics since 2008. The activity is not primarily aimed at running training courses but dedicated to training needs vs existing courses, development of good practices for individuals with different background, and development of policy and standards for future curricula, with consideration of different career stages and diverse scientific backgrounds. The actions carried out in the 1st phase have already led to a preliminary survey of leading existing courses and recommendations for future training needs, and INCF has positioned itself strategically to help accelerate the sharing of training opportunities, encourage cross-disciplinary programs and assist in elevating the value of the neuroinformatician as an essential member of the global neuroscience research enterprise of the 21st century.

INCF will significantly extend the activities related to training in the next 5 years by exploiting the unique values of the organization, particularly the openness, neutrality and stability. Two directions of development will be pursued simultaneously:

- curating and updating comprehensive information on training opportunities at the INCF Neuroinformatics Portal
- collaborating with scholarly societies such as Society for Neuroscience and Federation of European Neuroscience Societies to establish best practice at an international level, by developing widely applicable syllabi, online curricula/modules for different types of courses, and/or model courses integrating lectures with research.

Several INCF National Nodes in the UK, Sweden, Finland, Germany and India have been administrating national courses individually and their experience and expertise will be fully shared and integrated in the INCF actions. In addition, INCF will promote innovative cooperation on training initiatives such as joint international supervision, laboratory rotation and degree awarding among its National Nodes by leveraging the inherited worldwide network.
Objective 6. Develop further the integration of INCF National Nodes and coordinate the development of Neuroinformatics at both a global and national levels by enhanced mechanisms for interactions among all components of INCF network

INCF is formed with a central Secretariat and National Nodes of INCF member countries. Implementation of INCF activities and actions is through both the Secretariat and National Nodes, and National Nodes transmit international activities locally. Since the inauguration of INCF, individual National Nodes have gradually been established based on their needs, circumstances and resources, and have made important contributions to the development of programs managed by the Secretariat. Several of the National Nodes have interacted and begun to launch joint activities in research and training during the first phase of INCF.

In the next phase of development, INCF will focus on opportunities for synergistic interactions among the activities of National Nodes to further strengthen the unique community formed by the Nodes. Special emphasis will be to promote the collaborative spirit and to avoid duplication of neuroinformatics activities in different parts of the world. The INCF National Nodes workshop will be established as an annual event. Staff exchange between nodes and for short visits to the Secretariat and a secondment scheme for long-term positions at the Secretariat office will be instituted to better involve personnel from the National Nodes in INCF technical projects and scientific activities. INCF will enhance the Travel Grant program with more emphasis on promoting exchange between National Nodes to seek coordination among INCF member countries.

Objective 7. Investigate synergies with initiatives in other domains of biomedicine and engineering by communication with targeted scholarly organizations

Applying information technology to life and biomedical sciences has resulted in great acceleration of research in these fields. In the post-genomic era, approaches and tools generated in systems biology and bioinformatics are increasingly exerting a fundamental impact. In many other domains of biomedicine and engineering, similar challenges have been encountered as in neuroscience, while numerous effective solutions have been developed through informatics and computational approaches. Therefore, the advance of neuroinformatics would significantly benefit from cooperation with sister areas.

INCF has already profited from collaboration with systems biology community on establishing international standards on simulator-independent modeling languages. In the next phase, INCF will further explore synergy and mutual benefits in other fields, for example the Physiome Project under the aegis of International Union of Physiological Sciences, Cancer Biomedical Informatics Grid® sponsored by the National Cancer Institute, and the Cardiovascular Gene Ontology Annotation Initiative at European Bioinformatics Institute.
**Objective 8. Extend INCF strategic partnership with journals by new cooperative initiatives**

INCF is recognized for its role in working with major research journals and the Society of Neuroscience to develop new directions in publishing of research articles to lessen the burden on review and accelerate the time to publication. Since 2008, a strategic partnership has been established through INCF hosting and administering the Neuroscience Peer Review Consortium which consists of virtually all the leading journals in neuroscience.

Building on this consortium, INCF will endeavor further cooperation with strategic partners. Endorsing the standards and guidelines established through INCF Programs by the relevant journals will be a major aim, as it critically promotes their adoption by the research community and thus exerting their due impact on facilitating data sharing. In addition, cooperation towards new directions like open access data deposition and alternative forms of publishing research results will be explored.

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**Objective 9. Elevate the visibility of INCF by intensifying INCF communication and outreach endeavors**

INCF has steadily built its visibility through improved web design and publicity materials, exhibits and presentations at scientific conferences, launch of an annual congress in Neuroinformatics and introduction of the INCF Newsletter.

With the growth of INCF scientific programs and technical projects, the next phase of advancing INCF standing in the community will be achieved by reinforcing the ongoing communication and outreach programs, as well as instituting novel initiatives. Specific attempts may focus on growing worldwide participation in INCF Congress, increasing INCF Newsletter circulation, and endorsing an official journal.

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**Objective 10. Explore the possibility of an internationally collaborative funding mechanism through philanthropic funding bodies and non-profit organizations, as well as public-private partnerships for coordinated support of development in Neuroinformatics**

One of the originally proposed roles for INCF is to establish a program in neuroinformatics to evaluate, fund, or monitor projects for neuroinformatics research or infrastructure, which cannot be addressed optimally through individual national funding systems. This suggested scheme is to address key areas of neuroinformatics where the scale of investment needed cannot be justified by the benefits resulting for one country alone, and/or when the work needs a coordinated effort from several groups in different countries. This proposed model represents a novel way of organizing international cooperation in research, and therefore is important for neuroinformatics researchers to develop a global-scale network to achieve their scientific goals.

INCF will continue the exploration of such a scheme with innovative mechanisms involving not only public funding agencies in INCF member countries where international review is acceptable for subsequent funding, but also private organizations with research funding remits relevant to neuroinformatics.
**Objective 11. Promote new INCF memberships by targeting countries with strategic strengths**

The growing activities and achievements of INCF in the first years demonstrate increasingly the benefits of international coordination for national initiatives in neuroinformatics. As a result, the membership of INCF has enlarged from 8 countries in August 2005 to 15 by the end of 2009.

With the development of the field and its evident capacity to accelerate basic, translational and clinical neuroscience research, an increasing number of nations and their research communities will become engaged in neuroinformatics. Consequently, an extended global coordination of activities, infrastructure and services is called for. In the next phase of INCF, new members will be pursued particularly by targeting countries with strength in reference, infrastructure and other resources pertinent to neuroinformatics, as well as those countries in which the field is developing rapidly. In addition, a novel form of membership may be exploited to maximize the engagement of all forces supporting neuroscience research.

**INCF Member Countries**

- Belgium
- Czech Republic
- Finland
- France
- Germany
- India
- Italy
- Japan
- Netherlands
- Norway
- Poland
- Sweden
- Switzerland
- United Kingdom
- United States
Concluding Remarks

Nearly all people are afflicted with a malady of the nervous system at least once in their lifetime. Major technological advances in communication science, robotics and machine-human interface of the 21st century are increasingly reliant on strategies of information processing that are analogous to those used by the brain. Success in neuroinformatics, the multidisciplinary field interfacing the domains of biomedicine and information technology, will not only markedly reduce the enormous social, economic and psychological burdens caused by brain disorders but also lead to greatly enhanced competitiveness in the industrial and economic environment of a nation. Fulfillment of this promise constitutes a global megascience challenge. INCF has been established to tackle this challenge through international coordination, and the organization has exhibited the capability to bring benefits and paybacks to its stakeholders. To capitalize on the initial success and to fully realize the scientific, medical, economic and societal potentials of neuroinformatics, INCF, with its strategic position to elicit added value and efficiency unattainable at individual national levels, will pursue persistently its vision, set at the founding of the organization, for a rapid progress in brain science and information technology through catalyzing and coordinating the global development of the field. Neuroinformatics will ultimately contribute to new therapeutic methods for disorders of the nervous system, and bio-inspired technology will gain inspiration from the many ingenious neural information processing systems.