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The Neuroscience Information Framework: A Prototype National Neuroinformatics Node

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Neuroscience web resources available and under development in INCF member countries include experimental, clinical, and translational neurodatabases, knowledge bases, atlases, genetic/genomic and material resources, and tool and modeling sites for processing, analysis, or simulation of brain data. This diversity of sites spans multiple biological scales, techniques, and data models, serving communities of neuroscientists with specific conventions, terminologies, and focus. With support from 14 Neuroscience Blueprint Institutes and Centers of the NIH (US), we announce a new initiative toward integrating access to, and use of, these resources. Partnered with the SfN and its Neuroinformatics Committee, as well as with volunteer collaborators at nine additional sites, we are developing: 1) a comprehensive, dynamic, inventory of Web-accessible neuroscience resources, 2) an extended and integrated BrainML terminology describing resources and contents, and 3) a framework accepting and aiding concept-based queries. The evolving Framework may be viewed at neurogateway.org.

Open methodology supports open data discovery for neuroscience. Access will be free and public, and schemas, terminologies, code, and specifications for data definition and exchange will be made freely available via Open Source licensing, thus aiding the development of INCF national nodes and similar gateways. Toward integration, we favor community-consensus semantics and syntax for controlled vocabularies: detector terms characterizing biomedical, neurobiological, and neuroinformatic resources, and selector terms for specifying particular contents. Arranging terms in hierarchies derives precise terms, essential for specific areas of neuroscience, from more general terms useful for bridging findings across subfields.

We present as well demonstration projects under the Framework development umbrella: 1. NeuroMorpho.Org is a centrally curated inventory of digitally reconstructed neurons. NeuroMorpho.Org contains contributions from over two-dozen labs and is continuously updated as new morphological reconstructions are collected, published, and shared, with the goal of densely covering all available data. Morphological data are essential for understanding the cellular complexity of the nervous system, and are used for analysis, visualization, and modeling. NeuroMorpho.Org facilitates access to such data and encourages data sharing in the whole neuroscience community. Deposition and distribution of reconstruction files ultimately prevents data loss. Centralized curation and annotation aims at minimizing the effort required by data owners while ensuring a unified format. It also provides a "one-stop" entry point for all available reconstructions, thus maximizing data visibility and impact. Each neuron in NeuroMorpho.Org is represented by a unique identifier, general information (metadata), the original and standardized ASCII files of the digital morphological reconstruction and a set of morphometric features. The

web-based, user-friendly graphical interface allows both for browsing the whole content of NeuroMorpho.Org and searching for specific cells.

2. The Society for Neuroscience's Neuroscience Database Gateway (NDG) is currently serving as a test bed for the Framework, exploring each of a series of interoperability approaches. These provide incremental levels of data sharing among NDG databases. Currently we are prototyping enhanced database terminology search from a group of selected NDG databases: Neurodatabase.org, SenseLab (ModelDB, NeuronDB and OrDB), Cell Centered Database, Brain Architecture Management System, and CocoDat.

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