

INCF Digital Atlasing Task Force perspective published in PLoS Computational Biology

Report represents significant progress towards an open and shared digital brain atlasing framework

Modern brain research generates immense quantities of data across different levels of detail, from gene activity to large-scale structure, using a wide array of methods. Each method has its own type of data which is stored in different databases. Integrating findings across levels of detail and from different databases, for example to find a link between gene expression and disease, can be very challenging and time consuming. Combining data from several types of studies provides a basis for new insights and is crucial for the progress of neuroscience research. Far too often, scientific progress is hindered by barriers to integrating data from different experiments and laboratories.

A major step in addressing these problems -- a spatial standard with supporting infrastructure to combine different types of neuroscience data -- has now been announced for one of the most important subjects in experimental neuroscience: the mouse, *Mus musculus*.

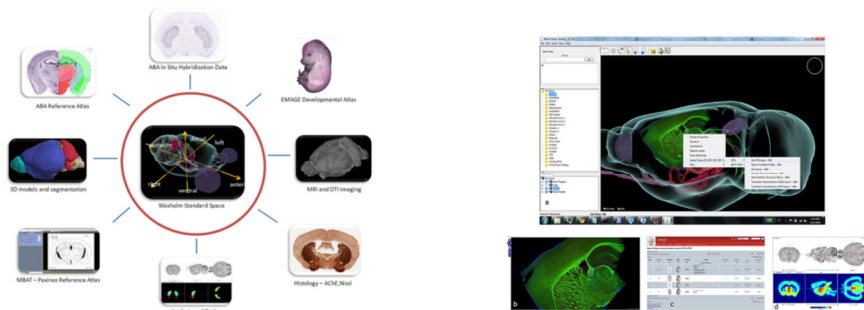
A perspective article highlighting the INCF Digital Atlasing Program has just been [published in PLoS Computational Biology](#) and is featured on the [current homepage of the journal](#). This article marks a milestone for the INCF Digital Atlasing Program, describing its vision and some key accomplishments, particularly a digital atlasing framework for sharing data, consisting of Waxholm Space (WHS) and a supporting web-based Digital Atlasing Infrastructure (DAI). Together they enable the integration of data from genetic, anatomical and functional imaging studies. A more detailed publication of the recommendations from the INCF Standards in Digital Atlasing Task Force can be found in their report, [available from Nature Precedings](#). This foundation is being built on and expanded by other INCF Digital Atlasing Task Forces. To find more details about these groups, standards and projects, or other recent activities see [their community pages](#).

“The development of the Waxholm Space and the new Digital Atlasing Infrastructure represents a key step in the creation of an international infrastructure to support data sharing and enhance neuroscience research – precisely the reason INCF was founded in the first place.”

– Dr. Sean Hill, Executive Director, INCF.

Three major online mouse brain resources - the Allen Mouse Brain Atlas, the Edinburgh Mouse Atlas Project, and an effort from University of California San Diego (primarily the Cell Centered Database) - are now integrated with the INCF Digital Atlasing Infrastructure and therefore working together and are accessible from multiple software clients. Any client that is WHS aware and uses components of the DAI may now access these resources. This interoperability will facilitate future research as well as increase the value of previously acquired data.

Images



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Contact

Sean Hill, Executive Director
International Neuroinformatics Coordinating Facility,
Karolinska Institutet, Stockholm, Sweden
sean.hill@incf.org
+46 (8) 524 87092

Jyl Boline, Project Coordinator
Informed Minds, Wilton Manors, Florida
jyl.boline@informedminds.net
+1 (626) 644-8337

Brief facts

- The Waxholm Space (WHS) is a virtual coordinate system that unifies 3D mouse brain data
- The Digital Atlasing Infrastructure (DAI) includes web services that allow researchers to
 - Transform images from their own data format to that of a collaborator
 - Integrate different types of data from several sources at once
- Use of WHS data and the DAI are provided freely to the international research community
- Work to add WHS capability for the rat is actively underway at the University of Oslo
- Waxholm Space is named in honour of Waxholm, Sweden, the site of the first INCF Digital Atlasing Working Group, September 2008

Information resources

The Waxholm Space was developed by the INCF Standards in Digital Atlasing Task Force. A more detailed publication of this group's recommendations can be found in their report, published in September 2009. Available via the INCF Collection at Nature Precedings:
<http://precedings.nature.com/documents/4000/version/1>

The Waxholm Space framework is being built on and expanded by the current INCF Digital Atlasing Task Forces. To find more details about these groups, standards and projects, or other recent activities see: <http://waxholm.incf.org/>.

Scientific publications using WHS:

- *Digital Atlasing and Standardization in the Mouse Brain*. Hawrylycz M, Baldock RA, Burger A, Hashikawa T, Johnson GA, Martone M, Ng L, Lau C, Larsen SD, Nissanov J, Puellas L, Ruffins S, Verbeek F, Zaslavsky I, Boline J. PLoS Comput Biol 7(2): e1001065.
<http://dx.doi.org/10.1371/journal.pcbi.1001065>
- *A symmetrical Waxholm canonical mouse brain for NeuroMaps*. Bowden DM, Johnson GA, Zaborsky L, Green WD, Moore E, Badea A, Dubach MF, Bookstein FL. J Neurosci Methods. 2011 vol. 195(2):170-5.
<http://dx.doi.org/10.1016/j.jneumeth.2010.11.028>
- *Waxholm space: an image-based reference for coordinating mouse brain research*. Johnson GA, Badea A, Brandenburg J, Cofer G, Fubara B, Liu S, Nissanov J. Neuroimage. 2010 vol. 53(2):365-72.
<http://dx.doi.org/10.1016/j.neuroimage.2010.06.067>

More information on the community resources currently integrated with WHS can be found via these web pages:

- Allen Brain Atlas: <http://mouse.brain-map.org>
- Edinburgh Mouse Atlas Project: <http://genex.hgu.mrc.ac.uk/>
- UCSD and the Cell Centered Database: <http://ccdb.ucsd.edu/index.shtm>

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- Whole Brain Catalog: <http://wholebraincatalog.org/>
- Scalable Brain Atlas: <http://scalablebrainatlas.incf.org>
- Mouse BIRN Atlasing Toolkit (MBAT): <http://www.loni.ucla.edu/Software/MBAT>
- BrainNavigator: <http://www.brainnav.com/home>

About INCF

The INCF was established in 2005 through the Global Science Forum of the OECD, to foster the sharing of data and computing resources to the international research community. INCF is leading the development of an international neuroinformatics infrastructure for clinical and neuroscientific data sharing, archiving, publishing, analysis, visualization, modeling and simulation - using grid, cloud and supercomputing infrastructures. See www.incf.org for more information.