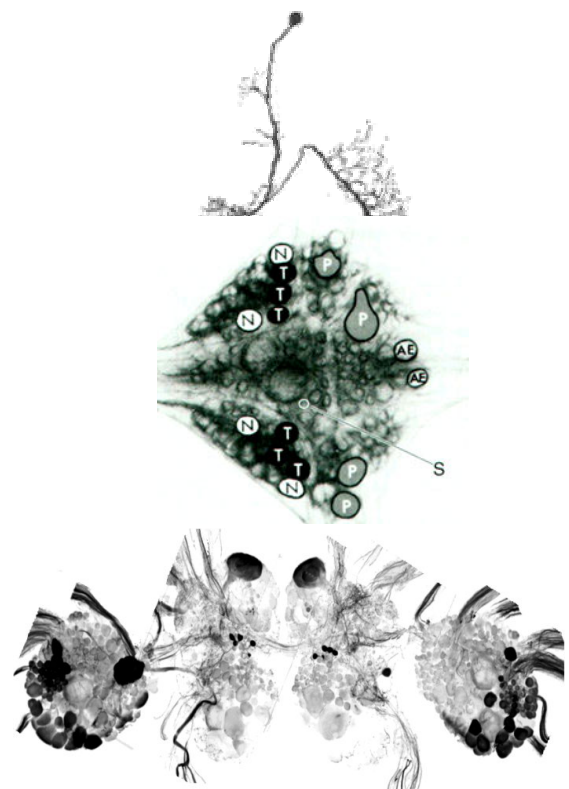
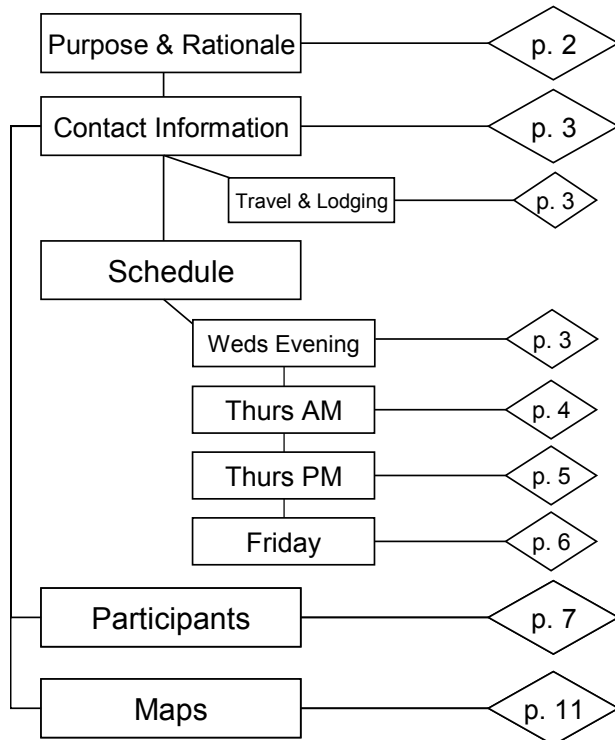


Identified Neuron Database Workshop

December 15-17, 2004

Georgia State University
Atlanta, Georgia



For additional information see <http://biology.gsu.edu/brains&behavior/>

Sponsors:

- NIMH Office on Neuroinformatics
<http://www.nimh.nih.gov/neuroinformatics/index.cfm>
- Georgia State University:
 - Brains & Behavior Program <http://biology.gsu.edu/brains&behavior/>
 - The Center for Behavioral Neuroscience <http://www.cbn-atl.org>
 - The Center for Neural Communication and Computation



Purpose:

The purpose of this workshop is to bring together Computer Scientists and Neuroscientists interested in the problem of creating databases of identified neurons and connections. The immediate goal is to increase the communication among three groups of people: 1) Experimental neuroscientists who represent communities that might need such a database, 2) Experts who have created related databases, and 3) Computer scientists who have expertise in related areas of data management and manipulation. The ultimate goal is to create web-based tools where information about identified neurons or neuronal classes and synapses can be published. This will be an important resource for all researchers interested in the properties of neurons and networks. It is hoped that the conference will lead to collaborative and individual efforts to build the tools needed for this massive undertaking. This workshop will also lead to plans for holding a larger conference on the uses of databases for furthering neuroscience research. Plans have been made to publish the proceedings of this meeting.

Rationale:

Why do we need databases of identified neurons and connections? A basic understanding of how the brain works is predicated upon understanding the underlying circuitry and its properties. The identification of the neuronal elements and their interconnectivity is the foundation upon which all of nervous system function is built. Yet a complete map of all neurons and connections is lacking in all but the nematode nervous system.

A fundamental problem in the study of complex nervous systems, such as the human brain, is an inability to identify explicit classes of neurons. Although there are about 10^{11} neurons in the human brain, it is estimated that they fall into about 5000 different classes. In contrast, the nervous systems of invertebrates are comprised of individually identifiable neurons. In the mollusc, *Aplysia*, the central nervous system has been estimated to contain about 8000 individual neurons that fall into about 5000 different cell types. Thus, the central complexity of some invertebrate nervous systems is about the same as that of the mammalian brain. But unlike the mammalian brain, there is no ambiguity in identifying classes of neurons because the developmental process of most invertebrates leads to uniquely identifiable neurons. Thus, invertebrate nervous systems can serve as models for unraveling complex circuitry.

A database of identified neurons in invertebrates will serve as a test bed for understanding the issues involved in creating a complete wiring diagram of the mammalian brain. The issues that will be discussed in this meeting are tractable in invertebrate nervous systems, but not yet tractable in the mammalian brain.

The creation of this database will also advance research in invertebrate systems, which serve as important models for understanding how neuronal circuitry produces behavior. Although the last 30 years has seen important technical advances that have allowed experiments in mammals that used to be feasible in invertebrates only, it is still true that only in invertebrates is it possible to understand the neural basis of actual behaviors at the cellular level. Research on these important model neural circuits is hampered by the lack of a knowledge base of identified neurons and connections. It is hoped that this workshop will identify the issues and challenges needed to be addressed in order to create this important tool for the neuroscience community.

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Out of town visitors can take a train (MARTA) from the airport directly to the hotel. See <http://itsmarta.com/> for information. Fare: \$1.75
From the Airport, take MARTA to the Peachtree Center Stop (N1 on the North/South Line). The hotel is at the corner of Peachtree Street and Andrew Young International Blvd. (map p. 12)

Weather

Please be aware that although Atlanta is in the south, it can get cold and even snow in December.

Special Thanks

Tara Alexander, James Newcomb, Robert Calin-Jageman, Jason Pamplin and Lei Li for assisting with the logistics of the meeting. Daniel Gardner and the Society for Neuroscience Neuroinformatics Committee for providing dinner for the invited speakers. Elliott Albers and the Center for Behavioral Neuroscience for hosting the reception.

MEETING SCHEDULE AND AGENDA

Wednesday, Dec 15th

7:00 PM Welcome Reception

Room: International C, 6th floor in the Westin Hotel
Hors d'oeuvres and Drinks

Thursday, Dec 16th

Location: Indian Creek Lodge,
Georgia State University Recreational Facility
<http://www.gsu.edu/~wwwrec/facilities/icra.html>
900 South Indian Creek Road



Directions:

Take MARTA to Eastbound from Five Points Station to the Indian Creek Station (E9, See Map p.11) When you exit the station, walk East on Durham Park Road 1/3 mile to South Indian Creek Rd. The Georgia State University Indian Creek Lodge is across the street. The meeting will be in the lodge (pictured at right), which is at the top of the hill.

Please allow 45 minutes travel time from downtown.

Morning Session: Reports on Neuroinformatics Efforts.

What are issues of database design? What's out there already? Presentations will be on existing neuronal databases, highlighting their features. These presentations will discuss how these databases are used by the various communities. They will also discuss current problems that need to be worked on. Talks are 15 minutes with 5 minutes for discussion

- 8:45 **Light breakfast**
- 9:00 **Paul Katz**, Georgia State University
Introductory remarks
- 9:20 **Gwen Jacobs**, Montana State University
Overview of activity at NIH, SFN and the neuroscience community with respect to data sharing, ontologies and ongoing efforts in other communities.
- 9:40 **Maryann Martone**, University of California San Diego
Federation of distributed multiscale data: the BIRN and CCDB projects
- 10:00 **Daniel Gardner**, Cornell Medical College
Neurodatabase.org and BrainML.org: open databases for neuroscience
- 10:20 **Coffee Break**
- 10:40 **Luis Marengo**, Yale University School of Medicine
The EAV/CR WebDB Toolkit: An open source application framework for building evolvable neuroscience databases
- 11:00 **Christopher Comer**, University of Illinois at Chicago
Identified neuron database for insect segmental ganglion
- 11:20 **Nirav Merchant**, University of Arizona
Community Databases: Flat files to semantic web
- 11:40 **General Discussion** - What can we achieve with this workshop?
- 12:00 **Lunch**
Catered lunch will be provided

Thursday, Dec 16th continued

Afternoon Session: Database Needs of the Invertebrate Neuroscience Community

These talks will be by potential users of a database of identified neurons describing what their needs would be. What types of data are collected by experimentalists? How are neurons identified?

Talks will be 10 minutes with 5 minutes for discussion.

- 1:30 **Paul Katz**, Georgia State University
Developing a database of identified neurons for the mollusc, *Tritonia*
- 1:45 **Klaudiusz Weiss**, Mt. Sinai School of Medicine
Identified neurons in *Aplysia*
- 2:00 **Leonid Moroz**, University of Florida
Single neuron gene expression profiling and the *Aplysia* transcriptome project
- 2:15 **W. Otto Friesen**, University of Virginia
Identified neurons in the CNS of the medicinal leech.
- 2:30 **Dirk Bucher**, Brandeis University
Identified neurons in the crustacean stomatogastric system
- 2:45 **Donald Edwards**, Georgia State University
Identified neurons in the crustacean segmental nervous system
- 3:00 **Coffee Break**
- 3:15-5:00 **General Discussion**

Discussion Points:

- 1) Scope of a project to develop identified neuron databases.
 - a) How distributed and how centralized should a federation of related databases be?
 - b) What is the useful Phylogenetic unit for individual databases? Genus, Family, Order...?
 - c) How do we ensure interoperability between allied databases?
 - d) Ontology: How do we define the terms?
 - e) What type of information should be included in a database?
 - i) How should anatomy and physiology be represented?
- 2) Managing the databases.
 - a) How should the entry of data in the database be governed?
 - b) How should quality be controlled?
 - c) How should publication credit and copyright maintained?
 - d) How can it be kept up-to-date and accurate?
 - e) How do we get our communities to use it?

Dinner for Invited Speakers

7PM at City Grill

Sponsored by the Society for Neuroscience

Friday Dec 17th

Location: Sinclair Suite, GSU Student Center, 2nd Floor (see maps p. 12, 13)

Database Implementation Issues

These talks will bring together the issues surrounding the implementation of database design. Talks are 15 minutes with 5 minutes for discussion.



- 8:45 **Breakfast**
Fruit, Pastries, Bagels
- 9:15 **Gwen Jacobs**, Montana State University
Neurosys: Hierarchical database project
- 9:35 **Monte Westerfield**, University of Oregon
How to get started building a database
- 9:55 **Daniel Gardner**, Cornell Medical College
Towards interoperable databases: relatable terms and compatible interfaces
- 10:15 **Mihai Bota**, University of Southern California
The Brain Architecture Management System
- 10:35 **Coffee Break**
- 10:50 **Raymond Lee**, California Institute of Technology
Connections, functions and genes-integrating neuronal information in WormBase
- 11:10 **Scott Emmons**, Albert Einstein College of Medicine
Computer software for nervous system reconstruction from serial section electron micrographs.
- 11:30 **Ying Zhu**, Georgia State University
A plan for visualization and mapping neurons
- 11:50 **Raj Sunderraman**, Georgia State University
Issues of design and implementation
- 12:10 **Lunch**
Sandwich buffet in the Lanier Suite at the Student Center
- 1:00-3:00 **Roundtable Discussion** - Building identified neuron databases.
What should the structure of the databases be? What is the relative value of detail vs. searchability? What features should the user interface have? How much time should it take to enter data for a cell? What features should be included in the search engine? What steps should be taken? Where do we go from here? Create Action Plan.
- 3:00-3:30 **Closing Remarks**

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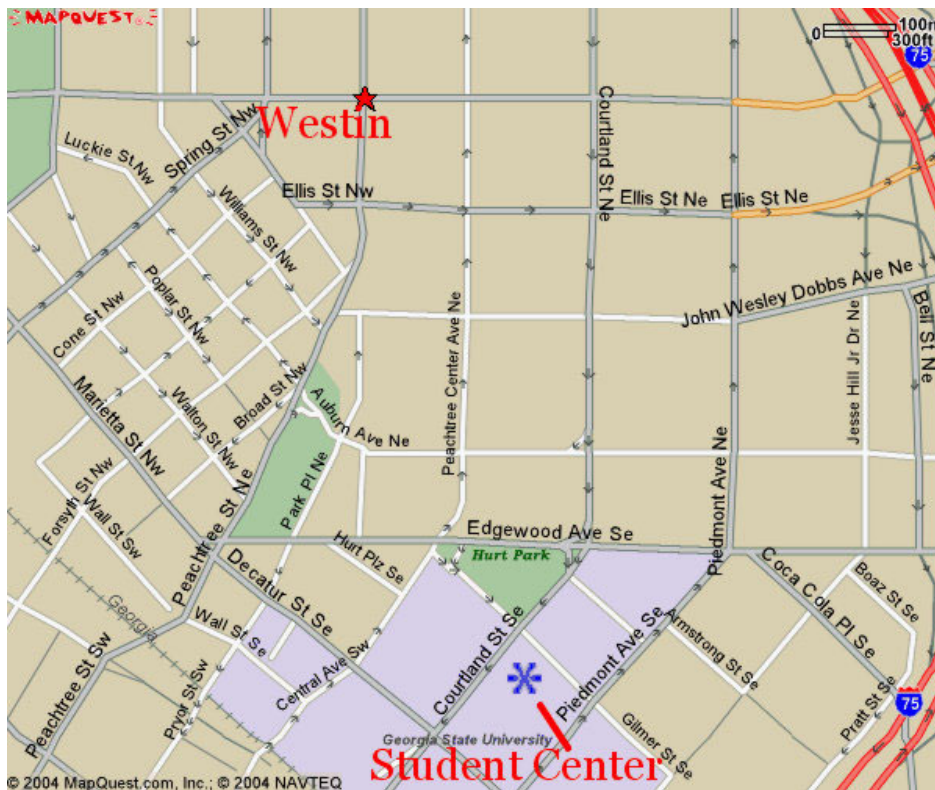
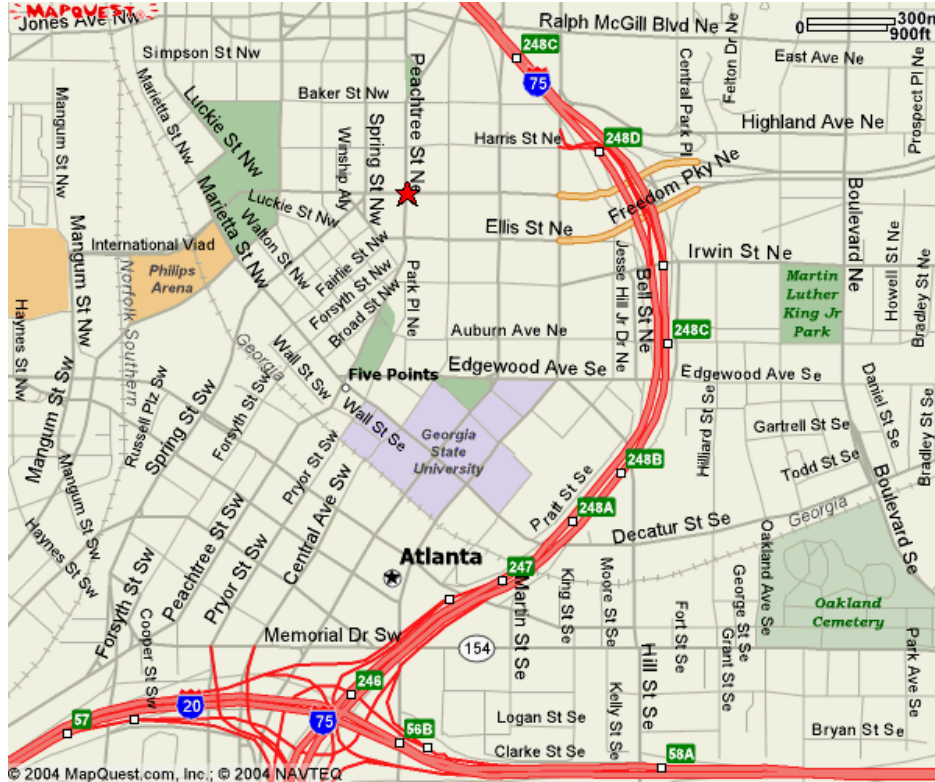
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Maps



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