Development of NeuronBank:
An online knowledge base of identified neurons and synaptic connections

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Neuroscientists seek to understand the brain by mapping its network topology. This involves finding ways to reliably classify neurons and then delineating their interconnections. Although knowledge of circuit topology is invaluable, no standard has evolved for representing this knowledge. The primary difficulty is that neuroscientists do not yet understand the determinants of a "natural class" of neurons. Instead, neuroscientists have built neuron typologies from whatever attributes they can currently measure. Extant typologies are thus *species specific* (reflecting the techniques currently available for that species) and *provisional* (changing as new techniques become available).

The NeuronBank project seeks to develop tools to allow neuroscientists to represent, explore, and share their knowledge of identified neuron types and neural circuits. Our approach is to provide a common framework that can accommodate species differences and changes in the way neuron types are described. The goal is to create a federation of extensible knowledge bases that can be seamlessly queried.

To represent neurons, we are using Protégé to develop an extensible ontology. Our ontology includes a "core" branch defining invariant concepts (neuron class, connection, etc.) and an extensible branch of attributes that can be used for describing and defining neuron types.

To store the knowledge of neuron types, we are developing the *NeuronBank Species Server*, a web-enabled knowledge base that uses our extensible ontology. Different communities of neuroscientists will be able to setup their own server and customize the ontology to describe the neuron typology in use for their species of interest. We are developing clients to enable users to input, browse, search, and compare neural circuits within a species. We are currently using Protégé as a back-end for the Species Server.

To share knowledge across neuroscience communities, we are developing the *NeuronBank Meta Server*, a portal for collecting information across groups of species-servers. Together, these components will form a federation of knowledge-bases that can serve species-specific needs while allowing wide-spread data sharing in the neuroscience community.