

**Invited Presentation—Symposium 53: Neuroinformatics: an enabling capability for understanding and integrating data on brain function**

**A COMMON DATA MODEL FOR ARCHIVE AND EXCHANGE OF NEURONAL BIOPHYSICAL DATA IS EXTENSIBLE TO NEUROPSYCHOPHARMACOLOGIC DATASETS**

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Neuropsychopharmacology, neurology, and psychiatry depend increasingly on insights obtained from data acquired by neurophysiological, neuropharmacological, and genomic techniques (Kandel 1989). Recognizing the expanding complexity of neuroscience data and the techniques used to acquire, store, display and compare it, we have developed new methods that allow these data types to be archived in computer databases and exchanged freely via the Internet. Our databases transcend the utility of static figures or tables printed in the literature by providing views of data and the datasets themselves. These systems have been applied to neurophysiological recordings from cortical neurons of awake behaving subjects, and to biophysical data from *Aplysia*, a preparation utilized as a standard system for the study of learning. Recently this methodology has been shown applicable to functional imaging (Knuth et al 1999).

The schemas underlying these neurophysiological databases have been generalized to a Common Data Model (CDM) extending throughout current neuroscience (Gardner et al 1999, 2001). Recognizing the diversity of data, we have constructed a largely data driven and operational data model, rather than an ontological or theory-based one. First-class elements each derive from one of five top-level elements: data (numeric datasets and metadata), site (e.g., neurons), reference (publication), model (e.g., hypotheses), and method (protocols). Relational operators link elements. Site elements link multiple levels of anatomic specialization by abstracting and providing hierarchies of sites. Hierarchical attribute-value trees provide selectable specificity for exploring structured controlled-vocabulary metadata attributes.

To test the applicability of the CDM to clinical neuroscience, we asked whether the data types and models appropriate to psychopharmacologic patient data could be derived from the top-level CDM classes. Diagnoses are derived from top-level model elements, treatment regimens and pharmacological agents are method elements, and clinical observations are data elements. Specialized data element wrappers encompass patient clinical data and metadata. Although our definitions of psychopharmacologic data types are not intended to be canonical, we demonstrate that the CDM successfully accommodates this case study set of patient data.

Extending the proven utility of genomic databases, the Common Data Model thus incorporates multiple data types relevant to neuroscience, including physiological, anatomical, pharmacological, and clinical. Additionally, it provides mechanisms that may prove useful for cross-modality data exchange and data mining across domains of neuroscience.

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