

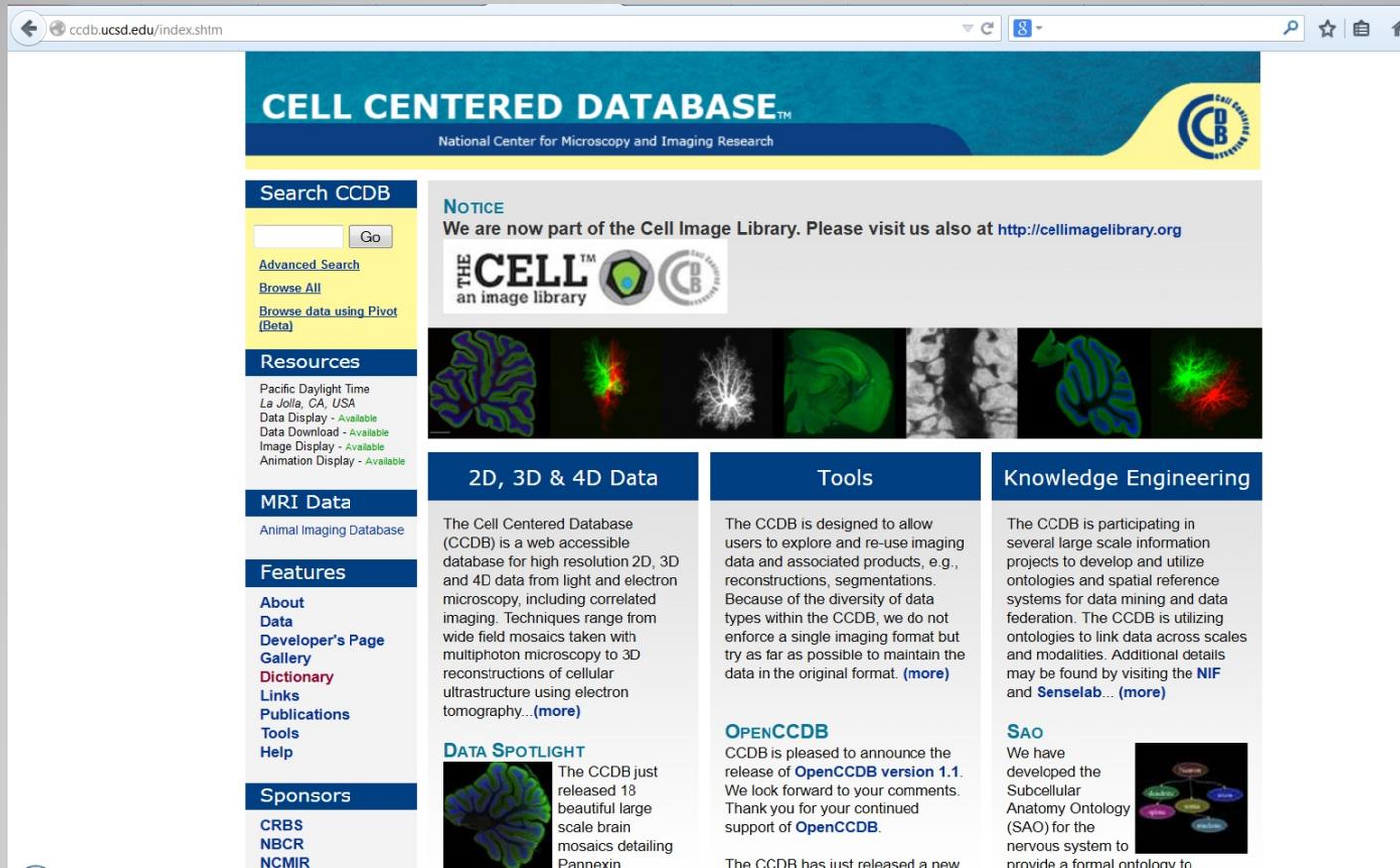
Datenbanken: CCDB und SAO

Seminar: Multidimensional Cell Visualization
Referentin: Semia Chouchane
Semester: SS 2014

Einführung

- Datenbanken sind integraler Bestandteil
- Elektronentomographie bietet eine Fülle von 3D strukturellen Daten biologischer Komponenten
- Wichtiges Problem besteht in Datenaufbereitung und Speicherung in geeignet indizierten und verknüpften biologischen Datenbanken
- Vorteile: einheitlichen Struktur, leichtere Durchsuchbarkeit und Automatisierbarkeit

CCDB – Cell Centered Database



The screenshot shows the homepage of the Cell Centered Database (CCDB). The browser address bar displays "ccdb.ucsd.edu/index.shtm". The page features a blue and yellow header with the text "CELL CENTERED DATABASE™" and "National Center for Microscopy and Imaging Research". A search bar is located on the left side, with a "Go" button and links for "Advanced Search", "Browse All", and "Browse data using Pivot (Beta)". Below the search bar are sections for "Resources", "MRI Data", "Features", and "Sponsors". The "Features" section lists "About", "Data", "Developer's Page", "Gallery", "Dictionary", "Links", "Publications", "Tools", and "Help". The "Sponsors" section lists "CRBS", "NBCR", and "NCMIR". The main content area includes a "NOTICE" section stating that the CCDB is now part of the Cell Image Library, with a link to "http://cellimagelibrary.org". Below the notice is a banner for "THE CELL™ an image library" with a logo. A row of six small images shows various biological structures. The main content is organized into three columns: "2D, 3D & 4D Data", "Tools", and "Knowledge Engineering". The "2D, 3D & 4D Data" section describes the database as a web-accessible resource for high-resolution data from light and electron microscopy. The "Tools" section explains that the database is designed for exploring and re-using imaging data and associated products. The "Knowledge Engineering" section mentions participation in large-scale information projects to develop ontologies and spatial reference systems. A "DATA SPOTLIGHT" section highlights the release of 18 beautiful large-scale brain mosaics detailing Pannexin. The "OPENCADB" section announces the release of "OpenCCDB version 1.1" and thanks users for their support. The "SAO" section mentions the development of the Subcellular Anatomy Ontology (SAO) for the nervous system.

ccdb.ucsd.edu/index.shtm

CELL CENTERED DATABASE™

National Center for Microscopy and Imaging Research

Search CCDB

[Advanced Search](#)
[Browse All](#)
[Browse data using Pivot \(Beta\)](#)

Resources

Pacific Daylight Time
La Jolla, CA, USA
[Data Display - Available](#)
[Data Download - Available](#)
[Image Display - Available](#)
[Animation Display - Available](#)

MRI Data

[Animal Imaging Database](#)

Features

- [About](#)
- [Data](#)
- [Developer's Page](#)
- [Gallery](#)
- [Dictionary](#)
- [Links](#)
- [Publications](#)
- [Tools](#)
- [Help](#)

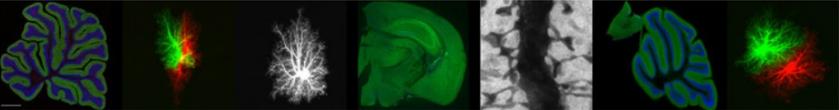
Sponsors

- [CRBS](#)
- [NBCR](#)
- [NCMIR](#)

NOTICE

We are now part of the Cell Image Library. Please visit us also at <http://cellimagelibrary.org>

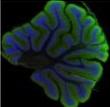
THE CELL™
an image library



2D, 3D & 4D Data

The Cell Centered Database (CCDB) is a web accessible database for high resolution 2D, 3D and 4D data from light and electron microscopy, including correlated imaging. Techniques range from wide field mosaics taken with multiphoton microscopy to 3D reconstructions of cellular ultrastructure using electron tomography...[\(more\)](#)

DATA SPOTLIGHT



The CCDB just released 18 beautiful large scale brain mosaics detailing Pannexin

Tools

The CCDB is designed to allow users to explore and re-use imaging data and associated products, e.g., reconstructions, segmentations. Because of the diversity of data types within the CCDB, we do not enforce a single imaging format but try as far as possible to maintain the data in the original format. [\(more\)](#)

OPENCADB

CCDB is pleased to announce the release of **OpenCCDB version 1.1**. We look forward to your comments. Thank you for your continued support of **OpenCCDB**.

The CCDB has just released a new

Knowledge Engineering

The CCDB is participating in several large scale information projects to develop and utilize ontologies and spatial reference systems for data mining and data federation. The CCDB is utilizing ontologies to link data across scales and modalities. Additional details may be found by visiting the [NIF](#) and [SenseLab](#)... [\(more\)](#)

SAO

We have developed the Subcellular Anatomy Ontology (SAO) for the nervous system to provide a formal ontology to



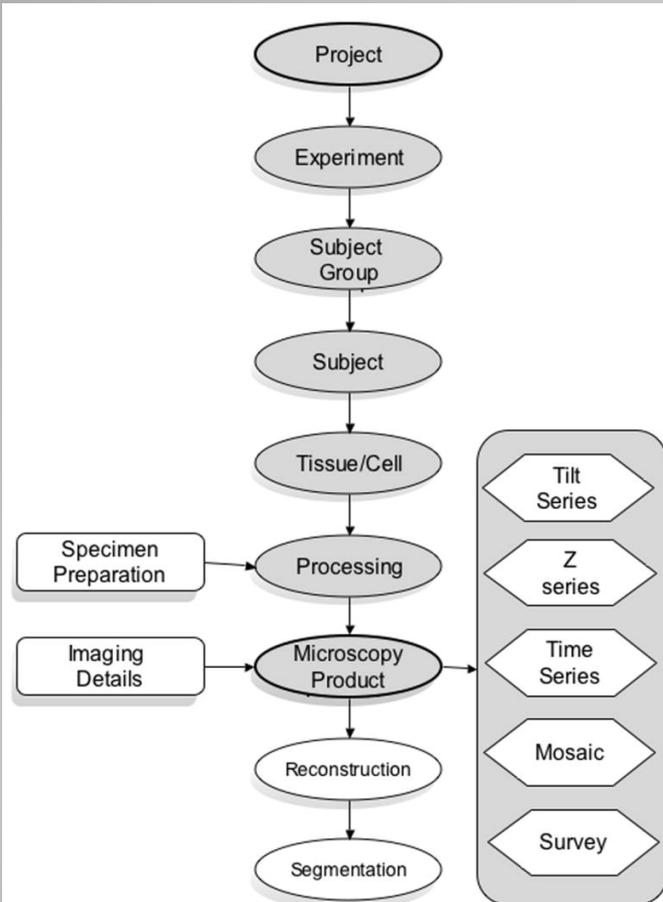
CCDB – Cell Centered Database

- eine der ersten Online-Datenbanken für zelluläre Bilddaten (<http://ccdb.ucsd.edu>)
- März 2002 vom National Center for Microscopy and Imaging Research (NCMIR) erstellt
- aufgebaut in objekt-relationaler Struktur mit Oracle 8i
- Server im San Diego Supercomputer Center (University of California, San Diego)

CCDB – Cell Centered Database

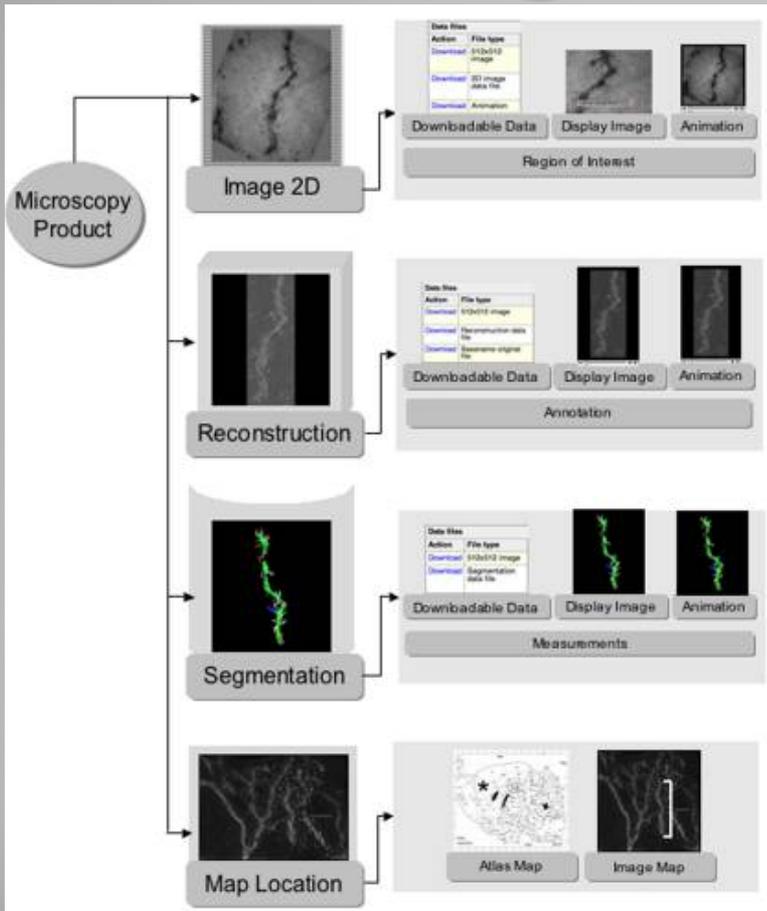
- macht hochauflösende 3D-licht- und elektronenmikroskopische Aufnahmen für Forschung zugänglich
- Daten auf der „mesoscale“-Ebene, z.B. zelluläre Netzwerke, molekulare Strukturen
- Daten können über eine Web-Interface abgelegt und aufgerufen werden

CCDB - Architektur



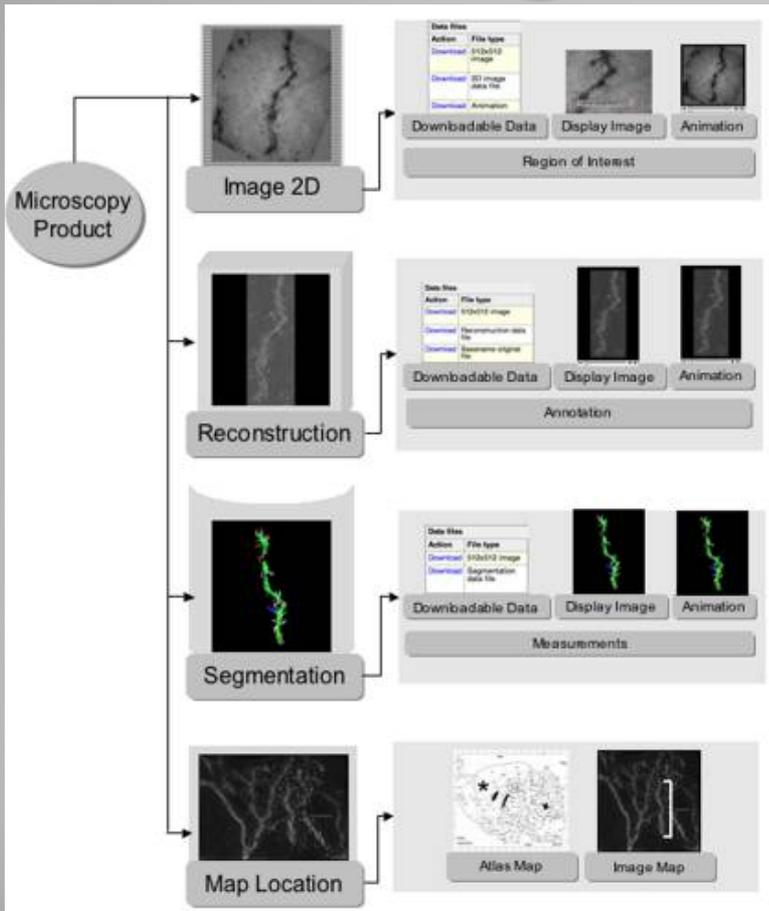
- relationale Datenbank (Oracle 10g + Java –Applikationen)
 - zeigt die Hauptklassen in CCDB
→ jede erneut in Tabellen unterteilt
 - nach Vorbild eines Rekonstruktionsprozesses zweidimensionaler Mikrobilder aufgebaut
- Schritte vom Experiment zur Analyse

CCDB - Ergebnisse



- Jedes „Microscopy Product“ kann mehrere Daten zusammen speichern
- Bilddaten in voller Auflösung zum Download oder Web-Anzeige
- Anmerkungen ebenfalls gespeichert

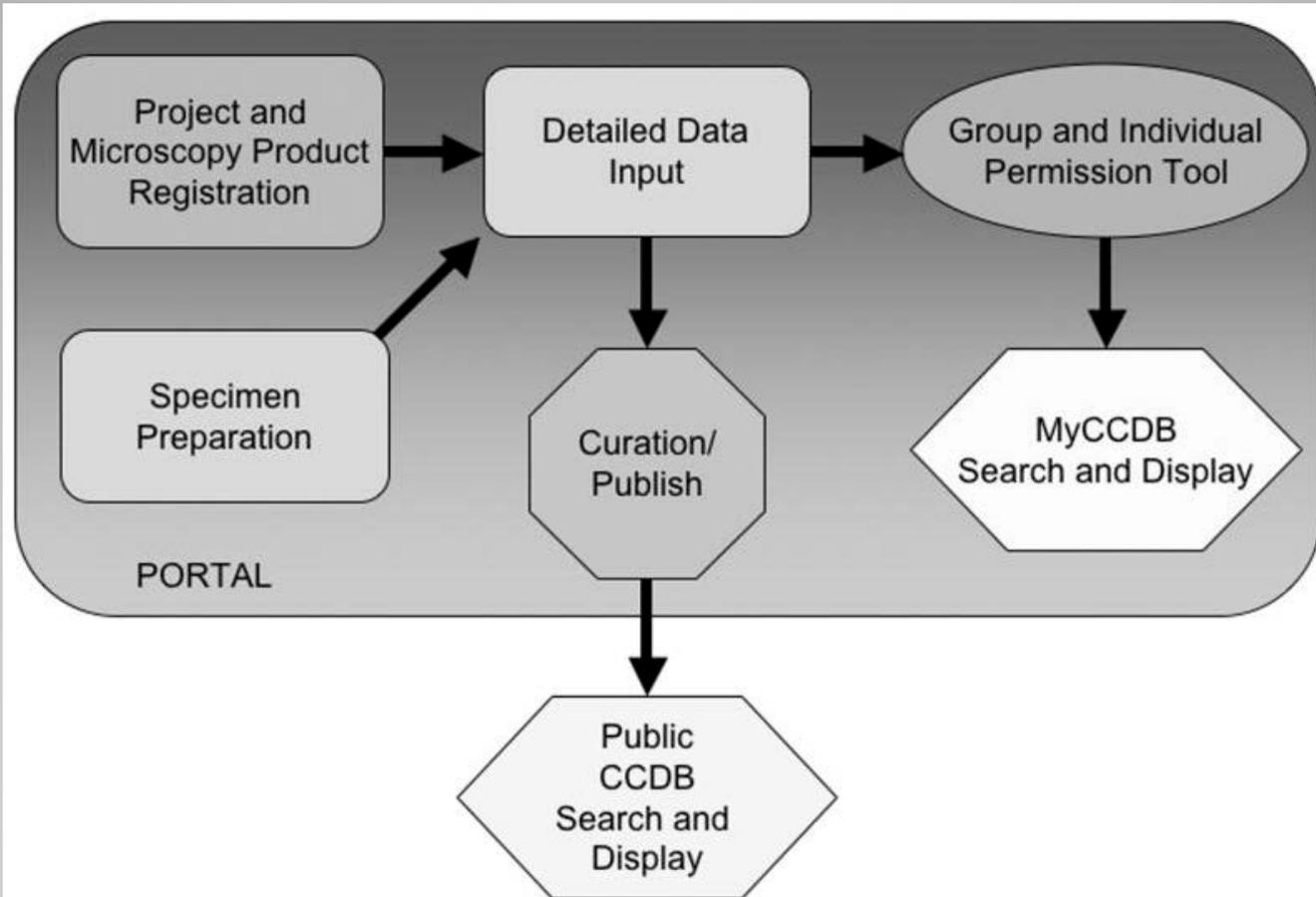
CCDB - Ergebnisse



Beispiele:

- [Image 2D](#)
- [Segmentation](#)
- [Reconstruction](#)
- [Map Location](#)

CCDB – Workflow



CCDB – Einblick Interface

LifeSearch
Keyword | Node Search

Examples of keywords:
• Purkinje
• cerebellum
• confocal
• Joe Scientist
• electron tomography
• neuropil
• Or see dictionary for more suggestions...

1. Enter Search Term

2. View Results Summary

3. View Detailed Record

View Project Structure

- Project P1136
 - Experiment 29 (structure and modeling)
 - Subject group 30
 - Animal 29 (neurate)
 - Tissue 30 (dorsal root)
 - Processing step 41
 - Microscopy product 48 (conf_node)

- Experiment 29 (structure and modeling)
- Subject group 30
 - Animal 30 (neurate)
 - Tissue 40 (dorsal root)
 - Processing step 42
 - Microscopy product 49 (pPP_node)

View Other Projects By Same Project Leader

Project ID	Project name	Description
P1136	Dynamics of membrane organization at the node of Ranvier	Serial tomogram of a conventionally prepared peripheral nerve Node of Ranvier
P1243	High Pressure Freezing and Freeze Substitution	This project is designed to achieve ultimate ultrastructure of animal tissues.

View Other Microscopy Products Under this Project

ID	Image filename	Experiment purpose	Organ	Region	Cell type	Structure	Product type
48	conf_node	Structure and modeling	sciatic nerve	Schwann cell	Node of Ranvier	Node of Ranvier	single tilt
50	node2X	Structure, localization of components	dorsal root	Schwann cell	Node of Ranvier	Node of Ranvier	double tilt

[Download this dataset](#)

- Daten ohne Registrierung abrufbar
- Suche über Stichwort, Projekt-ID oder über konkrete Nummer des Datensatzes möglich
- Daten nicht immer vollständig (viele Angaben sind freiwillig)

Subcellular Anatomy Ontology (SAO)

CELL CENTERED DATABASE™
National Center for Microscopy and Imaging Research



MyCCDB coming soon!

Search CCDB

Search help

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NIDA
NIBIB
NBCR
NIMH
NCMIR
NCRR
UCSD
CRBS

Subcellular Anatomy Ontology (SAO)

THE SUBCELLULAR ANATOMY ONTOLOGY (SAO)

Download SAO 1.2
[Browse the SAO 1.2 \(on the NCBO Bioportal\)](#)

Download SAO 1.1
[Browse the SAO 1.1](#)

Download SAO 1.0
[Browse the SAO](#)

Special Announcement

We are greatly saddened by the sudden and untimely death of our friend and colleague, William Bug ("Bill"). Bill was a tireless contributor to the Biomedical Ontology community in general, and the Subcellular Anatomy Ontology in particular. He will be missed by all of us. The OBI community has set up a [wiki](#) where people can share tributes to our remarkable colleague.

NEW! To view the CCDB / SAO Wiki, click [here](#)

NEW! To read a published article that describes the SAO from a neuroscience perspective, click [here](#)

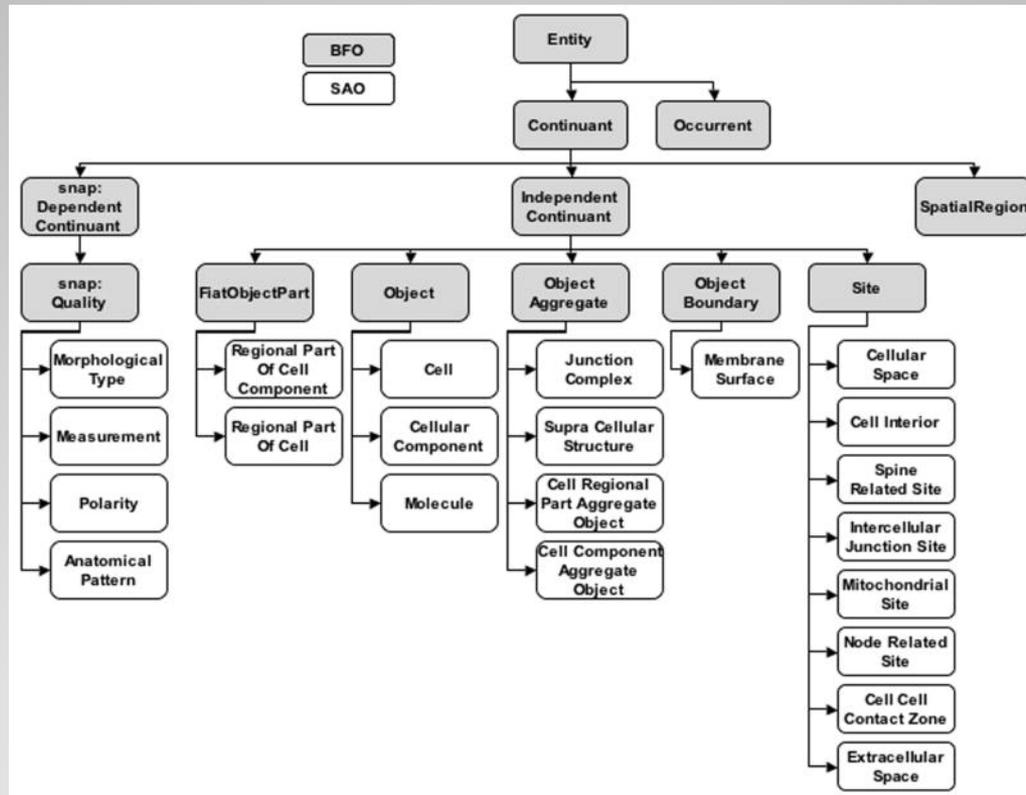
Larson SD, Fong LL, Gupta A, Condit C, Bug WJ, Martone ME (2007) "A formal ontology of subcellular neuroanatomy", *Front. Neuroinform.* 1:3. doi:10.3389/neuro.11/003.2007

To view the SAO 1.2.5 on the NCBO Bioportal, click [here](#).

CCDB und SAO

- Ziel des CCDB: hierarchisches Modell einer Zelle
 - mit CCDB allein nicht möglich
- Subcellular Anatomy Ontology - kurz SAO
 - formale Ontologie: enthält ein Set von verschiedenen Konzepten oder Entitäten innerhalb eines Feldes, die in Beziehung zueinander stehen („ist ein“ oder „ist Teil von“)
 - Zum Beispiel: „Neuron ist eine Zelle“ oder „Zelle ist Teil der Plasma Membran“
- Mittlerweile gibt es neuere Ansätze

SAO - Basisstruktur



SAO wird zu GO-CCO

- Alter Ansatz nicht weiterverfolgt
- Integration in ein neues Projekt: The Gene Ontology Cellular Component Ontology (GO-CCO)
- Das GO-CCO integrierte die Ontologien aus SAO und CCO in die Gene Ontology (GO) und fügte neue Begriffe hinzu, so dass GO-CCO entstand.

GO – Gene Ontology

The screenshot shows the Gene Ontology website homepage. At the top, there is a navigation bar with the logo "the Gene Ontology" and a search box. Below the navigation bar, a central message reads "Welcome to the Gene Ontology website!". To the left of this message is a light blue box containing text about website renovations. Below the welcome message is a search section titled "Search the Gene Ontology Database" with a search input field and a "GO!" button. To the right of the main content is a sidebar with "Quick Links" and "News" sections. The "Quick Links" section includes links for Tools, AmiGO browser, Submit GO Annotations, OBO-Edit ontology editor, Ontology downloads, Annotation downloads, Database downloads, Documentation, GO FAQ, GO on SourceForge, and Contact GO. The "News" section includes links for GO on Twitter, Finding updates..., GO newsdesk, GO news RSS feed, and GO on Facebook.

GO The Gene Ontology

www.geneontology.org

Search go!

the Gene Ontology

Downloads Tools Documentation Projects About Contact

Welcome to the Gene Ontology website!

The GOC website is undergoing major renovations! In the coming weeks the new website for the Gene Ontology Consortium will go live. Test drive the new site at <http://beta.geneontology.org>. Please submit your questions and suggestions [here](#).

The Gene Ontology project is a major bioinformatics initiative with the aim of standardizing the representation of gene and gene product attributes across species and databases. The project provides [a controlled vocabulary of terms](#) for describing gene product characteristics and [gene product annotation data](#) from GO Consortium members, as well as tools to access and process this data. [Read more about the Gene Ontology...](#)

Search the Gene Ontology Database

Search for genes, proteins or GO terms using [AmiGO](#):

GO!

[AmiGO](#) is the official GO browser and search engine.

Quick Links

- Tools
- AmiGO browser 
- Submit GO Annotations
- OBO-Edit ontology editor
- Ontology downloads
- Annotation downloads
- Database downloads
- Documentation
- GO FAQ
- GO on SourceForge 
- Contact GO

News

- GO on Twitter 
- Finding updates...
- GO newsdesk
- GO news RSS feed 
- GO on Facebook 

Zusammenfassung

- Elektronentomographie hat eine Fülle von dreidimensionalen strukturellen Daten biologischer Komponenten hervorgebracht – von Molekülen bis hin zu Zellen
- Die rasch wachsende Anzahl von Daten macht eine besondere Handhabung dieser Daten notwendig
- Datenbanken ermöglichen eine einheitliche Struktur, leichtere Durchsuchbarkeit und Automatisierbarkeit der Organisation durch Softwareentwicklungen

Zusammenfassung

- CCDB ist eine der ersten Online-Datenbanken für zelluläre Bilddaten
- macht hochauflösende 3D-licht- und elektronenmikroskopische Aufnahmen für Forschung zugänglich
- Noch nicht erreichtes Ziel des CCDB: hierarchisches Modell einer Zelle
- Subcellular Anatomy Ontology - kurz SAO
 - Ansatz nicht weiterverfolgt, stattdessen Integration in GO-CCO

Einschätzung CCDB

- viele Datensätze unvollständig, da Angaben freiwillig gemacht oder weggelassen werden können (anders als bei PDB)
- wenig Neuerscheinungen: Datendownload nach Angaben der CCDB stärker genutzt als Datenupload
- Visualisierungstool verbesserungsfähig: siehe im Vergleich beispielsweise [hier](#)...

Quellen

- Martone ME1, Gupta A, Wong M, Qian X, Sosinsky G, Ludäscher B, Ellisman MH (2002): A cell-centered database for electron tomographic data. Journal of structural biology. Online verfügbar: <http://www.ncbi.nlm.nih.gov/pubmed/?term=12160711> (12.05.2012)
- Martone ME, Tran J, Wong WW, Sargis J, Fong L, Larson S, Lamont SP, Gupta A, Ellisman MH. (2008): The cell centered database project: an update on building community resources for managing and sharing 3D imaging data. Journal of structural biology, online verfügbar: <http://www.ncbi.nlm.nih.gov/pubmed/?term=18054501> (12.05.2014)
- Roncaglia P1, Martone ME, Hill DP, Berardini TZ, Foulger RE, Imam FT, Drabkin H, Mungall CJ, Lomax J. (2013): The Gene Ontology (GO) Cellular Component Ontology: integration with SAO (Subcellular Anatomy Ontology) and other recent developments. In: Journal of biomedical semantics. Online verfügbar: <http://www.ncbi.nlm.nih.gov/pubmed/24093723> (13.05.2014)
- Cell Centered Database, Subcellular Anatomy Ontology (SAO): <http://ccdb.ucsd.edu/CCDBWebSite/sao.html> (13.05.2014)
- Cell Centered Database Website: <http://ccdb.ucsd.edu> (13.05.2014)