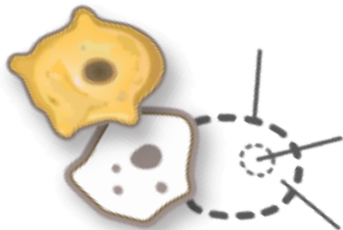
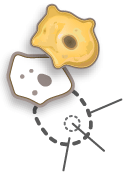


NCBO Web Services: Powering Semantically Aware Applications

Trish Whetzel
Outreach Coordinator

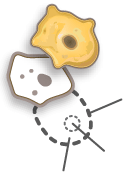


THE NATIONAL CENTER FOR
BIOMEDICAL ONTOLOGY



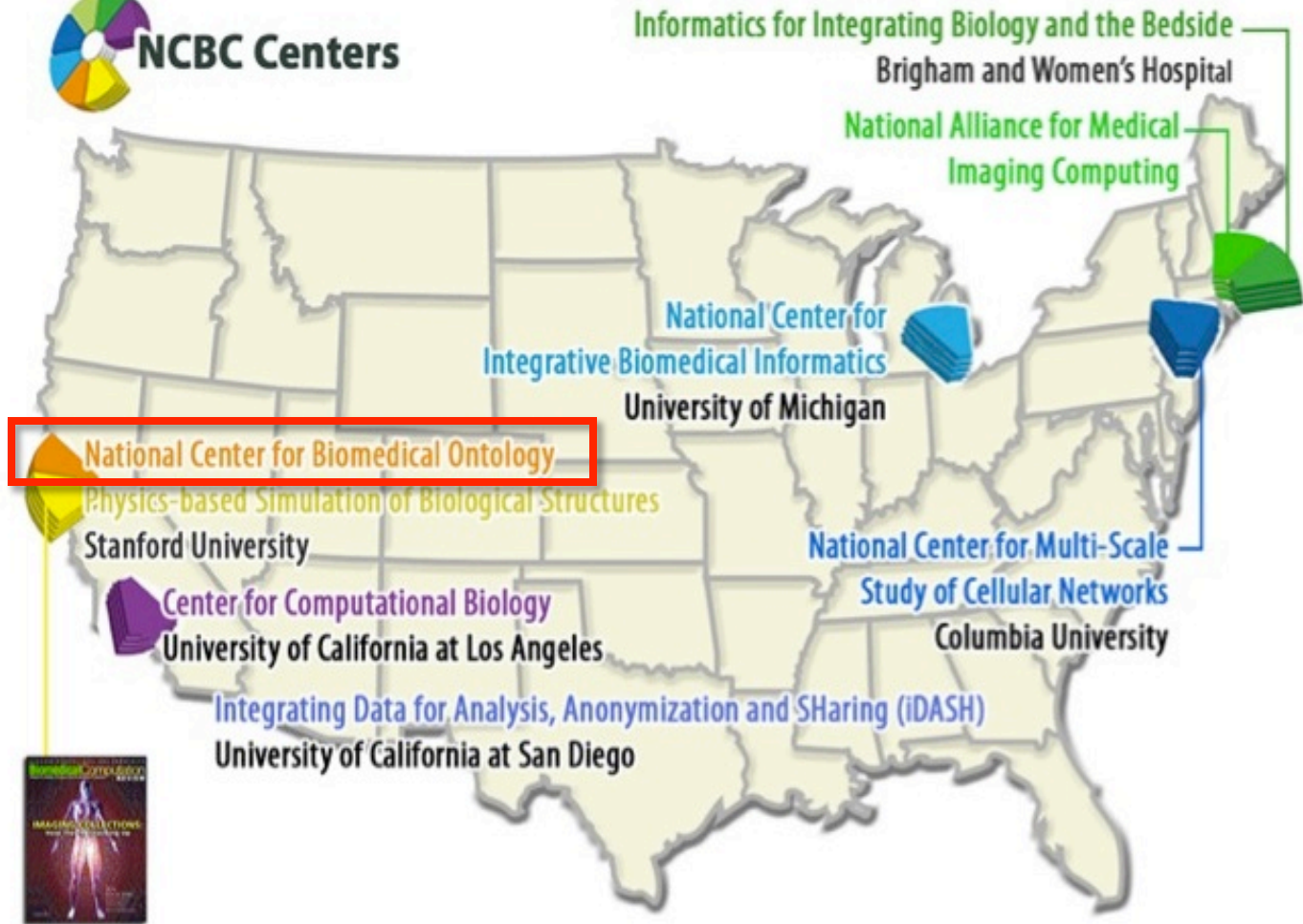
National Center for Biomedical Ontology

- Mission
 - To create software for the application of ontologies in biomedical science and clinical care
- NCBO Partners
 - Stanford University - Dr. Mark A. Musen
 - Mayo Clinic - Dr. Christopher G. Chute
 - University of Buffalo - Dr. Barry Smith
 - University of Victoria - Dr. Margaret-Anne Storey



NCBO Key Activities

- We ***create and maintain a library*** of biomedical ontologies
- We ***build tools and Web services*** to enable the use of ontologies
- We ***collaborate with scientific communities*** that develop and use ontologies



National Centers for Biomedical Computing
(<http://www.ncbcs.org>)



Search

Search Site

Search Google

LOGIN

Home

News & Events

Dissemination & Training

Collaboration

Community

Technology

About Us

Like 111

Of Current Interest

- ▶ **News:** Study Extracts Vioxx Heart-Attack Risk from EMRs, Shift from Ontology Development to Use
- ▶ **Webinar:** Wed, Dec. 7, 10:00am PT, Stephen Wu, Mayo Clinic, UMLS Term Occurrences in Clinical Notes: A Large Scale Corpus Analysis
- ▶ **Recent Publication:** Whetzel, PL, et al. (2011): BioPortal: enhanced functionality via new Web services...
- ▶ **Recent Release:** BioPortal 3.4 (Oct 31, 2011)
- ▶ **NCBO Webinar Announcements - Subscribe**
- ▶ **NCBO Software Support - Mailing List Archive**
- ▶ **More News & Events**

Follow us on Twitter

National Center for Biomedical Ontology

Community

Technology

Learning About Ontologies

Dissemination & Training

Ontology Library

Data Annotation

Go to BioPortal

Go to Annotator

NCBO Collaborations

Forum, Blog Publications

Ontology Development

Data Access Using Ontologies

Go to Resource Index

NCBO User Profile

Susanna-Assunta Sansone, Eamonn Maguire, Philippe Rocca-Serra
University of Oxford



"Our job is to contribute to the realization of the data sharing vision..."

More >

Other profiles >

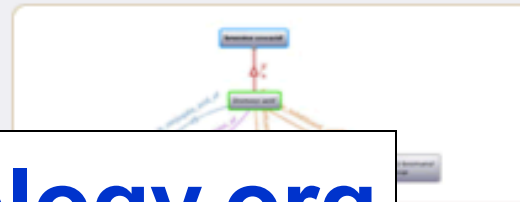
Video

Learn about Biomedical Ontologies. Watch a series of introductory videos.

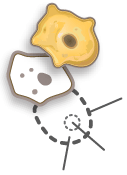


Browse ontologies in BioPortal!

BioPortal allows users to browse, search and visualize ontologies.



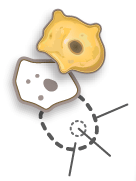
www.bioontology.org



Outline

- NCBO Web services Overview
- Ontology Development and Visualization
- Data Annotation
- Data Integration

<http://rest.bioontology.org>



Ontology Services

- Search
- Traverse
- Comment
- Download

Mapping Services

- Create
- Upload
- Download

Widgets

- Tree-view
- Auto-complete
- Graph-view

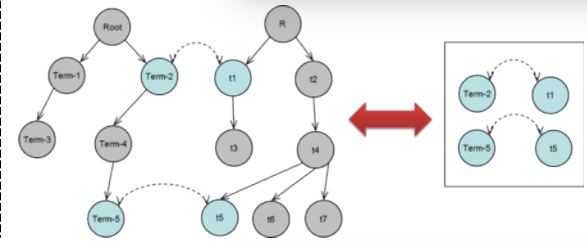
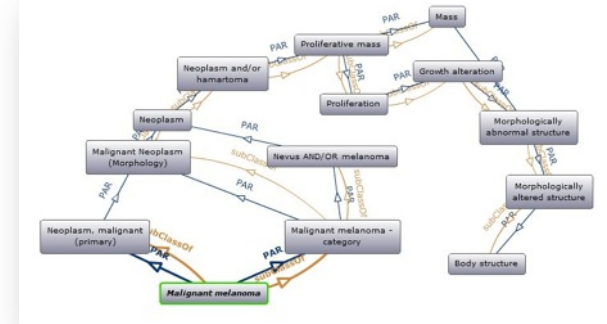
Annotation

Term recognition

Data Access

Search "data" annotated with a given term

<http://bioportal.bioontology.org>

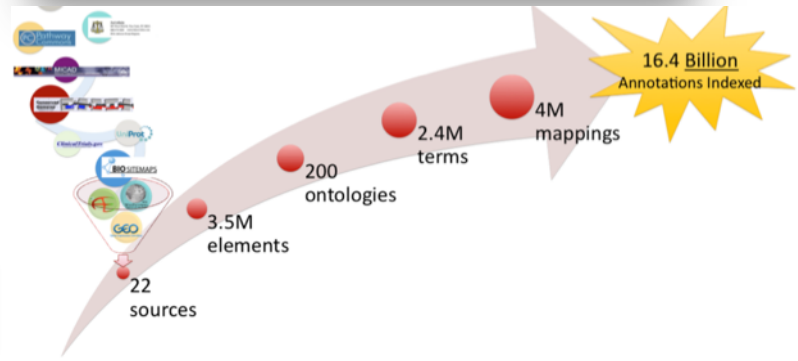


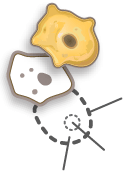
Jump To:

Legend

- Malignant melanoma (synonym)
- Amelanotic melanoma (preferred name)
- Excision of melanoma (preferred name)
- Melanoma in situ (preferred name)
- Melanoma vaccine (preferred name)

Expression, Expression of bladder, bladder, smooth, bladder muscle, muscle, smooth muscle, cells, mechanical, mechanical stimulation, stimulation, Chronic, results, bladder overdistension, associated, associated with, with, loss, genes, altered





Outline

- NCBO Web services
- **Ontology Development and Visualization**
- Data Annotation
- Data Integration

Thesaurus-small Protégé 3.4.7 (file:/work/protege/projects/nci/Thesaurus-small.pprj, OWL / RDF Files)

File Edit Project OWL Reasoning Code Tools BioPortal Window Collaboration Help

Metadata(Thesaurus.owl) OWLClass Properties Individuals Forms

SUBCLASS EXPLORER CLASS EXPLORER for owl:Thing (instance of owl:Class)

For Project: Thesaurus-small For Class: http://www.w3.org/2002/07/owl#Thing

Asserted Hierarchy

- owl:Thing
 - Abnormal_Cell_Kind
 - Activity_Kind
 - Anatomy_Kind
 - Biological_Process
 - Chemicals_and_Dru
 - Chemotherapy_Regi
 - Diagnostic_and_Pro
 - EO_Anatomy_Kind
 - EO_Findings_and_Di
 - Equipment_Kind
 - Findings_and_Disord
 - Gene_Kind
 - Gene_Product_Kind
 - Molecular_Abnormal
 - NCI_Kind
 - Organism_Kind
 - Pathway_Kind
 - Premerged_Concept
 - Preretired_Concepts
 - Properties_or_Attrib
 - Retired_Kind

Import classes from BioPortal

Select a BioPortal ontology as the source of the import (or start typing to get suggestions)

SNOMED Clinical Terms

Jump To :

THING

- Substance
- Record artifact
- Pharmaceutical / biologic product
- Procedure
- Qualifier value
- Special concept
- Event
- Clinical finding
- Situation with explicit context
- Physical force
- Environment or geographical location
- Observable entity
- Organism
- Linkage concept
- Body structure**
- Specimen
- Social context
- Staging and scales
- Physical object

Property	Value
ID	123037004
Full Id	http://purl.bioontology.org/ontology/SNOMEDCT/123037004
Label	Body structure
Synonyms	Body structures, Body structure (body structure)
ChildCount	9
CONCEPTSTATUS	0
CTV3ID	XU5tN
ISPRIMITIVE	1
Semantic_Type	Anatomical Structure
SNOMEDID	T-D000A

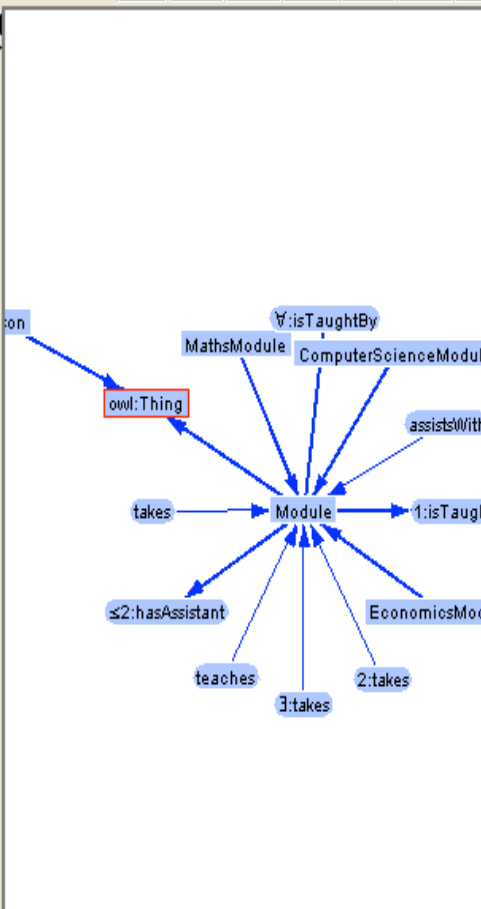
http://protegewiki.stanford.edu/wiki/BioPortal_Import_Plugin

Term Name: Search [Compare...](#)

- Search: [Search For:](#) [Search match:](#)
- Local
 - Classes
 - Exact Match
 - Watson
 - Individuals
 - Token Match

Repository Results Detail View

- owl:Thing
 - Module
 - Person
 - Student
 - Staff



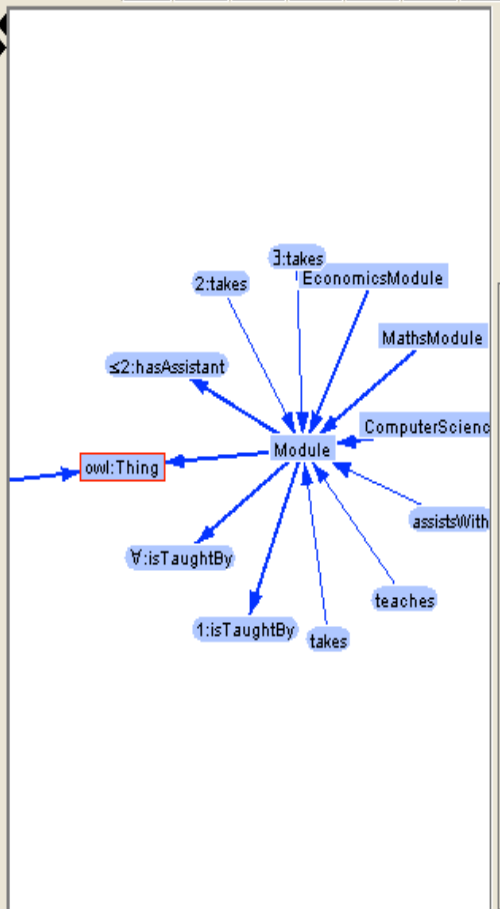
Class Name: Thing

Label:

Namespace: www.w3.org/2002/07/owl#

Comments:

- owl:Thing
 - Person
 - Module



Class Name: Thing

Label:

Namespace: www.w3.org/2002/07/owl#

Comments:

<http://ols2owl.sourceforge.net/>

Classes

Create Delete Watch Class Search: Type

- Resource
 - Funding Resource
 - Information Resource
 - Material Resource
 - People Resource
 - Service Resource
 - Computational Service
 - Data Storage Service
 - Facility Core
 - Biosafety Level Facility
 - Cell Biology Facility
 - Fabrication Facility
 - Imaging Facility
 - Molecular Biology Facility
 - Physiology Facility
 - Cardiovascular Facility
 - Exercise Study Facility
 - Metabolism Facility
 - Neurological Facility
 - Nutrition Facility
 - Sleep Study Facility
 - Research Animals Facility
 - Tissue Organ Facility
 - Material Service
 - Material Storage Service
 - Regulatory Compliance Resource

1

Properties for Physiology Facility

Add property value Delete property value

Property	Value
core:note	pending final vetting: Refine definition
core:prefLabel	Physiology Facility
core:editorialNote	pending final vetting: Refine definition
definition	A facility or core devoted to physiology (http://en.wikipedia.org/wiki/Physiology)
rdfs:label	Physiology Facility

2

BioPortal notes and proposals for Physiology Facility

Subject	Date
New Term Proposal: Exercise Study Facility	Tue Jun 15 13:59:36 PDT 2010
RE: New Term Proposal: Sleep Study Facility	Tue Jun 15 22:18:05 PDT 2010
RE: New Term Proposal: Exercise Study Facility	Tue Jun 15 22:23:20 PDT 2010

Author: Date:

Type: Status:

Body:

3

<http://webprotege/>

Go3R-GCI (http://www.go3r.org/2011/4/11/Go3R-GCI.owl) - [Users/waechter/home_sync/10_proj/Ontology_Completion_OntoComp_Baader/Go3R_2011-05-11-GCI.owl]

Go3R-GCI (http://www.go3r.org/2011/4/11/Go3R-GCI.owl)

Active Ontology | Entities | Classes | Object Properties | Data Properties | Individuals | OWLViz | DL Query | **Ontology Generation**

Class hierarchy: 'Go3R Ontology'

- owl:Thing
 - Go3R Ontology**
 - '3Rs Related Categories'
 - 'Animal Care & Handling'
 - 'Animal Conditions, Physiologic'
 - 'Animal Experiments'
 - 'Animal Species'
 - 'Body Systems & Structures'
 - 'Cell Culture Technology, Etc.'
 - 'Cultured Cells, Tissues, Etc.'
 - 'Diseases & Symptoms'
 - 'In Vitro Experimental Design'
 - 'In Vivo Experimental Design'
 - 'Laboratory Animals'
 - 'Life Sciences'
 - 'Method Specification'
 - 'Methodologies'
 - 'Properties & Effects of Substan'
 - 'Statistics'
 - 'Substances, Preparations & Pro'
 - 'Testing & Assessment of Subst'
 - 'Toxicity Testing Strategy, 3Rs'
 - 'Toxins and Pollutants'
 - 'Validation of Test Methods'

Ontology Generation:

All Steps | Terms Generation | Definition Generation | Preferences | Help | About

Step 1: Term Generation

PubMed | Web | Text | PDF | Clipboard (0)

Query PubMed: "skin sensitization"

	Terms generated for PubMed query "skin
<input checked="" type="checkbox"/>	local lymph node assay
<input type="checkbox"/>	formaldehyde [CHEBI:16842, EO:00
<input type="checkbox"/>	THP-1 cells
<input type="checkbox"/>	skin [FMA:7163, TAO:0000368, EH
<input type="checkbox"/>	dinitrochlorobenzene
<input type="checkbox"/>	dendritic cell
<input type="checkbox"/>	allergen [BS:01016]
<input type="checkbox"/>	haptent [CHEBI:59174]
<input type="checkbox"/>	worker
<input type="checkbox"/>	Langerhans cells

Search: Show

Step 2: Definition Generation

Find Definitions for: local lymph node ass

	Definitions for "local lymph node as
+	local lymph node assay is a well-established method for assessing skin sensitization; it involves the
+	local lymph node assay is an alternative method for the identification of chemicals that have the ability to ...
+	local lymph node assay is a new mouse test for the detection of skin sensitizing activity.
+	local lymph node assay is an alternative to the guinea pig sensitization test used to ...

Ontology Lookup Service Settings

Service: NCBO BioPortal Service

Language Settings

Language: English

Network Proxy Settings

URL:

Port:

User:

Password:

Reset Save

<http://www.biotec.tu-dresden.de/research/schroeder/dog4dag/>

RadLex Tree Browser

fluorosc



fluoroscopy (Preferred Name)

fluoroscopy acquisition (Preferred Name)

real-time reconstructed MR images (Synonym)

fluoroscopy image capture mode (Preferred Name)

Results provided by [NCBO BioPortal](#)

- + [Non-anatomical substance](#)
- + [Physiological condition](#)
- + [Assessment](#)
- [Imaging modality](#)
 - [Panographic radiograph](#)
 - + [Tomography](#)
 - + [Ultrasound](#)
 - [Dual energy xray absorptiometry](#)
 - [Fluoroscopy](#)**
 - + [Projection radiography](#)
 - [Spectroscopy](#)
 - [Magnetic resonance spectroscopy](#)
 - + [Nuclear medicine imaging](#)
 - + [Magnetic resonance imaging](#)
- + [Property](#)
- + [Imaging procedure attribute](#)
- + [Procedure step](#)
- [Report](#)

Fluoroscopy

Visualize

Preferred Name: Fluoroscopy

RadLex ID: [RID10361](#)

PURL: <http://www.radlex.org/RID/RID10361>

Definition: Production of an image when x-rays strike

Synonyms: fluoro,Durchleuchtung

UMLS_ID: C0016356

UMLS_TERM: fluoroscopy

Is A: [imaging modality](#)

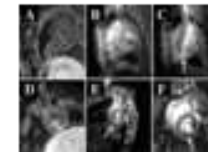
Sample Images:



Radiology 2008



Radiology 2008



Radiology 2006

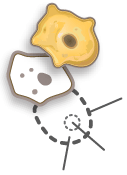


Radiology 2006

Image search powered by **ARRS GoldMiner®**

ARRS GoldMiner® is a registered trademark of the American Roentgen Ray Society.

<http://radlex.org/>



Outline

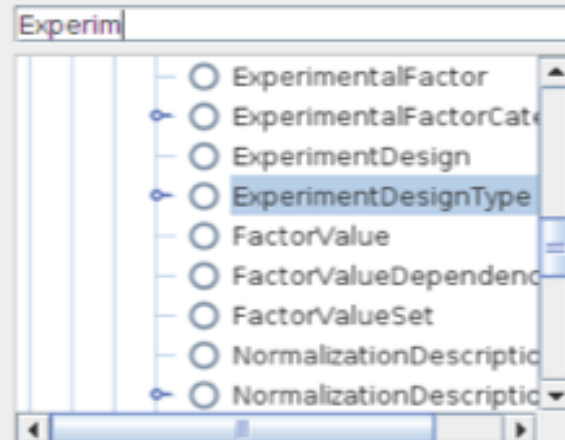
- NCBO Web services
- Ontology Development and Visualization
- **Data Annotation**
- Data Integration

File Edit Insert

	A	B	C
1	[IDF] Investigation Descrip...		
2			
3	# MAGE-TAB template Submiss...		
4			
5			
6			
7	# This section contains the top-l...		
8	Assay Title	<i>Title</i>	
9	Experiment Class	<i>Transcriptomics</i>	
10	Experiment Description		
11	Experimental Design	<i>DesignType</i>	
12			
13	# Please create as many Experi...		
14	# describe the variables investig...		
15	Experimental Factor Name	<i>TIME</i>	
16	Experimental Factor Type	<i>time</i>	
17			
18	# Quality Control Type example...		
19	Quality Control Type	<i>biological_replicate</i>	
20			
21	# Dates should be entered in th...		
22	# it is recommended that you s...		
23	# to help avoid any unwanted c...		
24	Public Release Date	<i>YYYY-MM-DD</i>	
25			
26	# Please list contact details in c...		
27	Person Last Name	<i>name</i>	
28	Person First Name		
29	Person SEEK ID	<i>SEEKID</i>	
30	Person Mid Initials		
31	Person Email		
32	Person Phone		
33	Person Address		
34	Person Affiliation		
35	Person Roles	<i>submitter</i>	
36	# Submitter is the same as per...		
37	# Please list all publications asso...		
38	PubMed ID		
39			

CELLS: B11:B11

HIERARCHY



TYPE OF ALLOWED VALUES

- "Free text"
- "Direct subclasses"
- "Subclasses"
- "Instances"
- "Direct instances"

ALLOWED VALUES

- RNA_stability_design
- all_pairs
- array_platform_variation_design
- binding_site_identification_desi
- cell_component_comparison_de
- cell_cycle_design
- cell_type_comparison_design

OVERVIEW

- Growth control of the e.
- BII-S-1
 - s_BII-S-1.txt
 - a_proteome.txt
 - a_metabolome.txt
 - a_transcriptome.t
- + BII-S-2



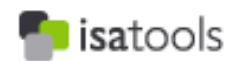
OntoMaton

ONTOLOGY SEARCH

cy5|

Search

- + Sample processing and separation techniques (version 39509)
- + Biological imaging methods (version 45792)
- + Medical Subject Headings (version 46836)
- Ontology for Biomedical Investigations (version 47203)
 - Select Cy5 dye
- + FGED View (version 43109)
- + IEDB View (version 43101)
- + Cell Phenotype Ontology (version 47248)
- + Chemical entities of biological interest (version 47800)
- + Protein-protein interaction (version 39508)
- + NCBI organismal classification (version 47845)
- + Protein modification (version 42456)
- + Cell Cycle Ontology (version 42983)
- + MESH Thesaurus (OWL version) (version 47112)



measuring protei

trient]	Facto
	0.1
	0.1
	0.1
	0.2
	0.2
	0.1
	0.2

recenth

- ies
- search
- + UO:m
- + EFO:g
- + NEWT
- cal
- + CHEBI
- nit
- + CHEBI
- + EFO:_
- 508
- + OBI:pr
- + OBI:m
- + EFO:ti

+ STUDY - STUDY OVERVIEW

INFORMATION

ontology term information

Nitrogen
 source ref: CHEBI
 accession no: 17997

19:08 January

• Lead II Amplitud

Time & Amplitude

Second: mV:

Ontology

Annotation

Jan 01

19:05

Scroll Down

<< < close > >>

<http://wiki.cvrgrid.org/index.php/ECGGadget>

NCBO BioPortal Ontology Visualization

Ok Cancel

Double click on the structure you would like, either in the tree view on the left or the main view in the center.
Then click the "ok" button below to add it to your search.

Drosophila gross anatomy

Find: wing

Go

- l larval tagma
- l pupal tagma
- l thorax
 - l adult thorax
 - l embryonic thora
 - l larval thorax
 - l mesothoracic seg
 - l adult mesoth
 - l adult exte
 - l adult mes
 - l mesothor
 - l mesothor
 - l mesothor
 - l mesothor
 - l skeletal m
 - l wing
 - l chordo
 - l dorsal
 - l tegula
 - l ventral
 - l wing b

Ontology Layouts Nodes Arcs Help

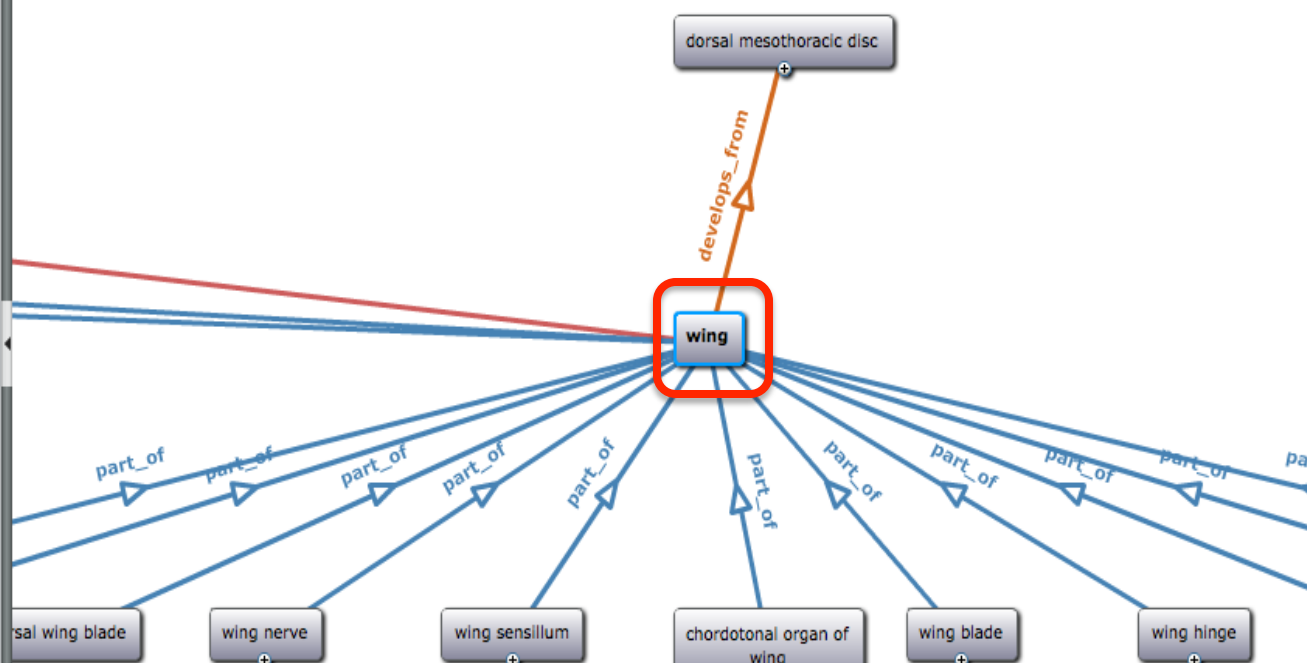
Vertical Tree Layout

Filters:

100%

Show Roots

Drosophila gross anatomy

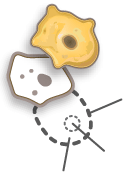


Search

Clear Search Fields

Clear

<http://redfly.ccr.buffalo.edu/index.php>



Outline

- NCBO Web services
- Ontology Development and Visualization
- Data Annotation
- **Data Integration**



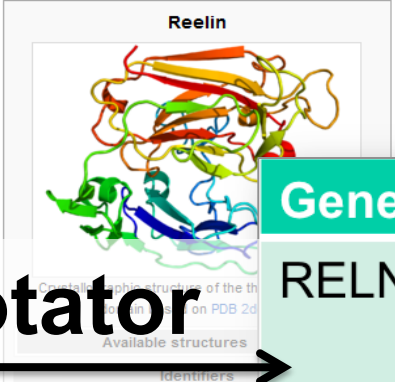
- Main page
- Contents
- Featured content
- Current events
- Random article
- Interaction
 - About Wikipedia
 - Community portal
 - Recent changes
 - Contact Wikipedia
 - Donate to Wikipedia
 - Help
- Toolbox
 - What links here
 - Related changes
 - Upload file
 - Special pages
 - Permanent link
 - Cite this page
- Print/export
- Languages
 - العربية
 - Български
 - Deutsch
 - Ελληνικά
 - Esperanto
 - Español
 - Français
 - Italiano
 - Nederlands
 - Polski
 - Русский
 - Svenska
 - Українська

Reelin

From Wikipedia, the free encyclopedia

Reelin is a protein that helps regulate processes of neuronal migration and positioning in the developing brain. Besides this important role in early development, reelin continues to work in the adult brain. It modulates the synaptic plasticity by enhancing the induction and maintenance of long-term potentiation.^{[1][2]} It also stimulates dendrite^[3] and dendritic spine^[4] development and regulates the continuing migration of neuroblasts generated in adult neurogenesis sites like subventricular and subgranular zones. It is found not only in the brain, but also in the spinal cord, blood, and other body organs and tissues.

Reelin has been suggested to be implicated in pathogenesis of several brain diseases. The expression of the protein has been found to be significantly downregulated in schizophrenia and psychotic bipolar disorder, but the cause of this remains uncertain as studies show that psychotropic medication itself affects the expression of reelin and the epigenetic hypothesis aimed at explaining the changed levels^[5] has received some contradictory evidence.^{[6][7]} Total lack of reelin causes a form of lissencephaly. Reelin may also play a role in Alzheimer's disease, temporal lobe epilepsy and autism.



Annotator

Gene	Property	Value
RELN	GO: Biological Process	Brain Development
RELN	DO: Related Disease	Alzheimer's Disease

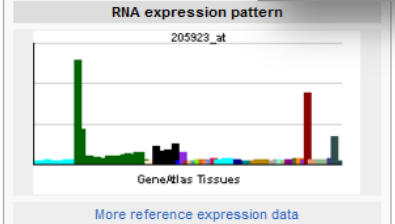
- Contents** [hide]
- Overview
 - Discovery
 - Tissue distribution and secretion
 - Structure
 - Function
 - Evolutionary significance
 - Mechanism of action
 - Interaction with Cdk5
 - Possible pathological role
 - Lissencephaly
 - Schizophrenia
 - Bipolar disorder
 - Autism
 - Temporal lobe epilepsy; granule cell dispersion
 - Alzheimer's disease
 - Cancer
 - Other conditions
 - Factors affecting reelin expression
 - Brain development

Symbols RELN; RL

External IDs OMM: 600514 MGI: 103022 HomoloGene: 3699 GeneCards: RL

EC number 3.4.21.-

Gene Ontology



Orthologs

Species	Human	Mouse
Entrez	5649	19699
Ensembl	ENSG00000189056	ENSMUSG00000042453
UniProt	P78509	Q148P9
RefSeq (mRNA)	NM_005045	NM_011261

http://en.wikipedia.org/wiki/Portal:Gene_Wiki



denosumab

SØK

Kunnskapsegget

Legemiddelsøk

Kodeverk

Ordbøker

Alternative søketermer

Denosumab, denosumab 60 MG/ML, denosumab 70 MG/ML, denosumab Injectable Solution, denosumab Injectable Solution [Prolia], denosumab Injectable Solution [Xgeva], denosumab Prefilled Syringe

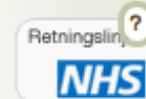
KBP Fagprosedyrer



KBP oppslagsverk



Retningslinjer & kvalitetsvurderte systematiske oversikter



Systematiske oversikter



Kvalitetsvurderte enkeltstudier &

<http://www.kunnskapsegget.no/>



Gene Weaver

A system for the integration of functional genomics experiments.

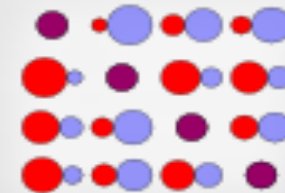
Home Search ▼ Manage GeneSets ▼ Analyze GeneSets ▼ About



Search for or Upload
sets of genes



Collect GeneSets
into Projects



Analyze and discover
GeneSet relationships

Gene Weaver Website and Tools

Gene Weaver allows users to integrate phenotype centered gene sets across species, tissue and experimental platform. Sets can be stored, shared and compared privately, among user defined groups of investigators

<http://ontologicaldiscovery.org/>

atherosclerosis

About 1098632 results for: ALL(athero

Search within results

Refine Results

- Content Sources
- Scopus (321380)
 - ScienceDirect (165169)
 - Patent Offices (88092)
 - MEDLINE / PubMed (77118)
 - MD Consult (19071)
- [View more](#) +

- Author
- Blumenthal, Roger S.
 - Nasir, Khurram
 - Criqui, Michael H.
 - Takasu, Junichiro
 - Allison, Matthew
- [View more](#) +

Clinical Trials (1146)

Drugs (2)



Genes (3)

Grants (1147)

Results from ClinicalTrials.gov

- 1) Insulin Resistance and Atherosclerosis in Women With Lupus
- 2) Non-traditional Cardiovascular Risk Factors and Atherosclerosis in Type 2 Diabetes
- 3) Carotid Atherosclerosis Regression at Magnetic Resonance Assessment.
- 4) Non-Invasive Assessment of Atherosclerosis in Patients With CGD and Other Disorders of the Immune System
- 5) Multi-Analyte, Genetic, and Thrombogenic Markers of Atherosclerosis
- 6) Understanding the Genetic and Hereditary Basis of Atherosclerosis

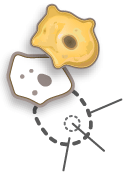
[See all resources at NCBO](#)

2.  **Applications of Nanotechnology to Atherosclerosis, Thrombosis, and Vascular Biology -- Wickline et al. 26 (3): 435 -- Arteriosclerosis, Thrombosis, and Vascular Biology**
<http://atvb.ahajournals.org/cgi/content/full/26/3/435>, September 2010
 ...differentiation Fibrinogen/fibrin Mechanism of atherosclerosis/growth factors Arteriosclerosis...Applications of Nanotechnology to Atherosclerosis, Thrombosis, and Vascular Biology...have been applied to the arenas of atherosclerosis, thrombosis, and vascular biology...
3.  **Atherosclerosis - Overview**
<http://www.umm.edu/ency/article/000171.htm>, September 2010
 ...Your Heart Maryland Heart Center Our Doctors Atherosclerosis - Overview Overview Symptom Treatment Prevention...arteries Plaque buildup - arteries Definition of Atherosclerosis: Atherosclerosis is a condition in which fatty material collects

atherosclerosis (& [nos])
 arteriosclerotic vascular disease nos
 coronary atherosclerosis
 heart disease: [arteriosclerotic] or [chronic ischemic nos]
 generalized atherosclerosis
 arteriosclerotic vascular disease
 vascular sclerosis
 arteriosclerosis
 ischemic heart disease (IHD)

See all terms & resources

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Thank you!

- Web service documentation:
[http://www.bioontology.org/wiki/index.php/NCBO REST services](http://www.bioontology.org/wiki/index.php/NCBO_REST_services)
- Keep in touch
 - Software support: support@bioontology.org
 - Twitter: @bioontology
 - Facebook: <http://on.fb.me/bioontology>
 - LinkedIn: <http://linkd.in/ncbo-group>