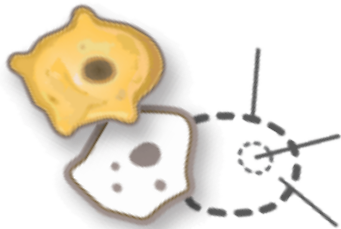
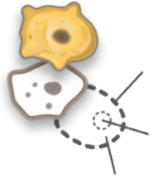


# NCBO Overview and Biositemaps

Trish Whetzel, PhD

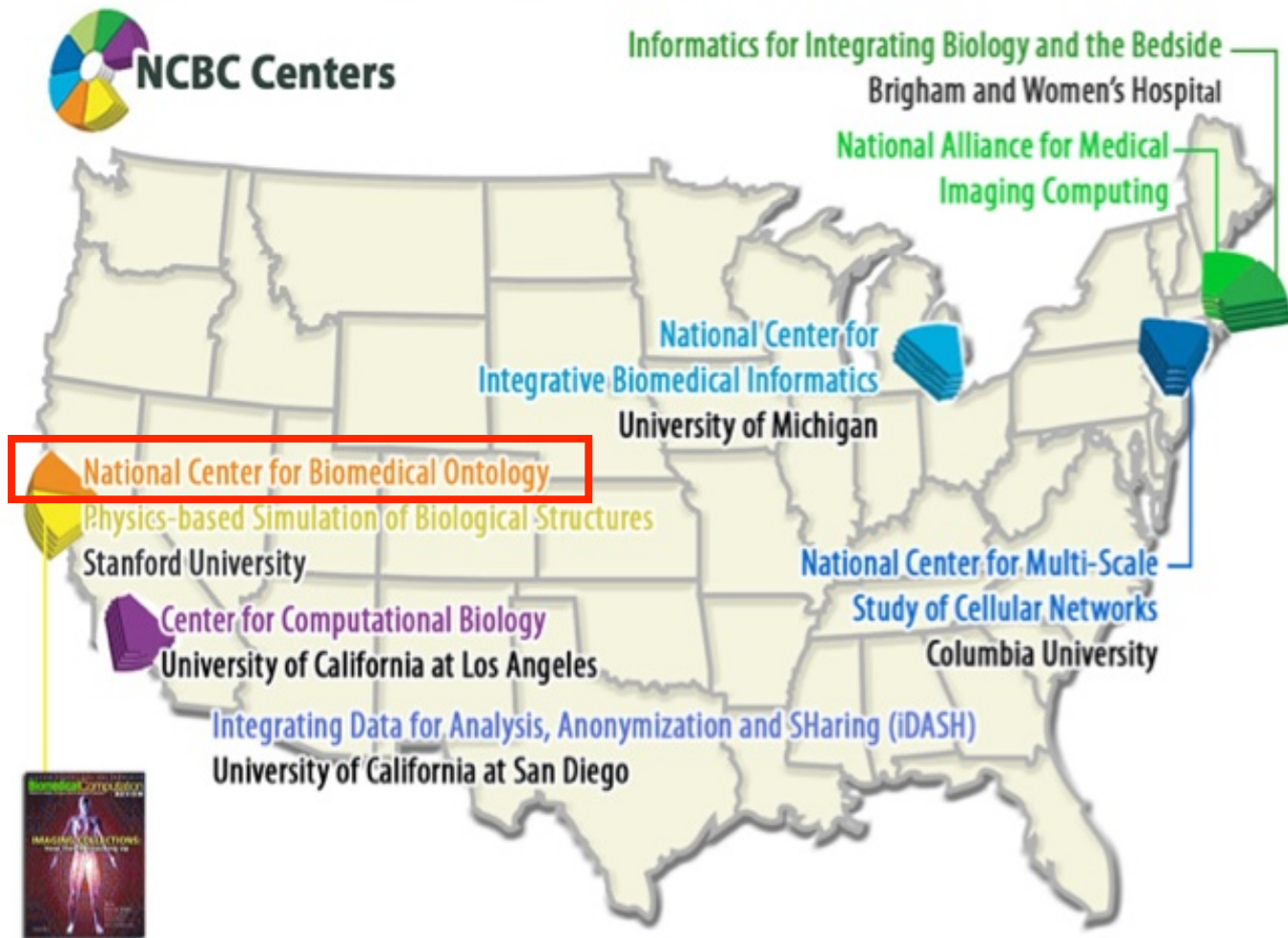


THE NATIONAL CENTER FOR  
**BIOMEDICAL ONTOLOGY**



# 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



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

Welcome to the NCBO Bioportal

Use BioPortal to access and share ontologies that are actively used in biomedical communities. You can search for terms in ontologies (try typing "Melanoma" in the "Search all ontologies" box in the left column), browse a list of ontologies in BioPortal (type "NCI Thesaurus" in the "Find an ontology" box in the middle column), search biomedical resources that we automatically annotated with ontology terms (try typing "Melanoma" in the "Search resources" box in the right column). You can [create ontology-based annotations for your own text](#) , [link your own project that uses ontologies to the description of those ontologies](#) , [find and create relations between terms in different ontologies](#), review and comment on ontologies and their components as you [browse](#) them. [Sign in to BioPortal](#) to submit a new ontology or ontology-based project, provide comments on ontologies or add ontology mappings.

Search all ontologies

Search

[Advanced Search](#)

Find an ontology

Explore

[Browse Ontologies >](#)

Search resources

Search

[Advanced Resource Search](#)

Most Viewed Ontologies (May, 2010)

Ontology	Views
<a href="#">NCBI organismal classification</a>	1612
<a href="#">NCI Thesaurus</a>	1567
<a href="#">SNOMED Clinical Terms</a>	1170
<a href="#">RadLex</a>	880
<a href="#">Foundational Model of Anatomy</a>	804

Latest Notes

[relationship with Smoking Behavior \(NCI Thesaurus\)](#) 19 days ago by pkcourtney  
Seems odd that Tobacco Use as a term is disconnected from the term Smoking Behavior. Although To...

[terms to add under technique \(NanoParticle Ontology\)](#) 24 days ago by dgt78

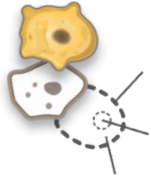
Latest Mappings

[JERMontology:BioMaterial \(SysMO-JERM\) => BioMaterial \(MGED Ontology\)](#)  
BioPortal UI07/07/10 kwolstencroft

[BioMaterial \(MGED Ontology\) => JERMontology:BioMaterial \(SysMO-JERM\)](#)  
BioPortal UI07/07/10 kwolstencroft

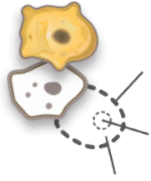
[JERMontology:ReplicateType \(SysMO-JERM\) => JERMontology:ReplicateType \(MGED Ontology\)](#)  
[JERMontology:ReplicateType \(SysMO-JERM\)](#)  
BioPortal UI07/07/10 kwolstencroft

<http://bioportal.bioontology.org>



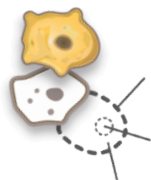
# BioPortal

- Library of Ontologies
  - NCBO BioPortal includes Biomedical ontology content, e.g. UMLS terminologies
- Architecture
  - Backend includes LexEVS and Protégé
  - Web Interface uses Ruby on Rails, Flex, and PHP
- Web services
  - REST Web services

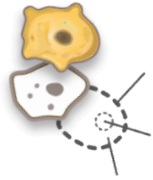


# Ontology Web Services

- Access Ontologies and Views (Value sets)
  - Search
  - Term
  - Hierarchy
  - Mapping
  - Notes
- Widgets
  - Auto-complete
  - Visualization
- Create ontology-based annotations
  - Annotator
  - Ontology Recommender
  - Lexicon Builder
- Access ontology-based index of annotations
  - Resource Index

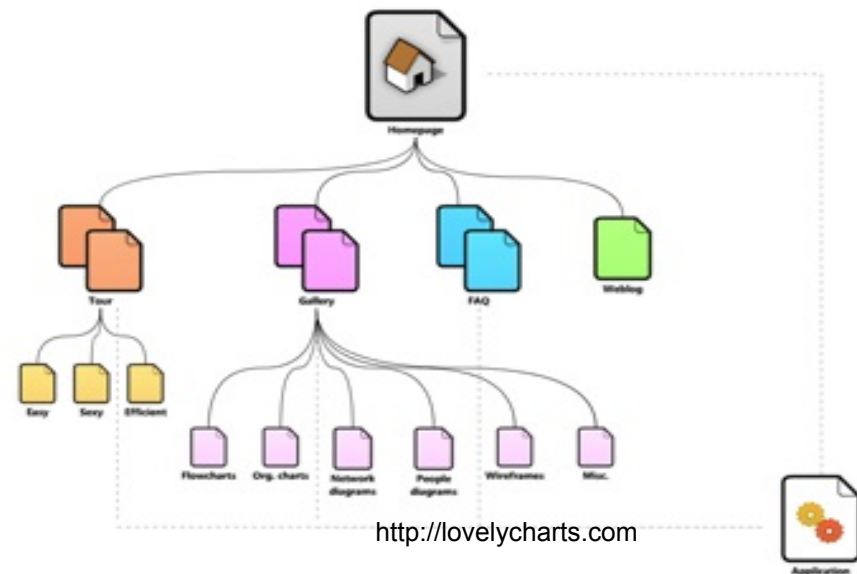


Software	NCBO Technology	URL
ALEX	W	<a href="https://alex.med.nyu.edu/portal/">https://alex.med.nyu.edu/portal/</a>
aTag Generator	W	<a href="http://hcls.deri.org/atag/generator/">http://hcls.deri.org/atag/generator/</a>
BioLit	O	<a href="http://biolit.ucsd.edu/doc/">http://biolit.ucsd.edu/doc/</a>
BioPortal Reference Plugin	O	<a href="http://protegewiki.stanford.edu/wiki/BioPortal_Reference_Plugin">http://protegewiki.stanford.edu/wiki/BioPortal_Reference_Plugin</a>
BioPortal Import Plugin	O	<a href="http://protegewiki.stanford.edu/wiki/BioPortal_Import_Plugin">http://protegewiki.stanford.edu/wiki/BioPortal_Import_Plugin</a>
BioScholar	O	<a href="https://wiki.birncommunity.org/display/NEWBIRNCC/BioScholar">https://wiki.birncommunity.org/display/NEWBIRNCC/BioScholar</a>
cgMDR	O	<a href="http://goo.gl/dvsgM">http://goo.gl/dvsgM</a>
CISBIC Data Management	O	<a href="http://www3.imperial.ac.uk/cisbic/corefacilities/datamanagement">http://www3.imperial.ac.uk/cisbic/corefacilities/datamanagement</a>
eleMAP	O	<a href="https://vict.vanderbilt.edu/eleMAP/">https://vict.vanderbilt.edu/eleMAP/</a>
GeneWiki	A	<a href="http://en.wikipedia.org/wiki/Portal:Gene_Wiki">http://en.wikipedia.org/wiki/Portal:Gene_Wiki</a>
iCAT	O	<a href="http://sites.google.com/site/icd11revision/home/icat">http://sites.google.com/site/icd11revision/home/icat</a>
ISAcceptor	O, A	<a href="http://isatab.sourceforge.net/isacreation.html">http://isatab.sourceforge.net/isacreation.html</a>
Jinx	O	<a href="http://ncmir.ucsd.edu/downloads/jinx.shtm">http://ncmir.ucsd.edu/downloads/jinx.shtm</a>
Knowledge Egg	W	<a href="http://www.kunnskapsegget.no/">http://www.kunnskapsegget.no/</a>
Microsoft Word Addin for Ontology Recognition	O	<a href="http://ucsdbiolit.codeplex.com/">http://ucsdbiolit.codeplex.com/</a>
NEMO Toolkit	O	<a href="http://nemo.nic.uoregon.edu/wiki/NEMO_ERP_Analysis_Toolkit">http://nemo.nic.uoregon.edu/wiki/NEMO_ERP_Analysis_Toolkit</a>
Nutritional Phenotype database	W	<a href="http://www.dbnp.org/">http://www.dbnp.org/</a>
ODIE	A	<a href="http://www.bioontology.org/ODIE-project">http://www.bioontology.org/ODIE-project</a>
ODiSSea	O, A, RI	<a href="http://www.hub.sciverse.com/">http://www.hub.sciverse.com/</a>
OntoCat	O	<a href="http://www.ontocat.org/">http://www.ontocat.org/</a>
Ontological Discovery Environment	A	<a href="http://ontologicaldiscovery.org/">http://ontologicaldiscovery.org/</a>
openMDR	O	<a href="http://citih.osumc.edu/projects/project&amp;r=1032">http://citih.osumc.edu/projects/project&amp;r=1032</a>
Oryzabase	W	<a href="http://www.shigen.nig.ac.jp/rice/oryzabase/top/top.jsp">http://www.shigen.nig.ac.jp/rice/oryzabase/top/top.jsp</a>
RadLex Tree Browser	O, W	<a href="http://www.radlex.org/">http://www.radlex.org/</a>
RadSpeech	W	<a href="http://digitaleveredelung.dfki.de/ME-DICO-Playground/term2.html">http://digitaleveredelung.dfki.de/ME-DICO-Playground/term2.html</a>
REDfly	W	<a href="http://redfly.ccr.buffalo.edu/">http://redfly.ccr.buffalo.edu/</a>
RightField	O	<a href="http://www.sysmo-db.org/rightfield">http://www.sysmo-db.org/rightfield</a>
S3DB	O	<a href="https://sites.google.com/a/s3db.org/s3db/">https://sites.google.com/a/s3db.org/s3db/</a>
SEEK	O	<a href="http://www.sysmo-db.org/seek">http://www.sysmo-db.org/seek</a>

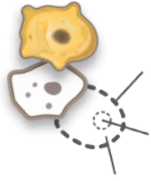


# Biositemaps: From the Beginning

- The NCBCs originally listed software and data resources on a wiki
- The wiki was not easily scalable or searchable, and was useable only by humans
- And then, Google sitemaps provided a key insight







# Biositemaps

**BIO SITEMAPS**

Home

**Biositemaps**

Breaking News: The [Resource Discovery System](#) now includes biositemap resources from all registered resource programs!

The Biositemaps Working Group of the NIH Roadmap National Centers of Biomedical Computing (NCBC) ([www.ncbcs.org](http://www.ncbcs.org)) has developed technologies to address (i) locating, (ii) querying, (iii) composing or combining, and (iv) mining biomedical resources. Each site which intends to contribute to the inventory instantiates a file on its Internet site "**biositemap.rdf**" which conforms to a defined RDF schema and uses concepts from the Biomedical Resource Ontology to describe the resources.

**What is a Biositemap?** Biositemaps represent a mechanism for computational biologists and bio-informaticians to openly broadcast and retrieve meta-data about biomedical resources. All institutions with an interest in biomedical research can publish a biositemap.rdf file on their Internet site. Each biositemap.rdf file is simply a list of controlled metadata about resources (data, software, tools, material, and services) that your organization uses or believes are important to biomedical research. The key enabling technologies are the [Information Model \(IM\)](#) which is the list of metadata fields about each resource (resource\_name, description, contact\_person, resource\_type,...) and the [Biomedical Resource Ontology \(BRO\)](#) which is a controlled terminology for the 'resource\_type', 'area of research', and 'activity' and which are used to improve the sensitivity and specificity of web searches. [\[more...\]](#)

**What is the Biomedical Resource Ontology (BRO)?** A key enabling technology for Biositemaps is the Biomedical Resource Ontology (BRO) which is a controlled terminology for the 'resource\_type', 'area of research', and 'activity' and which are used to improve the sensitivity and specificity of web searches. This is under development by a number of NIH-funded researchers who have a combined interest in classification of biomedical resources. The publication site for [BRO is the BioPortal](#).

**QuickStart for Biositemaps**

1. Use the [Biositemaps Editor](#) to fill in the info customized editors for [CTSA](#) and [NCBC](#). In
2. Your biositemap.rdf file will need to be dep
3. Use the [Biositemap Registration](#) to publish your biositemap after it has been deployed [\[help...\]](#)

**[www.biositemaps.org](http://www.biositemaps.org)**

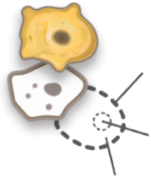
- Machine-readable resource associated with a website
- Resources are described in terms of an *information model*
- Supported by the Biomedical Resource Ontology
- Can be discovered by search engines such as Google





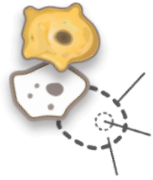
# Clinical and Translational Science Awards





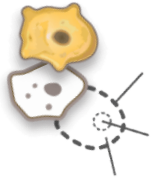
# Biositemaps Information Model (v 2.6)

- Required Properties
  - Resource Name
  - Organization
  - Research Program
  - Description
  - Resource Type
  - URL
  - Contact Person
  - Biositemap Author





# Biositemaps Information Model (v 3.2.1)

- Required Properties
  - Resource Name
  - Organization
  - Research Program
  - Description
  - Resource Type
  - URL
  - Contact Person
  - Biositemap Author
- Additional Properties
  - Related Areas of Research
  - Related Activities
  - Publication Identifier

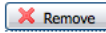




# Biositemaps Editor


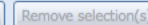


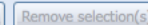


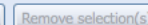


**BIO SITEMAPS EDITOR**

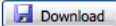

**Resource Descriptions**

Name
BioPortal
Jambalaya
LexGrid
OBA
OBO_Converter
OBR
PROMPT
Protege3
Protege4
WebProtege



**Resource Properties**

<b>Resource Name:</b>	WebProtégé
<b>Organization:</b>	Stanford University
<b>Center or Institute:</b>	National Center for Biomedical Ontology
<b>Research Program:</b>	NCBC
<b>Description:</b>	WebProtégé is an open source, lightweight, web-based ontology editor. The main goal in developing WebProtégé was to support the process of collaborative ontology development in a web environment and to facilitate knowledge acquisition from domain experts.
<b>Resource Type:</b>	<div><div> <b>BRO (1 Item)</b></div><div>BRO:Ontology_Development_and_Management</div><div></div></div>
<b>Related Areas Of Research:</b>	<div><div></div><div></div></div>
<b>Related Activities:</b>	<div><div></div><div></div></div>



The Biositemap Editor is joint project of [The National Center for Biomedical Ontology](#) and [The National Center for Integrative Biomedical Informatics](#) which are part of the [National Centers for Biomedical Computing](#) supported by the [NIH Roadmap](#).

# Resource Discovery System



Software   Material Resources   Funding Resources   Service Resources   Training Resources   People Resources

Search

[Advanced Search](#) | [Map](#) | [FAQ](#) | [About](#)

## Organization

Aberystwyth University (2)  
 Albert Einstein College of  
 Medicine (partnering with  
 Montefiore Medical Center) (6)  
 Argonne National Laboratory  
 (1)  
 Boston University (3)  
 Brigham and Women's Hospital  
 (1)  
 Broad Institute (1)  
 Carnegie Mellon (2)  
 Cleveland Clinic, Lerner  
 Research Institute (2)  
 Columbia University (58)  
 Compendia Bioscience (1)  
 Computer Human Interaction &  
 Software Engineering Lab  
 (CHISEL) (1)  
 Create, Inc. (1)  
 Drexel University (1)  
 Duke University (60)  
 FBI (1)  
 Center  
 Research Program  
 Resource Type  
 Related Activities  
 Areas of Research

1,475 **Resources** found, displaying 1 to 25.

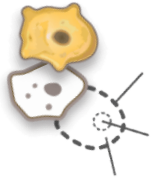
1 • 2 • 3 • 4 • 5 • 6 • 7 • 8

Name	Organization	Description	Links
1000 Functional Connectomes Project		ATTENTION The 1000 Functional Connectomes Project has a new home page at NITRC. Please visit us at <a href="http://con_1000.projects.nitrc.org">http://con_1000.projects.nitrc.org</a> or simply...	Home page Contact: Stan Colcombe
3D RNA Modeling & Simulation Workshop, UIC Chicago, March 2010	Stanford University	The structure and dynamics of molecules is central to understanding biological function, and yet most experimentalists find existing structural modeling...	Home page Contact: Blanca Pineda, Joy Ku
3D RNA Modeling and Simulation Workshop, June 19, 2009	Stanford University	The structure and dynamics of molecules is central to understanding biological function, and yet most experimentalists find existing structural modeling...	Home page Contact: Blanca Pineda, Joy Ku
3D Slicer		An extensible cross-platform totally open research platform for image computing.	Home page Contact: Dominik Meier

## Resource Discovery System

*A catalog of > 1,400 biomedical resources*

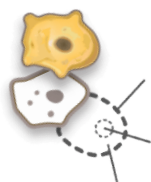
*A set of tools and services for easy sharing of and linking of resources to articles, websites etc.*



# Biositemaps Summary

- Initially developed in parallel to related efforts initiated by NIF, the CTSAs, and other groups
- Provides a shared framework with which to harmonize access to biomedical resources
- Adopts “Web oriented” philosophy of distributed information without central control
- Uses a formal Biomedical Resource Ontology to enhance precision and recall when searching for resources online





# Acknowledgements

## Contributing Members: Informatics and Translational Supplement

### University of Pittsburgh

Michael J. Becich MD PhD  
Charles D. Borromeo  
Harpreet Singh MS  
Nancy B. Whelan

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Trish Whetzel PhD

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### Working Group Members (38 POCs)

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## Funding Provided by

### CTSA

Administrative Supplement (Pittsburgh),  
3UL1RR024153-03S1

Administrative Supplement (Duke), 5UL1RR024128-03S1

Emory University CTSA, 1UL1RR025008-01

University of California Davis CTSA, 1UL1RR024146-01

University of Michigan CTSA, 1UL1RR024986-01

University of Pittsburgh CTSA, 1UL1RR024153-01

### NCBC

National Center for Integrative Biomedical Informatics,  
3U54DA021519-04S1

National Center for Biomedical Ontology, 3U54HG004028-04S1

<http://biositemaps.ncbcs.org>