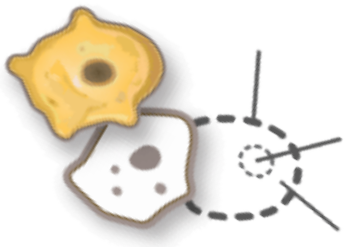
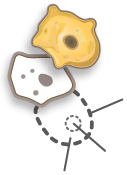
NCBO Technology Overview

Trish Whetzel

Outreach Coordinator

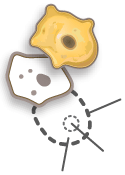


THE NATIONAL CENTER FOR
BIOMEDICAL ONTOLOGY



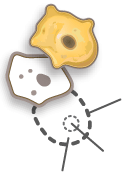
Links of Interest

- http://www.bioontology.org/wiki/index.php/NCBO_Web_Services_and_the_Development_of_Semantic_Applications



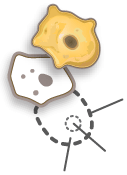
Outline

- Learning Objectives
- REST Web services
- BioPortal
- NCBO Web Services
- BioPortal SPARQL Endpoint



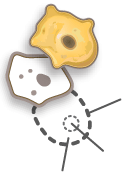
Learning Objectives

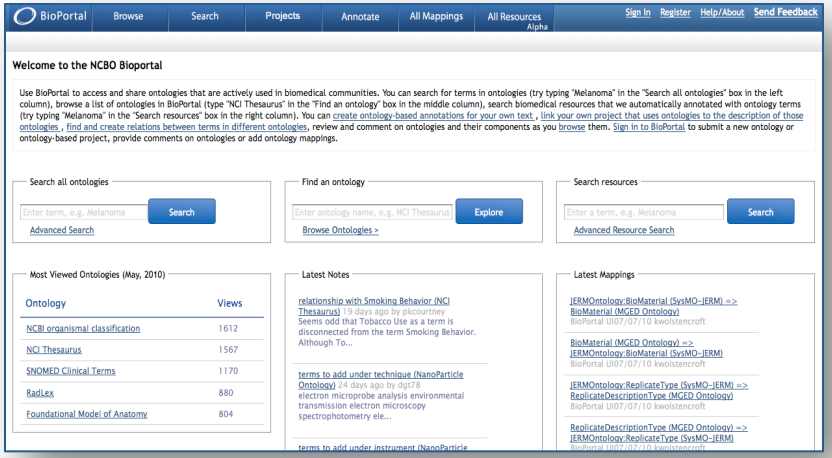
- Learn what Web services are available from NCBO
- Learn how to programmatically use these Web services
- Learn how to combine these Web services to perform tasks

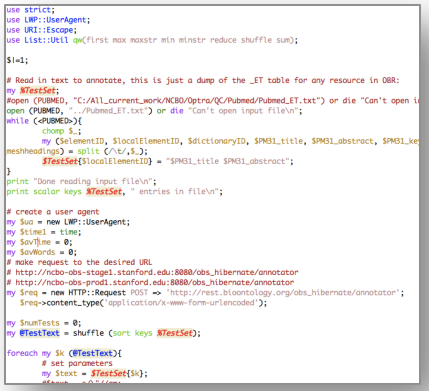


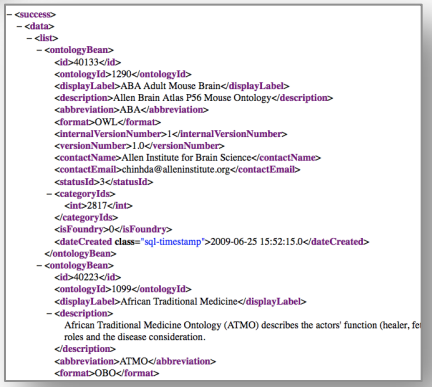
REST Web Services

- Accessed via HTTP
  - http://rest.bioontology.org/{parameters}
- Each unique URL is a representation of some object
- Operations include GET, POST, PUT, DELETE
- Lightweight, easy to build







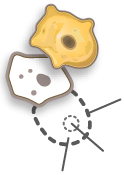


User Interface

Code

Browser

Web Services



Outline

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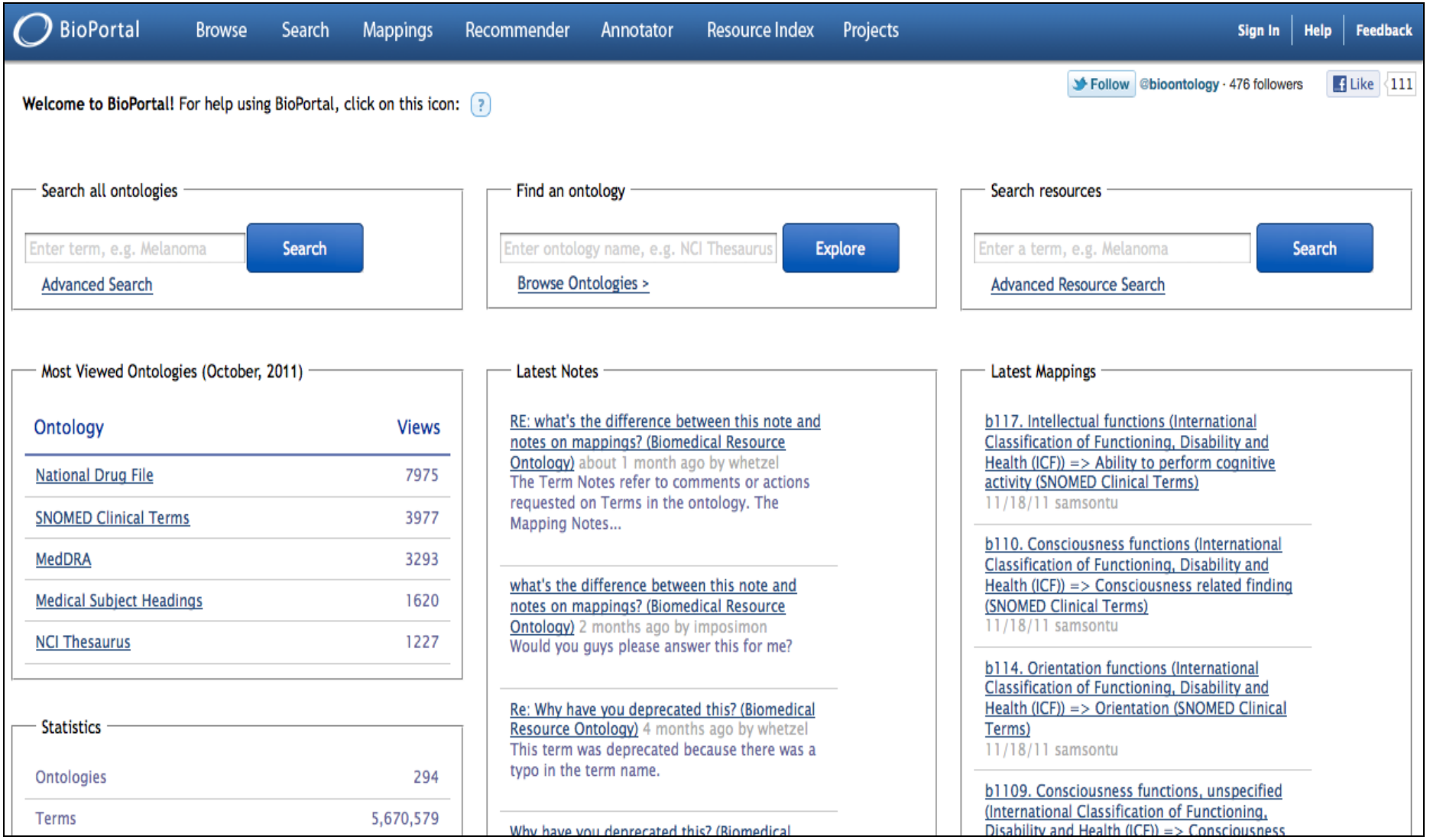
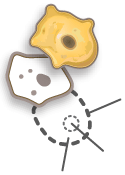


http://bioportal.bioontology.org



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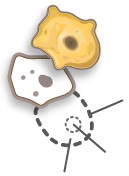
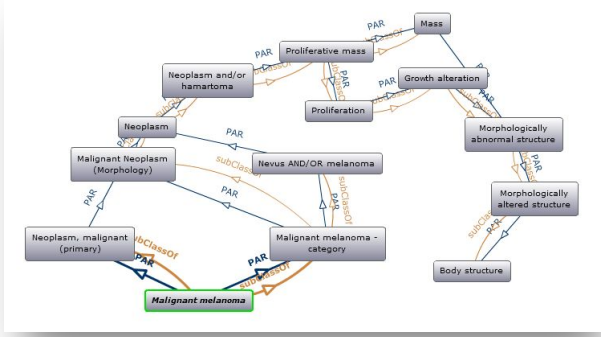


http://rest.bioontology.org

Ontology Services

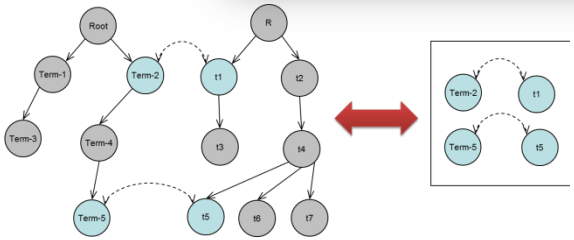
Views

- Search
- Traverse
- Comment
- Download



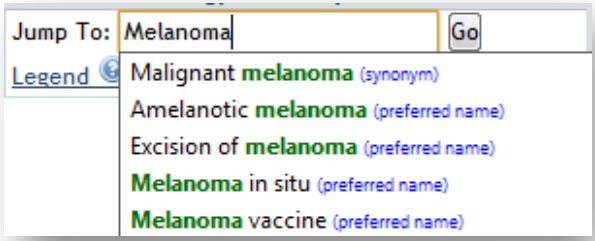
Mapping Services

- Create
- Upload
- Download



Widgets

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



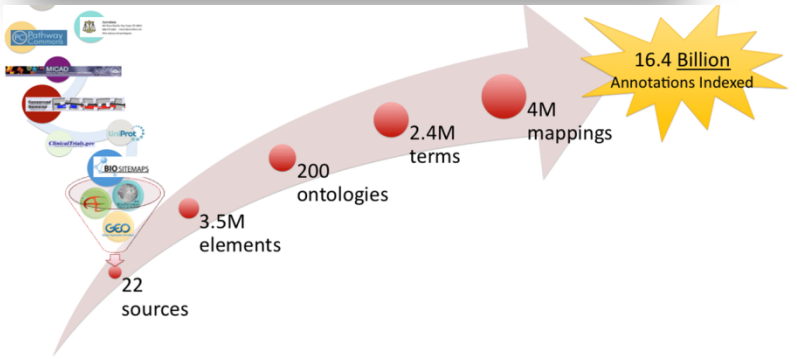
Annotation

Term recognition

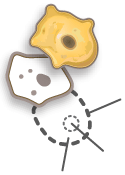
Expression, Expression of bladder, bladder, smooth, bladder muscle, muscle, smooth muscle, cells, mechanical, mechanical stimulation, stimulation, Chronic, results, bladder overdistension, associated, associated with, with, loss, genes, altered

Data Access

Fetch "data" annotated with a given term

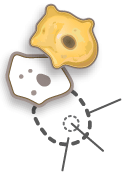


http://bioportal.bioontology.org



ONTOLOGY WEB SERVICES

Accessing, browsing, searching and traversing ontologies in *Your* application



Ontology Web Services

- List All Ontologies
  - List all ontologies in BioPortal
  - Documentation: http://bit.ly/sxL2Qi
  - GoogleDoc Excel example: http://bit.ly/ncbo-list-all-ontologies

```
- <success>
    <accessedResource>/bioportal/ontologies</accessedResource>
    <accessDate>2011-12-04 22:01:39.603 PST</accessDate>
  - <data>
    - <list>
      + <ontologyBean></ontologyBean>
      + <ontologyBean></ontologyBean>
      + <ontologyBean></ontologyBean>
      - <ontologyBean>
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          <ontologyId>1351</ontologyId>
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            <int>1456</int>
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        - <userIds>
            <int>38134</int>
          </userIds>
          <versionNumber>2011_2010_08_30</versionNumber>
          <isRemote>0</isRemote>
          <statusId>3</statusId>
          <dateCreated>2010-11-09 11:16:42.0 PST</dateCreated>
          <dateReleased>2010-08-30 00:00:00.0 PDT</dateReleased>
          <isManual>1</isManual>
          <displayLabel>Medical Subject Headings</displayLabel>
        - <description>
            Medical Subject Headings (MeSH);National Library of Medicine;Februrary, 2009;Bethesda, MD;ENG
          </description>
          <abbreviation>MSH</abbreviation>
          <format>RRF</format>
```
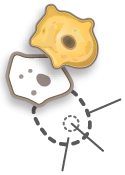


One ontology id has many ontology version ids

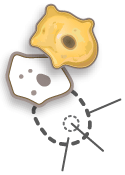
Ontology version id

Ontology id



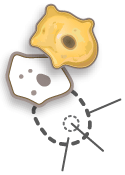
Ontology Web Services cont.

- Search
  - Search by term or term identifier across all ontologies in BioPortal
- Documentation: http://bit.ly/tMDkr6
- Example clients
  - Java: http://bit.ly/ttTb1G
  - Perl: http://bit.ly/sPXC2X



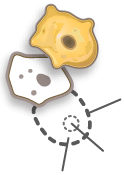
Ontology Web Services cont.

- Term
  - get details about a term including it's definition, synonyms, URI, super- and sub-classes, and other properties http://bit.ly/teedbd
- Hierarchy
  - get parent, children, and sibling terms http://bit.ly/tPzm75



NOTES WEB SERVICES

Propose new terms and comment on ontologies



Notes Web Service

- Add terms proposals and comments on ontology terms
- Documentation: http://www.bioontology.org/wiki/index.php/Ontology_Notes

Biomedical Resource Ontology

Notes

Notes

Subscribe to notes emails

Show 50 entries Filtering Options » Search:

SUBJECT	AUTHOR	TYPE	TARGET	CREATED
New Term Proposal: Exercise Study Facility archived	Mette	New Term Proposal	Physiology Facility (Class)	06/15/2010

New Term Proposal: Exercise Study Facility archived

New Term Proposal submitted by Mette over 1 year ago on Physiology Facility in Biomedical Resource Ontology

PREFERRED NAME	Exercise Study Facility	PROVISIONAL ID		PARENT	http://bioontology.org/ontologies/BiomedicalResourceOntology.owl#Physiology_Facility
REASON FOR CHANGE	Physiology facility child	STATUS		CONTACT INFO	
SYNONYMS					
DEFINITION	A facility or core devoted to exercise studies				

Responses

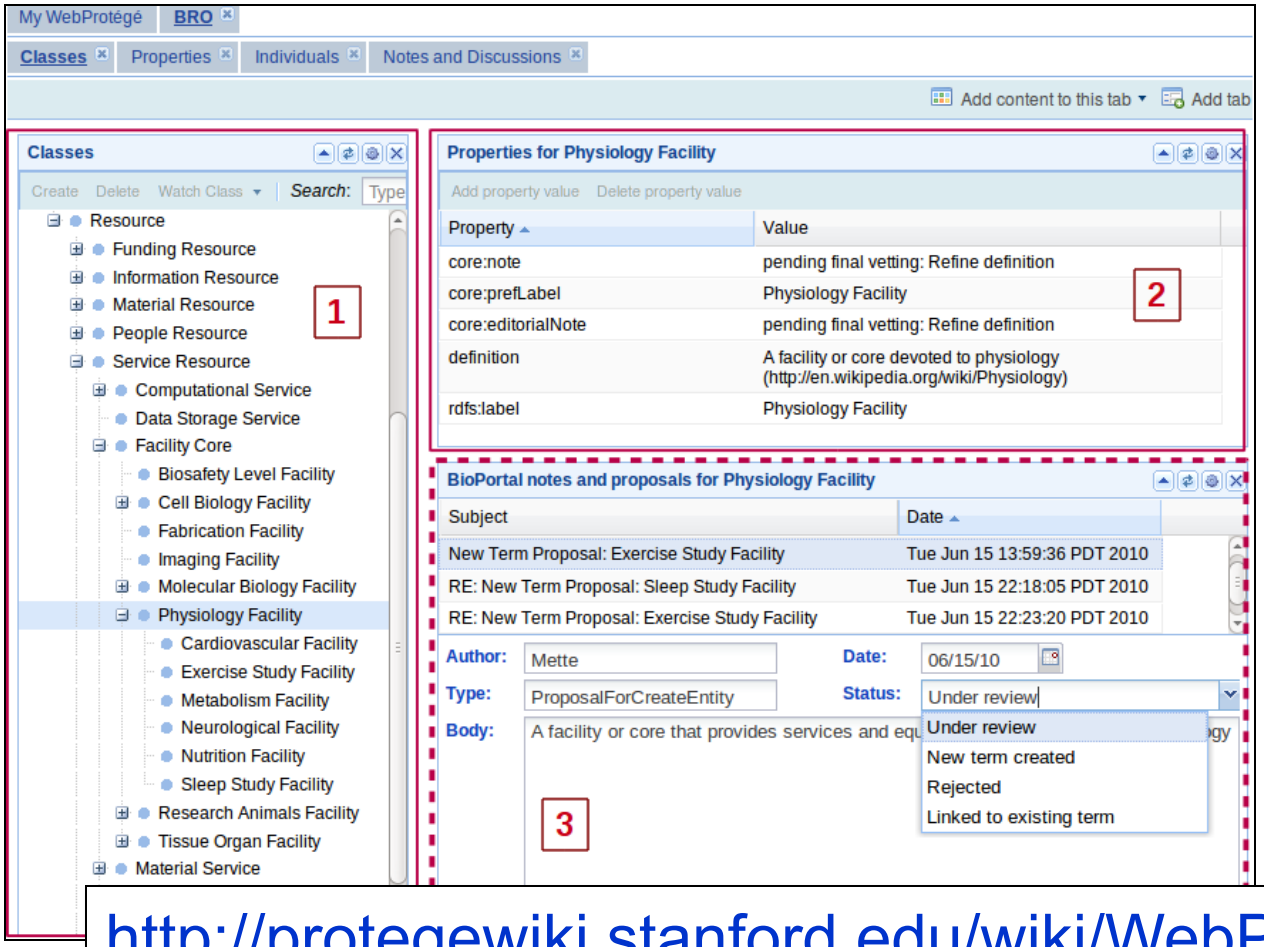
hide all | show all

RE: New Term Proposal: Exercise Study Facility by whetzel over 1 year ago

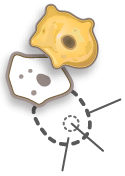
Can you expand on what an exercise study is?

reply

WebProtégé

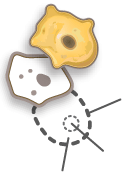


http://protegewiki.stanford.edu/wiki/WebProtege



VIEWS

Custom subset of large ontologies



Views and Value Sets

- Users can submit their own derivatives of BioPortal ontologies
  - these which become first-class objects in BioPortal and can be used as all other Web services

Views in BioPortal

Views

Create new view

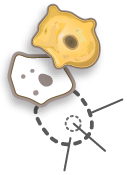
Expand All | Collapse All

- CORE Subset of SNOMED CT
- Neoplasm_breast_cancer
- Neoplasm_hamartoma
- SNOMED Anatomy
- SNOMED Clinical Findings

  - Description: The Clinical Finding subtree of SNOMED CT
  - Definition: Class subtree of ClinicalFinding
  - Ontology ID: 2018
  - Definition Language: Manual

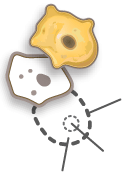
VERSION	BASE VERSION	CREATED	CREATED BY	ONTOLOGY FILE	DIFF FILE	VISIBILITY
1.2	2009_07_31	07/16/2010	Tania Tudorache, tudorache@stanford.edu	Download View		Public
1.1	2009_07_31	03/23/2010	Tania Tudorache, tudorache@stanford.edu	Download View		Public
1.0	2009_01_31	09/09/2009	Tania Tudorache, tudorache@stanford.edu	Download View		Public

- SNOMED Ethnic Group
- SNOMED Morphologically Abnormal Structure
- SNOMED Organism
- SNOMED Terminos Clinicos
- SNOMED Test Findings



Views and Value Sets

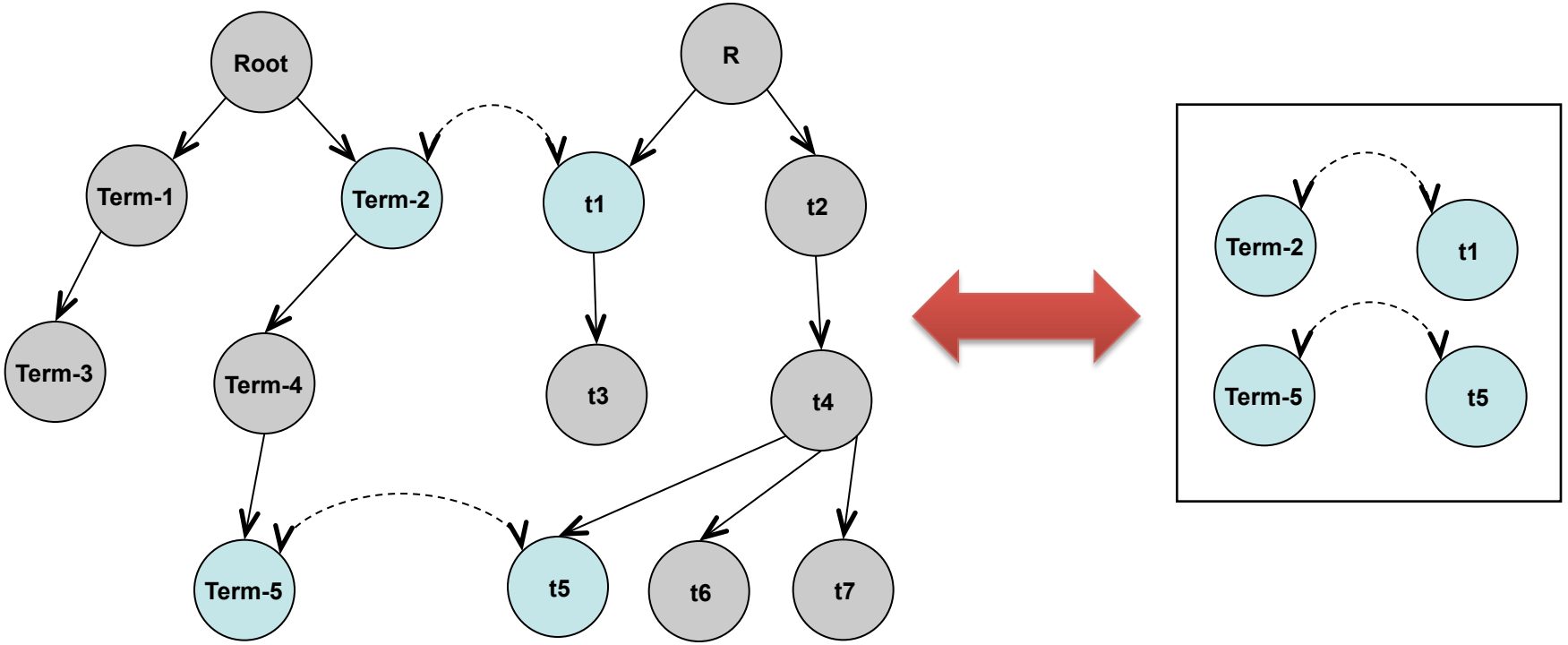
- View Extraction Web service
  - Given a root node term, extracts all child terms http://bit.ly/uXeh2s
- Access directly from Protégé via the BioPortal Import plugin http://protegewiki.stanford.edu/wiki/BioPortal_Import_Plugin



MAPPING WEB SERVICES

Using NCBO technology to integrate terminologies and ontologies

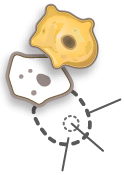
Mappings



Ontology A

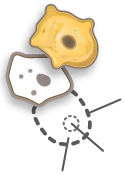
Ontology B

Upload or Download mapping subsets



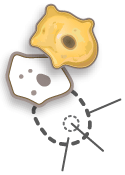
Mappings

- Mappings Web service
  - Documentation: http://www.bioontology.org/wiki/index.php/BioPortal_Mappings_Service
- Functions
  - Get
  - Create/Upload
- Example Perl client to Get mappings: http://bit.ly/tDKPQd



WIDGETS

Using NCBO technology on your web pages

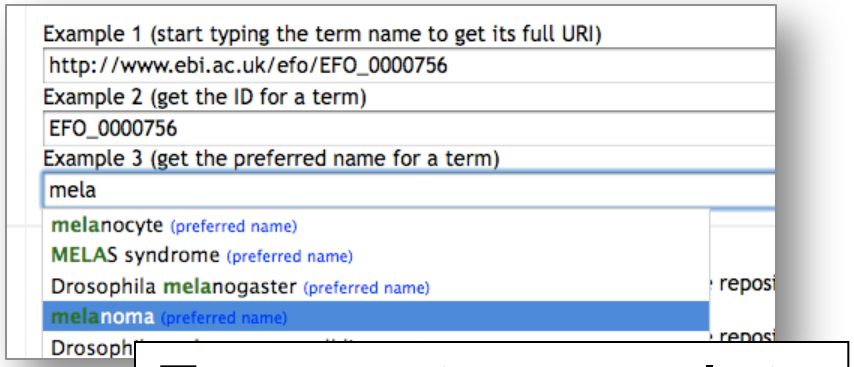


Widgets

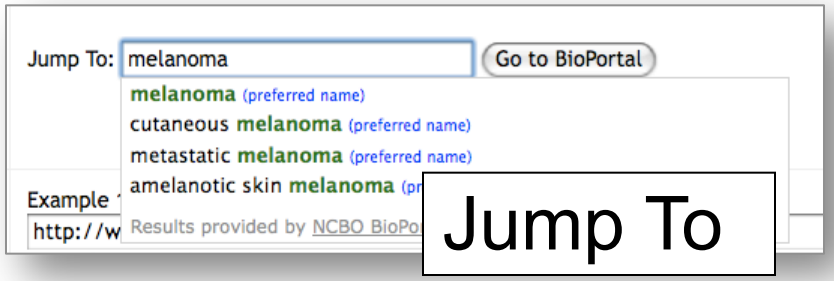
- Form auto-complete – auto-complete function and can return term URI, term ID or term name
- Jump To – auto-complete function to select term and Jump To BioPortal to view term details
- Visualize widget – view the ontology structure and relations
- Tree widget – view the ontology tree

Code for widgets is available on BioPortal

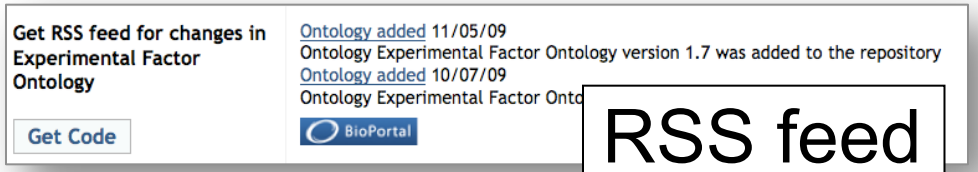
Widgets



Form auto-complete

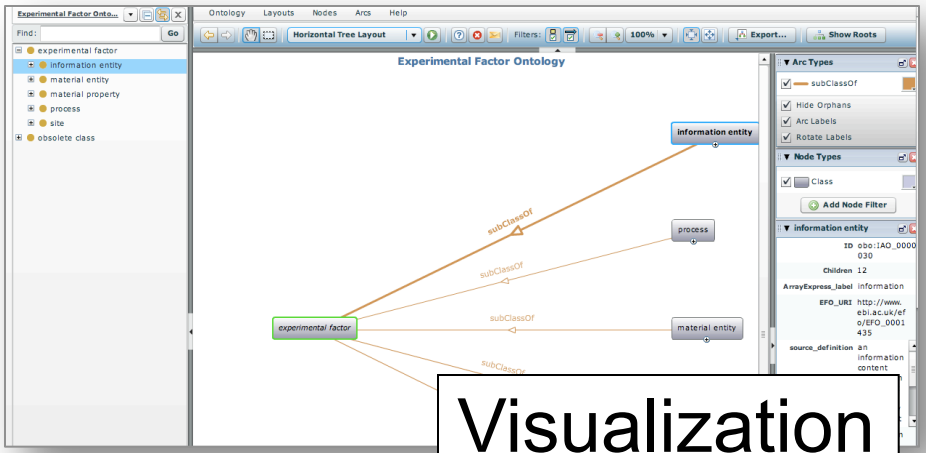


Jump To

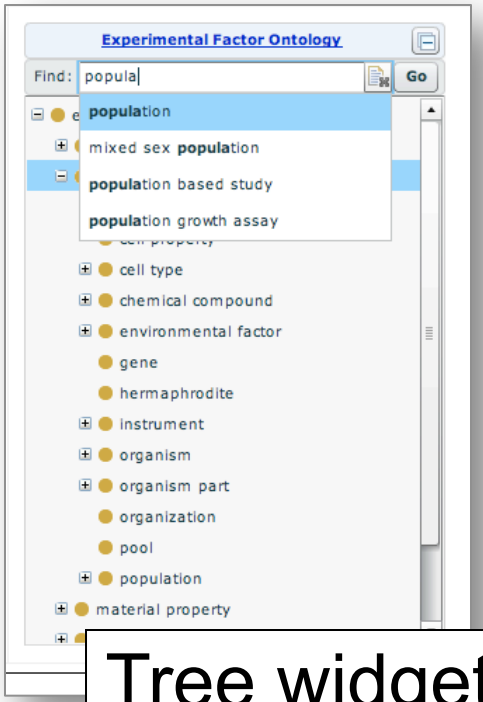


RSS feed

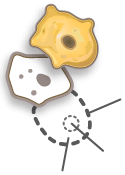
Widgets



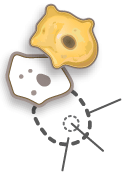
Visualization



Tree widget



Break

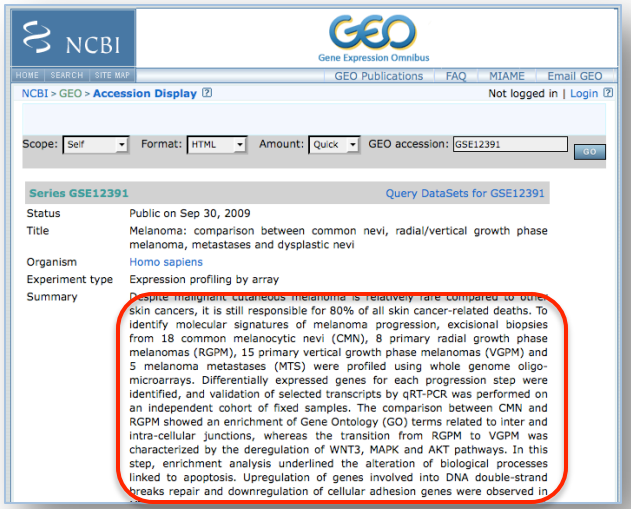


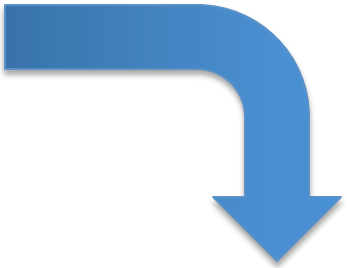
ANNOTATOR WEB SERVICE

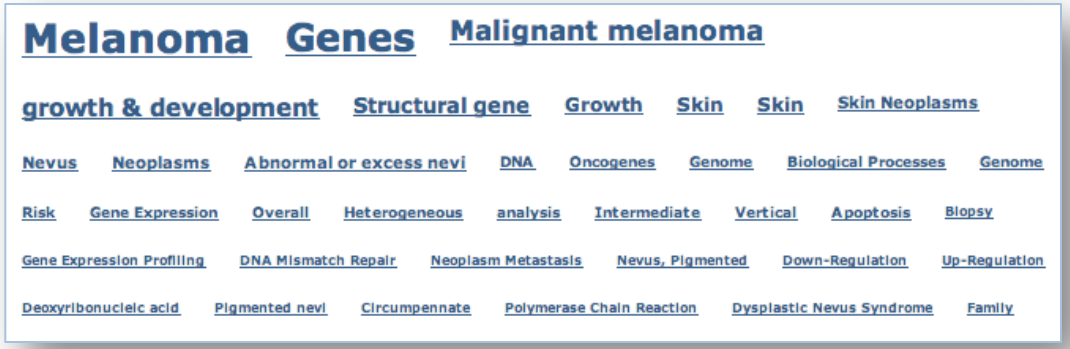
Using Ontologies to Annotate *Your* Data

Annotator: The Basic Idea

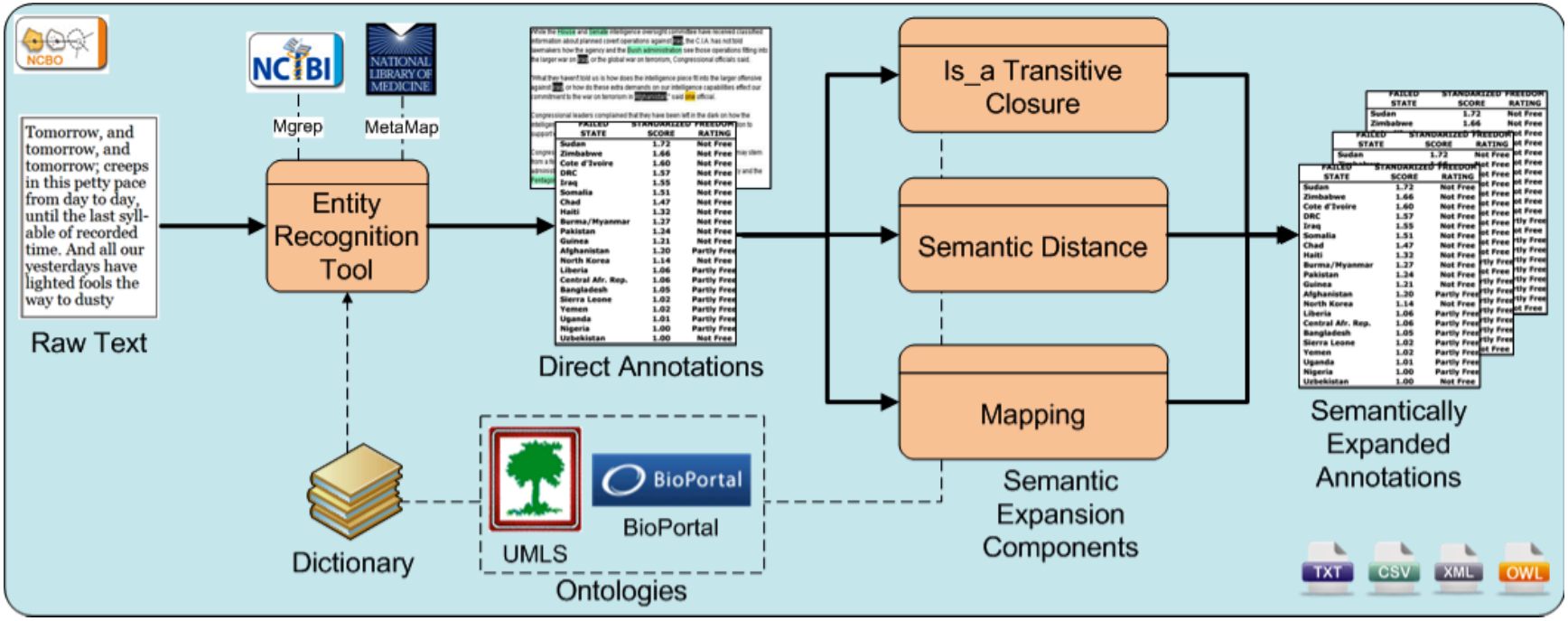
- Tag textual metadata with ontology terms

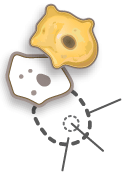






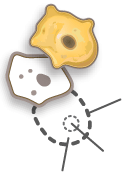
Annotator Workflow





Annotator Web Service

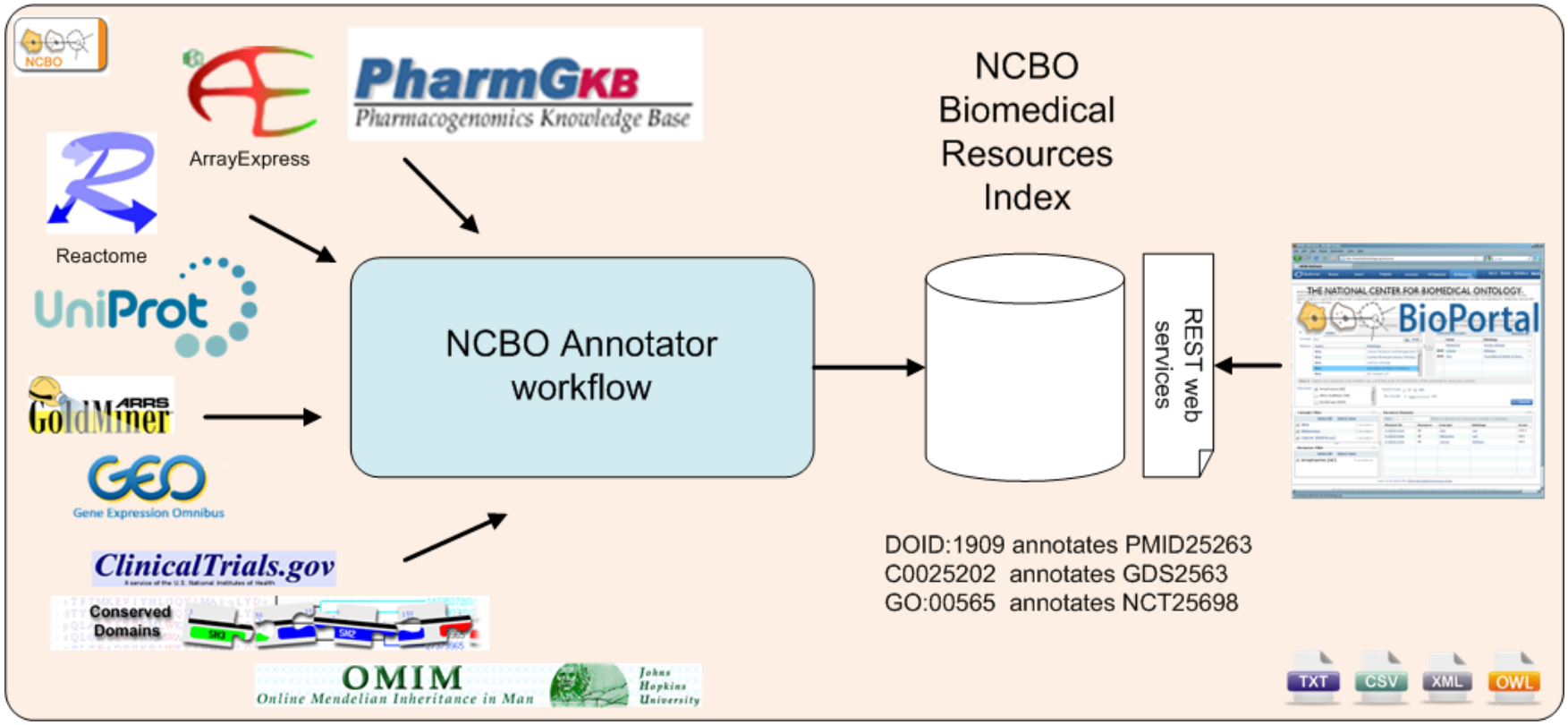
- Tag free text with ontology terms
- Documentation: http://www.bioontology.org/wiki/index.php/Annotator_Web_service
- Example clients:
  - Perl: http://bit.ly/vKYpCP
  - Java: http://bit.ly/rRFoKd



DATA SERVICE

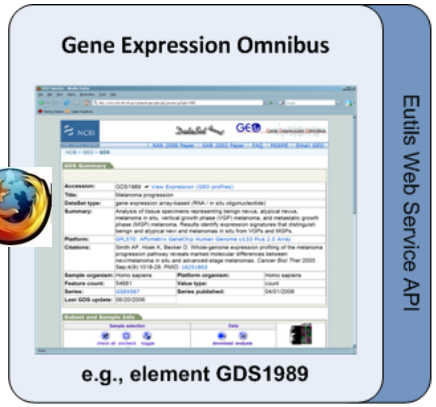
Using Ontologies to Access Public Data

Resource Index: The Basic Idea



- The index can be used for
  - Search
  - Data mining

Resources index: Example



Accessing resource elements

<title>
Melanoma progression
</title>

<description>
Analysis of tissue specimens representing benign nevus, atypical nevus, melanoma in situ, vertical growth phase (VGP) melanoma, and metastatic growth phase (MGP) melanoma. Results identify expression signatures that distinguish benign and atypical nevi and melanomas in situ from VGPs and MGPs.
</description>

Concept recognition

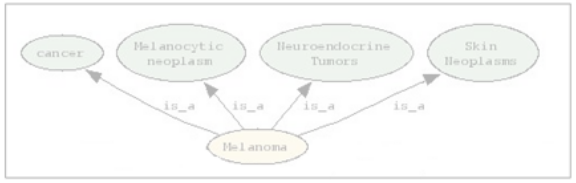
<title>
Melanoma progression
</title>

<description>
Analysis of tissue specimens representing benign nevus, atypical nevus, melanoma in situ, vertical growth phase (VGP) melanoma, and metastatic growth phase (MGP) melanoma. Results identify expression signatures that distinguish benign and atypical nevi and melanomas in situ from VGPs and MGPs.
</description>

23 direct annotations
(4 title, 19 description)

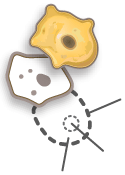
Example:
Melanoma, concept (DOID:1909) in ontology *Human disease*.

Semantic expansion



172 closure annotations

Examples:
Cancer, concept (DOID:162) in ontology *Human disease*
Skin Neoplasms, concept (DOID:3165) in ontology *Human disease*



Data Access

- Resource Index Web service
  - Documentation: http://www.bioontology.org/wiki/index.php/Resource_Index