

# Harnessing the Power of the Community in a Library of Biomedical Ontologies

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# What are we trying to do

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- You've built an ontology, how do you let the world know?
- You need an ontology, where do you go to get it?
- How do you know whether an ontology is any good?
- How do you find resources that are relevant to the domain of the ontology (or to specific terms)?



# BioPortal: A Community-Based Ontology Repository

BioPortal

Browse Search Projects Annotate All Mappings All Resources Alpha

Sign In Register Help/About Send Feedback

human phenotype ontology

Search all ontologies

Search

Advanced Search

Find an ontology

Explore

Browse Ontologies >

Search resources

Search

Advanced Resource Search

Most Active Ontologies

| Ontology  | Version | Notes | Mappings |
|---|---------|-------|----------|
| <a href="#">Human disease</a>                     | 1.36    | 0     | 17732    |
| <a href="#">Mouse adult gross anatomy</a>         | 1.194   | 0     | 3905     |
| <a href="#">NCI Thesaurus</a>                     | 08.12d  | 9     | 3798     |
| <a href="#">Foundational Model of Anatomy</a>     | 3.0     | 0     | 1997     |
| <a href="#">Zebrafish anatomy and development</a> | 1.21    | 0     | 791      |

Statistics

|                   |         |
|-------------------|---------|
| Ontologies        | 143     |
| Concepts          | 723,806 |
| Resources Indexed | 11      |

Latest Notes

[change namespace from IAO to OBI material entity \(Ontology for Biomedical Investigations\)](#) 06/10/09 whetzel

[RE:Add mapping to Unit ontology? unit \(Experimental Factor Ontology\)](#) 06/01/09 jamesmalone

[Add mapping to Unit ontology? unit \(Experimental Factor Ontology\)](#) 04/12/09 whetzel

[Release notes for version 2009-04-02 entity \(NanoParticle Ontology\)](#) 04/02/09 sobolevnm

[Missing preferred term field OBI 0000577 \(Ontology for Biomedical Investigations\)](#) 04/01/09 whetzel

Latest Mappings

[cellular component \(Biological process\) => Cell component \(Foundational Model of Anatomy\)](#) 04/27/09 matthiassamwald

[Cell component \(Foundational Model of Anatomy\) => cellular component \(Biological process\)](#) 04/27/09 matthiassamwald

[Cell \(Foundational Model of Anatomy\) => Cell \(NCI Thesaurus\)](#) 04/16/09 lechatpito

[Cell \(NCI Thesaurus\) => Cell \(Foundational Model of Anatomy\)](#) 04/16/09 lechatpito

[tbio:Cell \(Basic Vertebrate Anatomy\) => Cell \(NCI Thesaurus\)](#) 04/16/09 lechatpito

<http://bioportal.bioontology.org>

# BioPortal Today

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- ~170 ontologies and terminologies in OWL, RDFS, OBO format, RRF
- Well over 1,000,000 concepts
- ~1,000,000 mappings



# Community Features in BioPortal

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- Publication of ontologies
- Notes and discussions
- Ontology evaluation
- Mappings between concepts
- Ontology views

# Publishing Ontologies

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- Any ontology in biomedical domain can be **published** in BioPortal.
- When publishing the ontology, the authors provide the **metadata** describing salient features of their ontology.
- With publication, ontology authors get:
  - on-line browsing and search for their ontology
  - REST service access
  - version maintenance
  - RSS feeds for new comments, mappings, new versions



# Notes and Discussion

- Users create notes to
  - **discuss** class definitions
  - suggest **changes** and corrections
  - request **new** items
  - provide **additional information** about a class (e.g., references, images, supporting documentation)

The screenshot displays the Biomedical Resource Ontology (BRO) Version 2.7 interface. On the left, a tree view shows the ontology structure, including classes like `activity:Activity`, `area:Area_of_Research`, `BRO:Deprecated_Resource`, `BRO:Resource` (with subclasses `BRO:Funding_Resource`, `BRO:Information_Resource`, `BRO:Material_Resource`, `BRO:People_Resource`, `BRO:Service_Resource`), `BRO:Software` (with subclass `BRO:Training_Resource`), `descBiositemaps_Information_Model`, `area:Deprecated_Area_of_Research`, and `activity:Deprecated_Activity`. The `BRO:Software` class is highlighted. On the right, the 'Notes' tab is active, showing a discussion thread. The thread includes a comment by David States at 08/09/08 06:56 discussing the structure of software classes, and a reply by Peter Lyster at 08/12/08 08:29 discussing design principles. The comment text reads: "Comment: Software needs structure, too many top level subclasses" and "binary executable" is not a top level subclass of software, it is a form of software distribution and there are several other subclasses of software distribution (source code, web site, library, toolkit, etc.). Similarly, "network editor" is just one class of interactive editing tools. Lots of others. These are just a couple of examples. Software really needs a complete reorganization. Reply. Comment: RE:Software needs structure, too many top level subclasses PeterLyster at 08/12/08 08:29 The BRO used the initial design principle of: when in doubt make it flat at the top. This is a design principle whose purpose is to get the class names 'on the board and agreed upon' first, i.e., it is a componentization of the design process. This is a way of avoiding getting into debates about hierarchical location too early in the process. We can discuss location in the hierarchy in the future; that is appropriate. Reply. Comment: RE:Software needs structure, too many top level subclasses PeterLyster at 08/12/08 08:43 I (Peter Lyster) copy marginal notes that I also place in the 'Portals' class. I think this helps to explain the design principles. We adopted the design principle of (i) initially align the BRO top level with NIFSTD (Data Resource; Bibliographic

# Community-Based Evaluation

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*Which ontology from the library  
is appropriate for my task?*



# Community-Based Evaluation

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*Which ontology from the library  
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- The people who know the answer to these question are
  - (maybe) ontology authors
  - other users of the ontology

# Community-Based Evaluation

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*Which ontology from the library is appropriate for my task?*

- The people who know the answer to these question are
  - (maybe) ontology authors
  - other users of the ontology
- Our solution: Allow users to provide ratings for ontologies



# Reviewers Provide

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- General review and rating
- **Usage** information
  - Which applications have successfully used the ontology?
  - What problems were encountered?
- **Coverage**
  - Does it cover the domain properly?
  - Are there major gaps?
  - Are some parts developed better than others?

# Projects in BioPortal

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- Users can describe their **ontology-based projects** in BioPortal
- Projects are linked to ontologies they are using
- Ontology reviews can be done in the context of projects



# Ontology Mappings

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- BioPortal ontologies overlap in content
  - The same is true for almost any ontology library
- A **mapping** between two terms in different ontologies indicates a relationship between them
  - Usually a **similarity** relationship
  - For example, nostril in NCI Thesaurus is similar to naris in Mouse Anatomy Ontology

# Mappings in BioPortal

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- Mappings in BioPortal are **concept-to-concept** mappings
- Mappings are created by users or uploaded in bulk
- Bulk uploads are usually the results of automatic or semi-automatic mapping
- There is detailed **metadata** for provenance of mappings
- Users can comment on and discuss the mappings
- ~1,000,000 mappings in BioPortal now

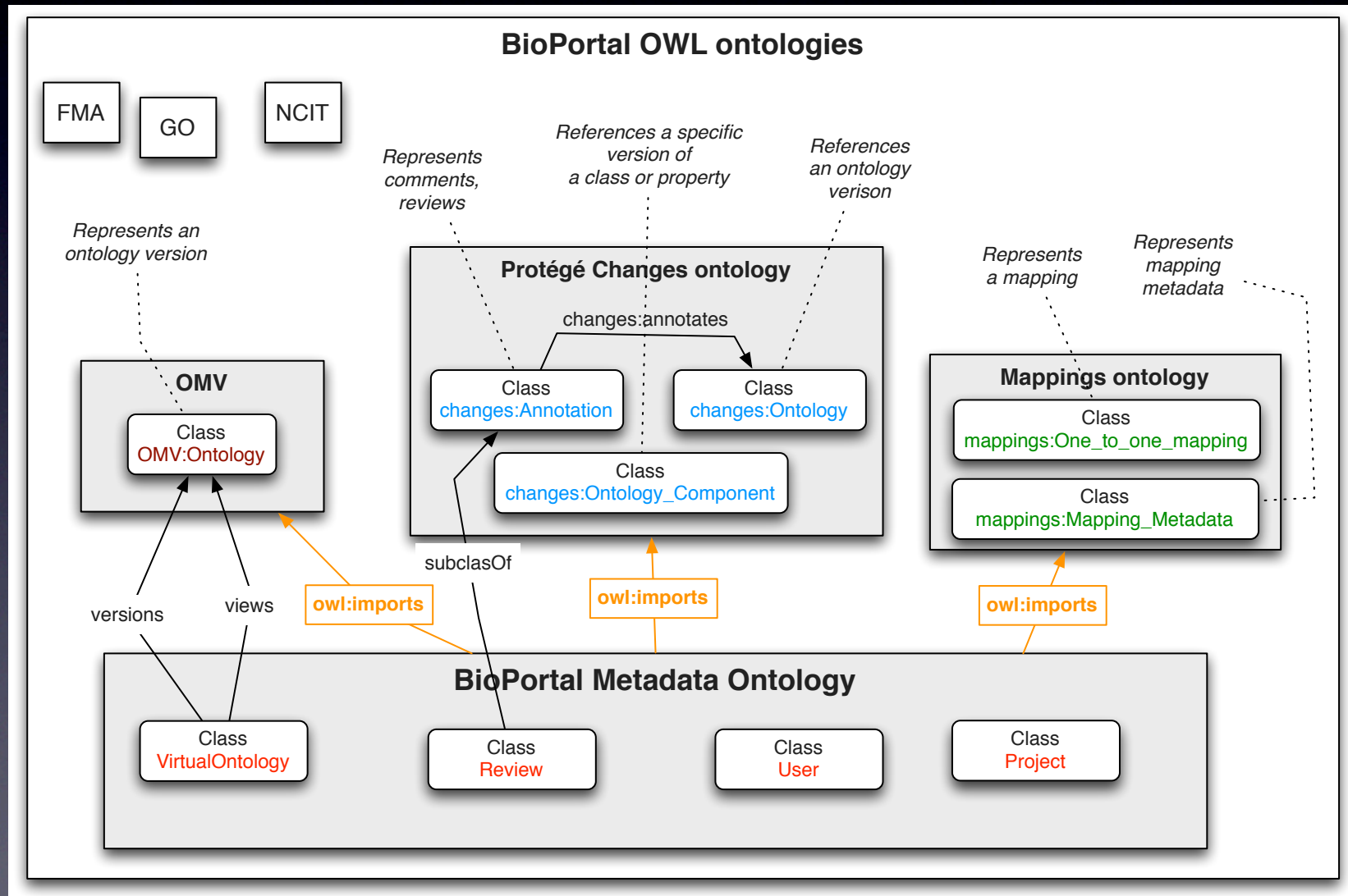


# Views, Subsets, and Value Sets

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- Users can contribute their derivatives of BioPortal ontologies
  - which become first-class objects in BioPortal and can be used as all other ontologies are.
- A view can be
  - A manually extracted module
  - A module generated by a query
  - A translation of an ontology into another language (e.g., Amino-acid ontology in Chinese)
  - A transformation of an ontology into another ontology language (e.g., SKOS version of an OBO ontology)

# Implementation: BioPortal Metadata Ontology





# Annotator

Use ontologies to annotate *your* data

- Give your text as input
- Select your parameters
- Get your results...
  - in text, XML or OWL

The screenshot displays the 'Open Biomedical Annotator' web interface. At the top, the 'Ontologies' field is set to 'SNOMEDCT' with a 'Choose...' button. Below it, the 'Semantic Types' field contains a list of codes: '7,T033,T200,T026,T029,T023,T038,T017,T047,T048,T191,T019,T121,T195,T020,T050', also with a 'Choose...' button. The 'Options' section has two radio buttons: 'Annotate Text' (selected) and 'Get Annotations By Resource Element' (labeled 'Alpha'). A 'Change...' button is next to the 'Options' label. The 'Text' input field contains the sentence: 'Melanoma is a disease of the melanocytes affecting the bowel and the eye'. An 'Annotate' button is at the bottom right of this section.

Below the input section, the 'Ontologies' panel (labeled '(1)') shows a filter set to 'UMLS and BioPortal Ontologies'. It has 'Select All' and 'Select None' buttons. A single ontology is listed and checked: 'SNOMED Clinical Terms, 2008\_07\_31'.

The 'Annotation Tag Cloud' panel (labeled '(5)') shows 'Annotation statistics':

- Expanded annotations generated from the is\_a transitive closure (ISA\_CLOSURE): 0
- Expanded annotations generated from mappings (MAPPING): 0
- Direct annotations generated from concept recognition on the given text (MGREP): 5

Below the statistics, the annotated text is displayed: 'Melanoma Eye Disease'. The words 'Melanoma', 'Eye', and 'Disease' are highlighted in blue. There are links for 'Entire eye' and 'Intestines' to the right of the text.

At the bottom of the interface, there is a footer with links: 'Learn more about the [NCBO Annotator web service](#) | Learn more about the [NCBO Biomedical Resources index](#)'.

# Discussion and Challenges

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- “If we build it, will they come”?
- We must maintain community contributions as ontologies **evolve**
  - When is the contribution no longer relevant?
  - Who can delete notes, mappings, etc.
  - How do we prevent abuse?
- If we are successful, **trust** will become a major issue
  - Web of Trust
  - Privacy



# Discussion and Challenges (cont'd)

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- Too much of a good thing?
  - Users want their “private areas” of BioPortal where they can discuss evolving projects
  - Users want their own installation of BioPortal to keep sensitive data “in-house”
- How do we **evaluate** and measure the success of our work?

# Try it out and contribute!

BioPortal


Browse Search Projects Annotate All Mappings All Resources Alpha Sign In Register

SUBMIT ONTOLOGY [Submit New Ontology](#)

FILTER BY CATEGORY

FILTER BY GROUP  [Link To This Filter](#)

FILTER BY TEXT

 [Subscribe to all ontologies](#)

| ONTOLOGY NAME   | FORMAT     | VERSION         | AUTHOR  | UPLOADED ON | GROUP      | STATUS                  |
|---|------------|-----------------|---|-------------|------------|-------------------------|
| <a href="#">ABA Adult Mouse Brain (ABA)</a>                                       | OWL        | 1.0             | Chinh Dang  | 06/12/2009  |            | <a href="#">Explore</a> |
| <a href="#">African Traditional Medicine (ATMO)</a>                               | OBO Format | 1.0.1           | Ghislain Atemezing  | 04/23/2009  |            | <a href="#">Explore</a> |
| <a href="#">Amino Acid (amino-acid)</a>   | OWL        | 1.2             | Nick Drummond, Georgina Moulton, Robert Stevens, Phil Lord                          | 04/25/2009  |            | <a href="#">Explore</a> |
| <a href="#">Amino Acid with Simplified Chinese annotations (Amino Acid-zh_CN)</a> | OWL        | v1.2 zh1.1      | Nick Drummond, Georgina Moulton, Robert Stevens, Phil Lord. Annotated by: Lin Zhang | 04/27/2009  |            | <a href="#">Explore</a> |
| <a href="#">Amphibian gross anatomy (AAO)</a>                                     | OBO Format | 1.8             | AmphiAnat list  | 07/30/2008  | OBOFoundry | <a href="#">Explore</a> |
| <a href="#">Animal natural history and life history (ADW)</a>                     | PROTEGE    | See Remote Site | <a href="http://animaldiversity">Http://animaldiversity</a> Administrators          | 04/27/2009  |            |                         |
| <a href="#">Ascomycete phenotype ontology (APO)</a>                               | OBO Format | 1.2             | Fungal_anatomy Administrators   | 05/02/2009  |            | <a href="#">Explore</a> |
| <a href="#">Basic Vertebrate Anatomy (basic-vertebrate-gross-anatomy)</a>         | OWL        | 1.1             |   | 01/16/2007  |            | <a href="#">Explore</a> |
| <a href="#">Bilateria anatomy (BILA)</a>  | OBO Format | See Remote Site | Thorsten Heinrich   | 04/13/2009  |            |                         |

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