A Gentle Introduction to Ontologies for Biology

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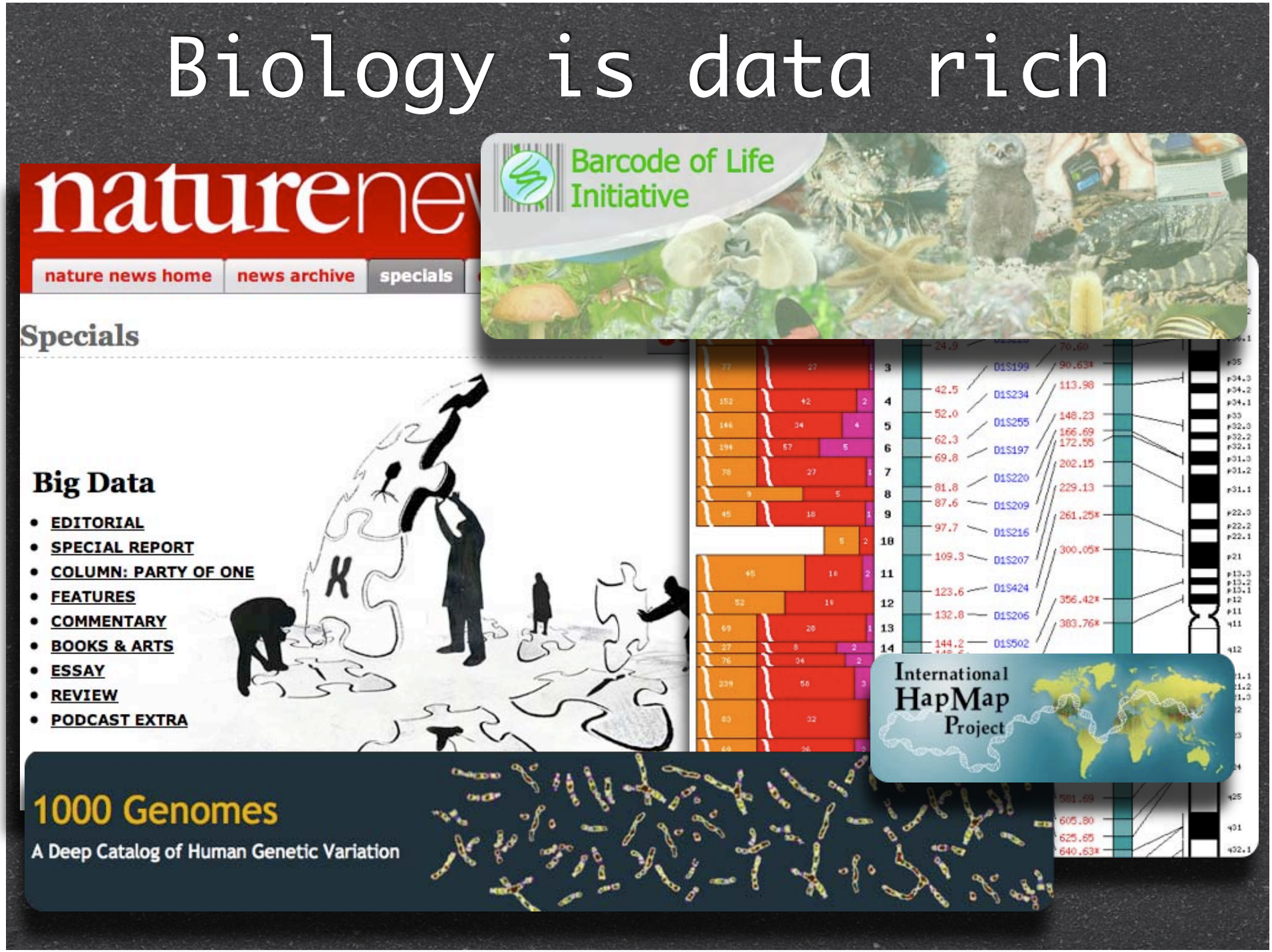
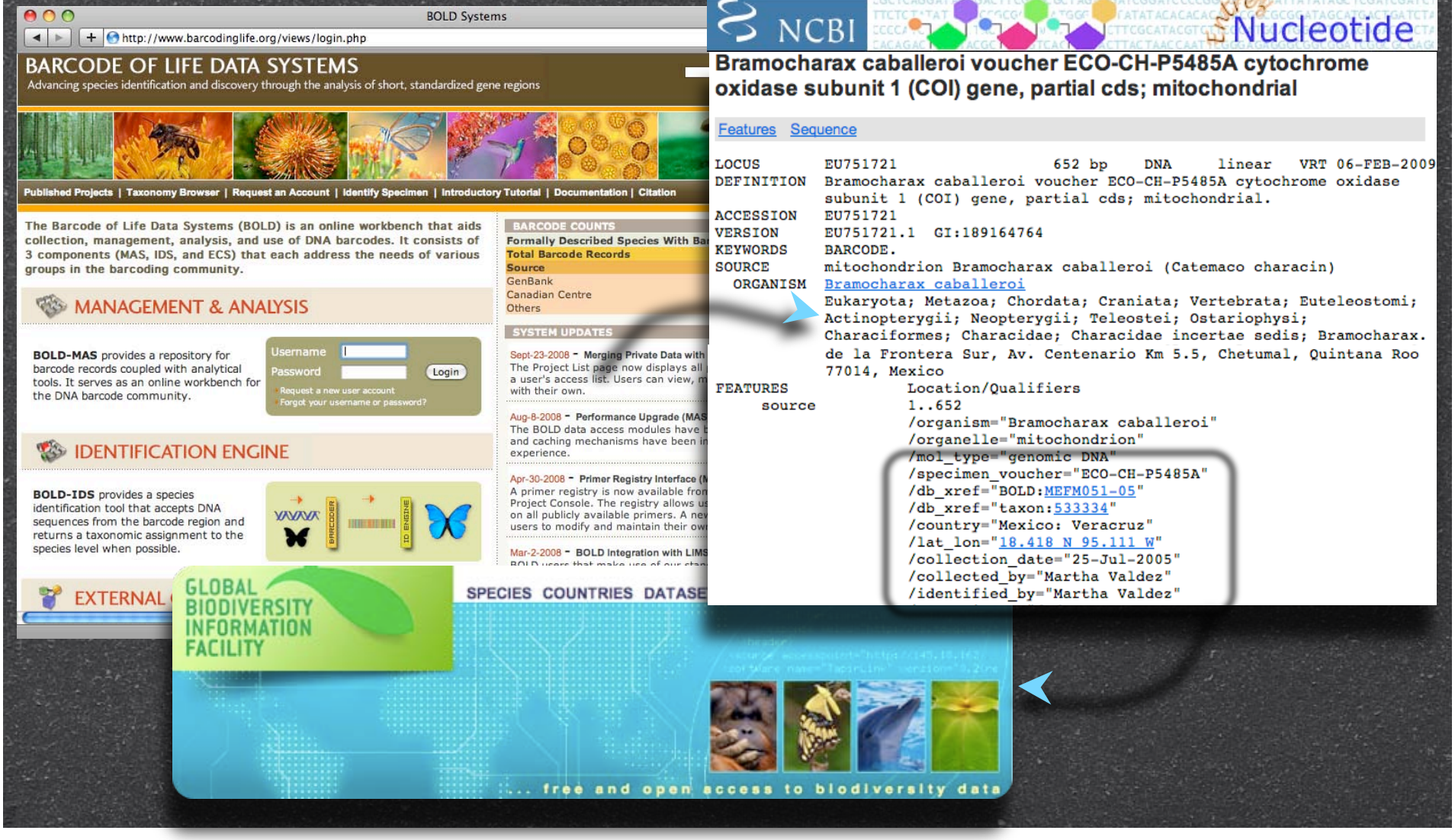
National Evolutionary Synthesis Center (NESCent)

Ontologies for Ichthyology and Herpetology Workshop
ASIH 2009, Portland, Oregon

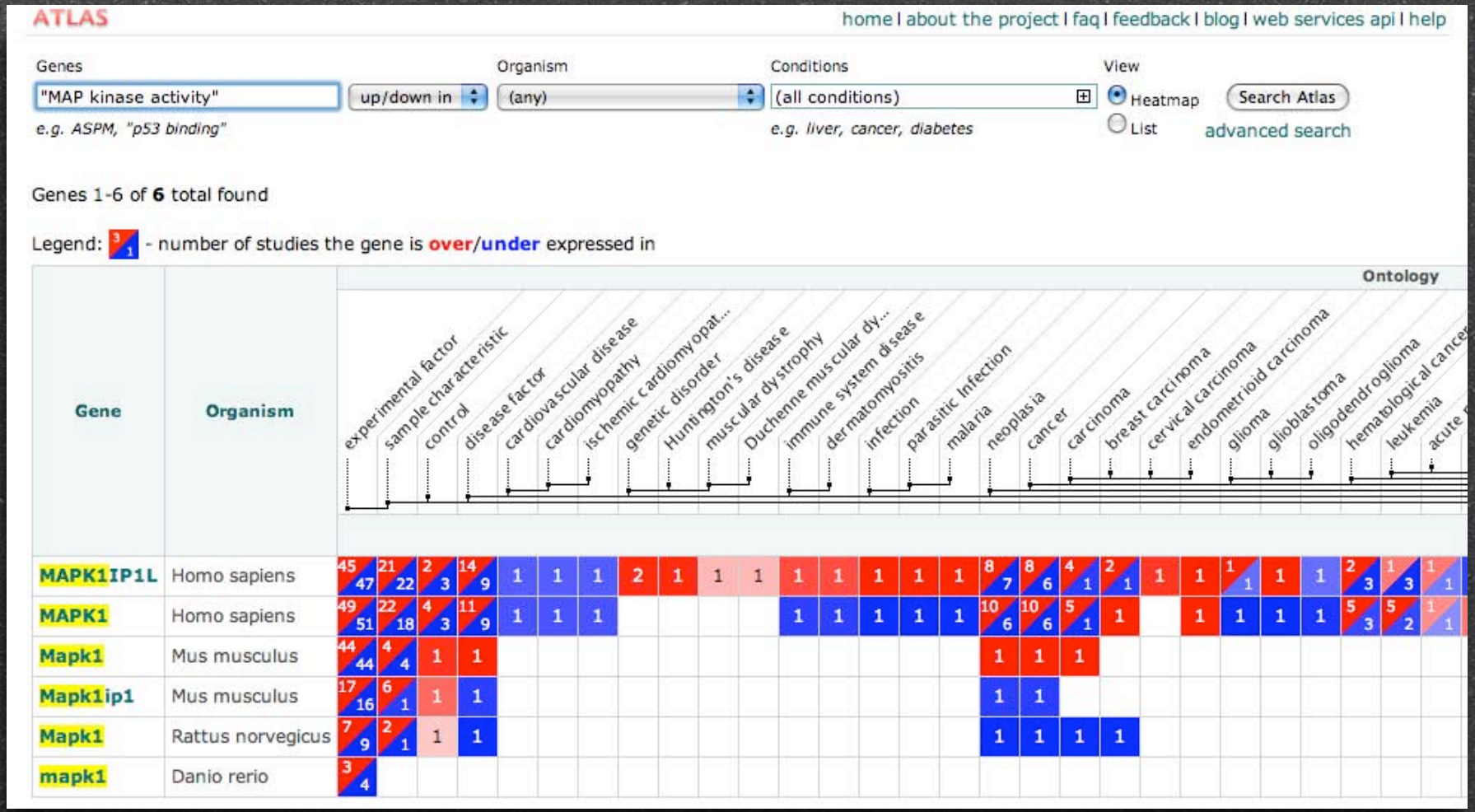
Biology is data rich



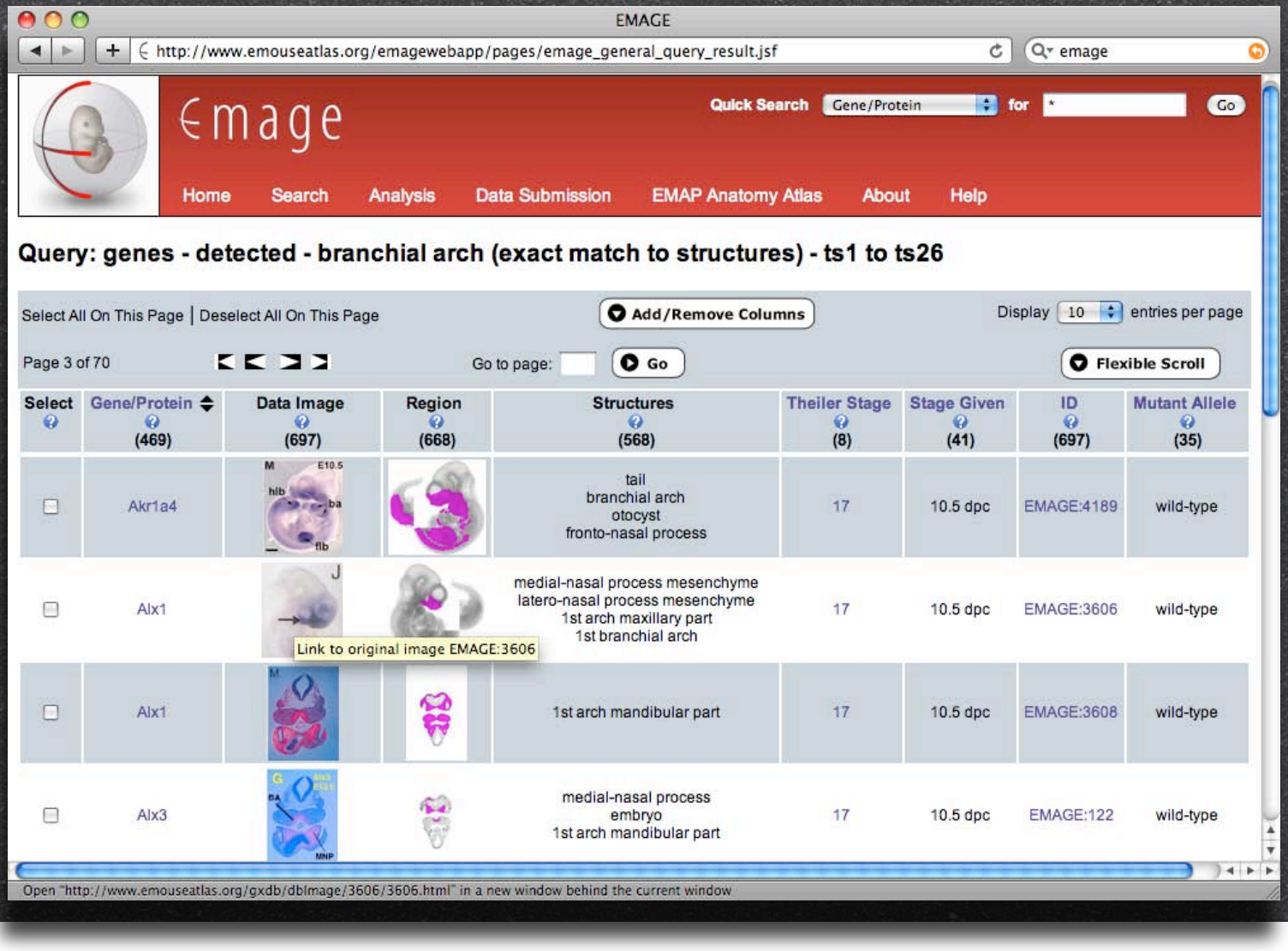
Data integration has to rely on computation



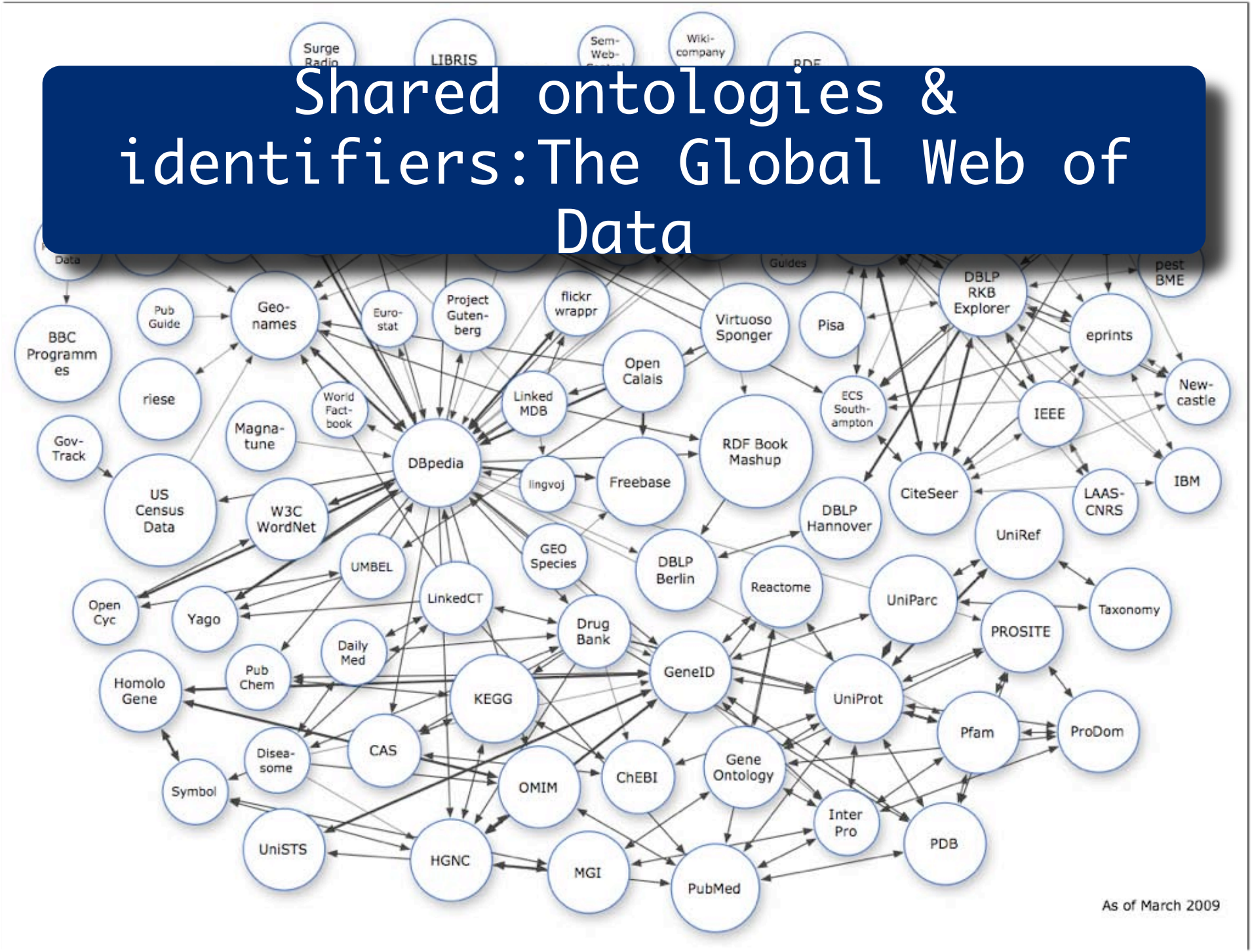
Ontologies facilitate data integration



Ontologies facilitate data integration



Shared ontologies & identifiers:The Global Web of Data



But phenotypes are complex, free text

OMIM – SRY-BOX 9; SOX9

http://www.ncbi.nlm.nih.gov/entrez/dispomim.cgi?id=608160

omim

NCBI

MIM *608160
Cloning
Mapping
Gene Function
Molecular Genetics
Cytogenetics
Evolution
Animal Model
Allelic Variants
View List
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Edit History

GENE FUNCTION

Morais da Silva et al. (1996) found that, consistent with its role in sex determination, SOX9 expression closely follows differentiation of Sertoli cells in the mouse testis, in experimental sex reversal when fetal ovaries are grafted to adult kidneys, and in the chick where there is no evidence for an Sry gene. The results suggested to the authors that SOX9 plays an essential role in sex determination, possibly immediately downstream of SRY in mammals, and that it functions as a critical Sertoli cell differentiation factor, perhaps in all vertebrates.

By cell transfection experiments, Sudbeck et al. (1996) showed that SOX
through the motif AACAAAG, a sequence recognized by other HMG d
SOX9 to the DNA-binding domain of yeast GAL4, the transactivating f
at the C terminus of SOX9. With 1 exception, all SOX9 nonsense and fr
dysplasia and sex reversal lead to truncation of this domain, suggesting t
skeletal development in these cases results, at least in part, from loss of th

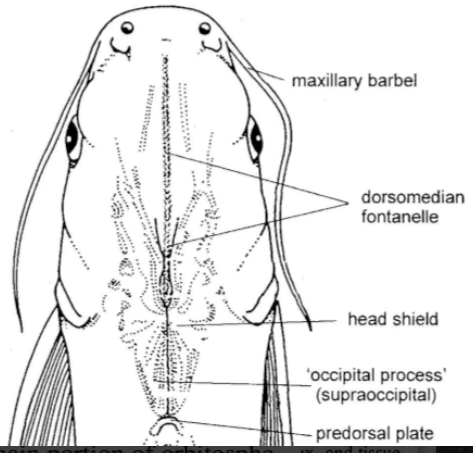
86 AMERICAN MUSEUM NOVITATES

APPENDIX 1. CHARACTER SUMMARY

1. Fifth infraorbital. 0, well developed, without contact between fourth and sixth infraorbitals; 1, greatly reduced, with posteroventral margin of sixth infraorbital in contact with posterodorsal margin of fourth infraorbital.
2. Antorbital-lateral ethmoid contact. 0, no contact; 1, antorbital contacting ventral wing of lateral ethmoid along its entire lateral edge.
3. Antorbital. 0, flat, platelike, without medial process; 1, with a short medial, vertically aligned process at its posterior edge that extends along posterior surface of ventral wing of lateral ethmoid; 2, with enlarged medial, vertically aligned process at its posterior edge that extends along posterior surface of ventral wing of lateral ethmoid.
4. Mesethmoid spine. 0, conical, or with a dif-

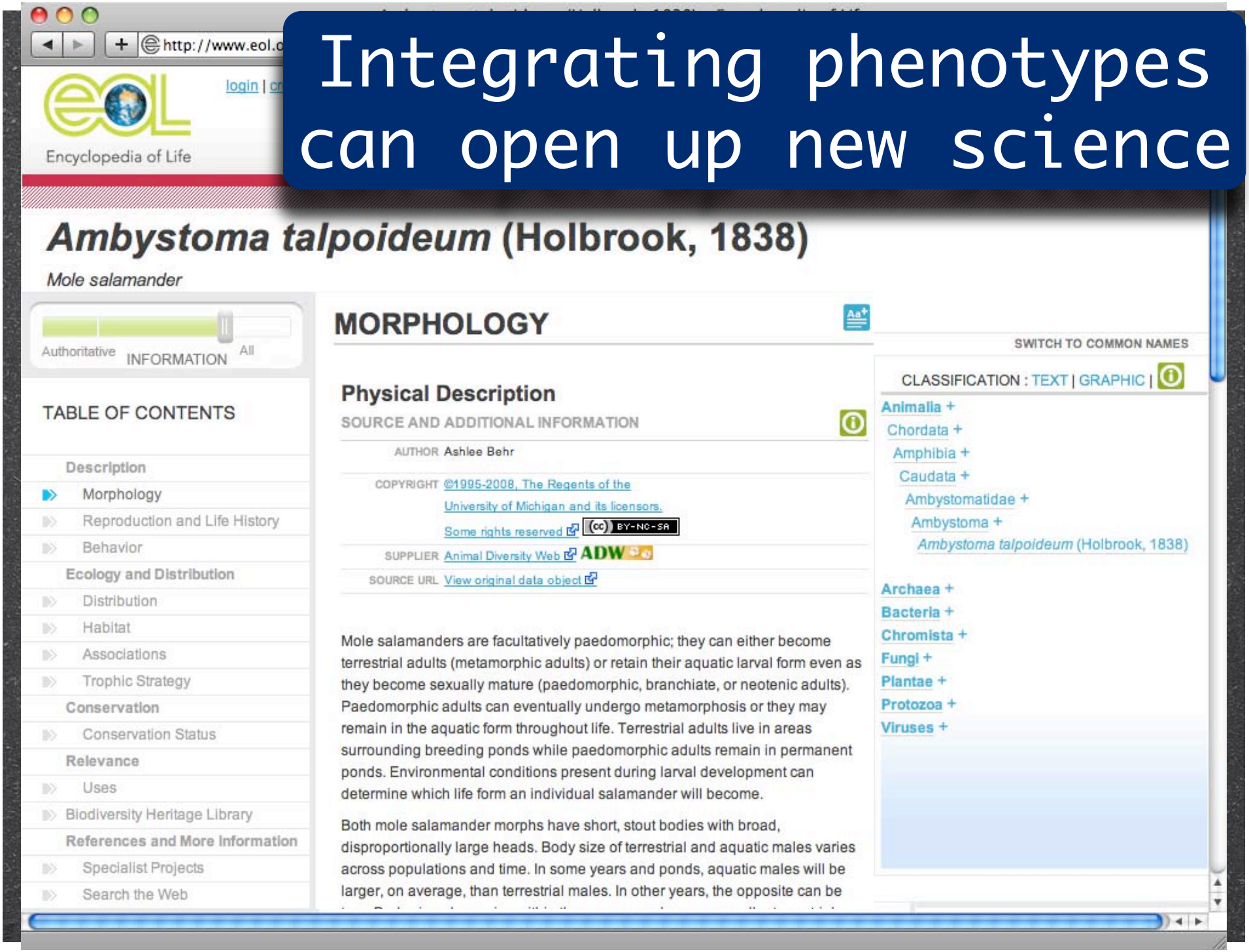
tilaginous surface
body of vomer.
14. Portion on vome
0, not modified i
depression on its
anterior tip of ma
15. Ridge on lateral
1, present.
16. Rhinosphenoid. 0
17. Lateral ethmoid-
absent; 1, presen
18. Parasphenoid and main portion of orbitosphenoid. 0, well separated; 1, close to each other.
19. Dilatator fossa. 0, not extending anteriorly on dorsal surface of frontal or if so, only to dorsoposterior edge of orbit; 1, highly developed, extending anteriorly on dorsal surface of frontal beyond dorsoposterior edge of orbit.

47. *Shape of posterior dorsomedian fontanelle.* An elongate-rectangular posterior fontanelle of most catfishes appears to be the plesiomorphic condition (see also Tilak 1963, 1964, 1965a; Lundberg 1982; Arratia 1987; Grande 1987). An irregularly-shaped or rounded



State 0 = frontal broad anteriorly and moderately narrow posteriorly, anterior space reduced (adults) and arms moderately wide; 1 = frontal moderately broad posteriorly, anterior space moderately enlarged; 2 = frontal broad posteriorly, anterior arms narrow, space enlarged.

49. *Laminar bone over the anterior vertebrae.* The laminar bone is usually continuous medianly in ariids (except in *Galeichthys* and *Ancharius*) and is more extensive in larger individuals, an ontogenetic change evidenced in most taxa. However, the excavation of the laminar bone posteromedially and the overlapping of the transverse process bases laterally is variable. I consider that a minimal cover over the aortic groove is plesiomorphic in ariids and interpret a 'minimal cover' as exposed transverse process bases and a deep median excavation on the ventral surface. The laminar bone in ariids extends over four to eight vertebra centra. Some ariids possess apomorphic modifications in the laminar shelf, such as depressions (e.g., *Guiritinga barbus, Cinetodus froggatti*) or median single keel (e.g., high and acute in *Batrachocephalus, Nemapteryx armiger*) or double keel (e.g., *Bagre marinus*).


Integrating phenotypes can open up new science
http://www.eol.
login
Encyclopedia of Life
Ambystoma talpoideum (Holbrook, 1838)
Mole salamander
Authoritative
INFORMATION
All
TABLE OF CONTENTS
Description
Morphology
Reproduction and Life History
Behavior
Ecology and Distribution
Distribution
Habitat
Associations
Trophic Strategy
Conservation
Conservation Status
Relevance
Uses
Biodiversity Heritage Library
References and More Information
Specialist Projects
Search the Web
MORPHOLOGY
Physical Description
SOURCE AND ADDITIONAL INFORMATION
AUTHOR Ashlee Behr
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Some rights reserved (cc) BY-NC-SA
SUPPLIER Animal Diversity Web ADW
SOURCE URL View original data object
Mole salamanders are facultatively paedomorphic; they can either become terrestrial adults (metamorphic adults) or retain their aquatic larval form even as they become sexually mature (paedomorphic, branchiate, or neotenic adults). Paedomorphic adults can eventually undergo metamorphosis or they may remain in the aquatic form throughout life. Terrestrial adults live in areas surrounding breeding ponds while paedomorphic adults remain in permanent ponds. Environmental conditions present during larval development can determine which life form an individual salamander will become.
Both mole salamander morphs have short, stout bodies with broad, disproportionally large heads. Body size of terrestrial and aquatic males varies across populations and time. In some years and ponds, aquatic males will be larger, on average, than terrestrial males. In other years, the opposite can be
SWITCH TO COMMON NAMES
CLASSIFICATION : TEXT | GRAPHIC |
Animalia +
Chordata +
Amphibia +
Caudata +
Ambystomatidae +
Ambystoma +
Ambystoma talpoideum (Holbrook, 1838)
Archaea +
Bacteria +
Chromista +
Fungi +
Plantae +
Protozoa +
Viruses +

Words often are polysemous

Mole:

- Burrowing insectivorous mammals in the family Talpidae
- A spy buried secretly within an organization or country
- The SI unit used in chemistry for the amount of a substance
- A small, sometimes raised area of skin, usually with darker pigment
- A Mexican sauce made from chili peppers and other spices, including chocolate
- A massive structure, usually of stone, used as a pier, jetty, or breakwater between places separated by water

Words often are polysemous

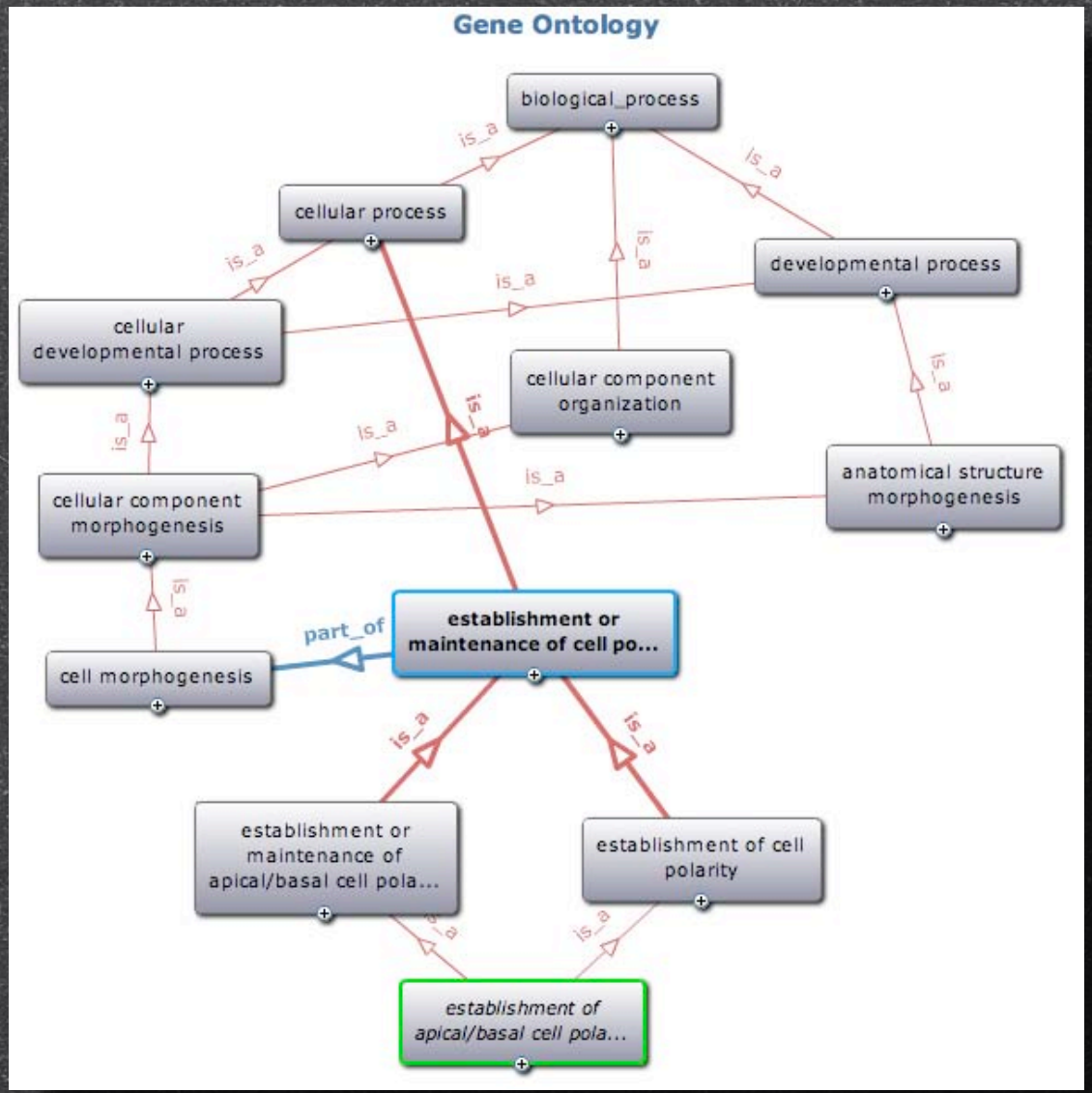
- “Replacement bone that is median and is the anterior-most bone of the ventral hyoid arch”

- basihyal bone
- basihyoid
- glossohyal

What is an ontology?

- An ontology is a type of vocabulary with well-defined terms and the logical relationships that hold between them.
- An ontology represents the knowledge about its subject domain.

Ontologies support reasoning



- The relationships ("assertions") induce a hierarchical structure.
- Ontologies can be processed by machines to make inferences.

What are ontologies not?

- An ontology is not a database.
  - Databases typically are silos, but ontologies can connect siloed data
- An ontology is not a terminology.
  - Terminologies are built ad-hoc to serve specific application needs.
- An ontology is not data.
  - Ontologies are used to annotate data and make data interoperable.

Ontologies can address the problems with text

List of characters

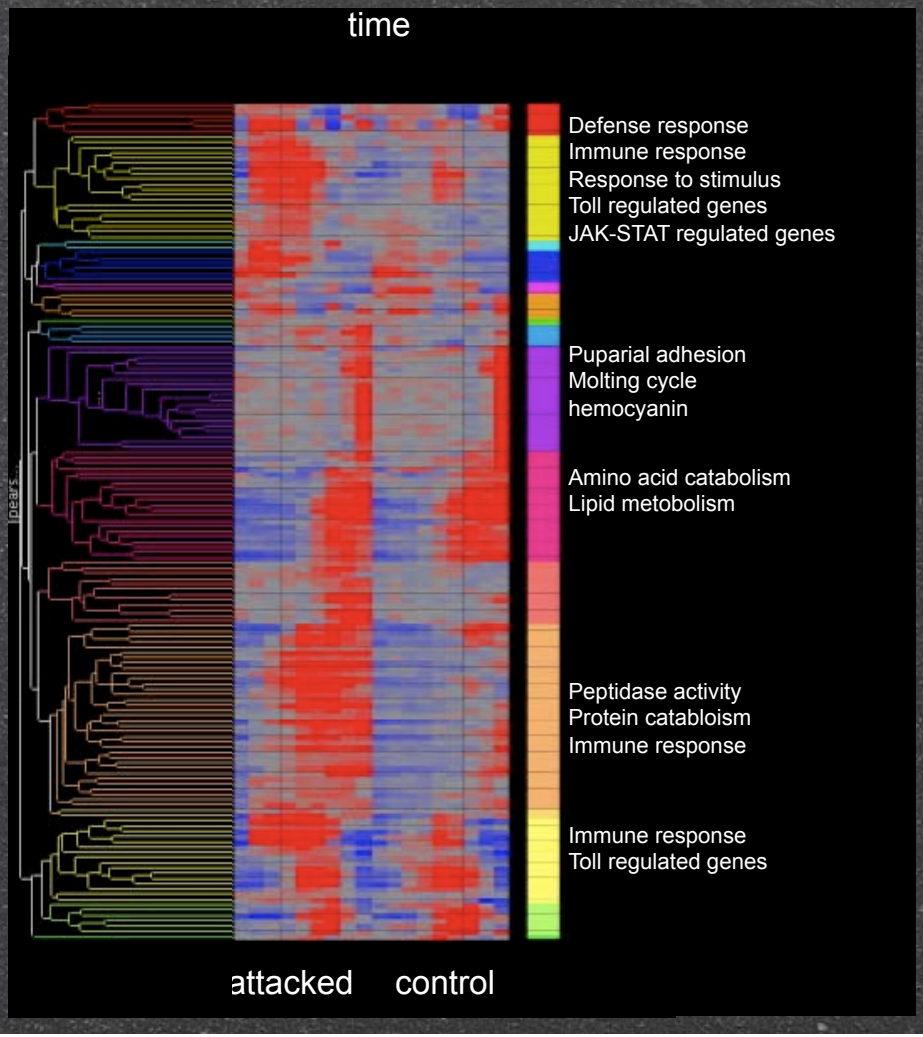
The list of characters, the analysis of certain morphological characters, and the phylogenetic relationships of certain teleosts are based on the features listed below. [0] represents the plesiomorphic character state and [1], [2], [3], and [4] the apomorphic character states. The outgroup used to polarize characters includes †*Watsonulus eugnathoides*, *Amia calva*, *Lepisosteus* spp., and others in different analyses.

With the exceptions indicated, characters 1 to 167 are from ARRATIA (1991, 1996b, 1997) or are new characters. Because of the use of different outgroups, characters 26, 27, 28, 36, 76, 77, 78, 92, 122, 124, 125, 126, 128, 129, 130, 137, 140, and 157 changed their polarization with respect to ARRATIA (1996b, 1997), and in other cases, the presentation of some characters was slightly modified (indicated below). Characters 168 to 175 are from GRANDE & BEMIS (1998); characters 176 to 191 are taken from PINNA (1996); and characters 192 to 196 are from BRITO (1997).

1. Ethmopalatine ossification in the floor of nasal capsule articulating with autopalatine: [0] absent; [1] present. (PATTERSON & ROSEN 1977.)
2. Two paired endoskeletal ethmoidal ossifications: [0] absent; [1] present.
3. Parietal bones fused in a median element: [0] absent; [1] present.

Arratia, 1999. Zoological Journal of the Linnean Society 151:691-757.

Ontologies can address the problems with text



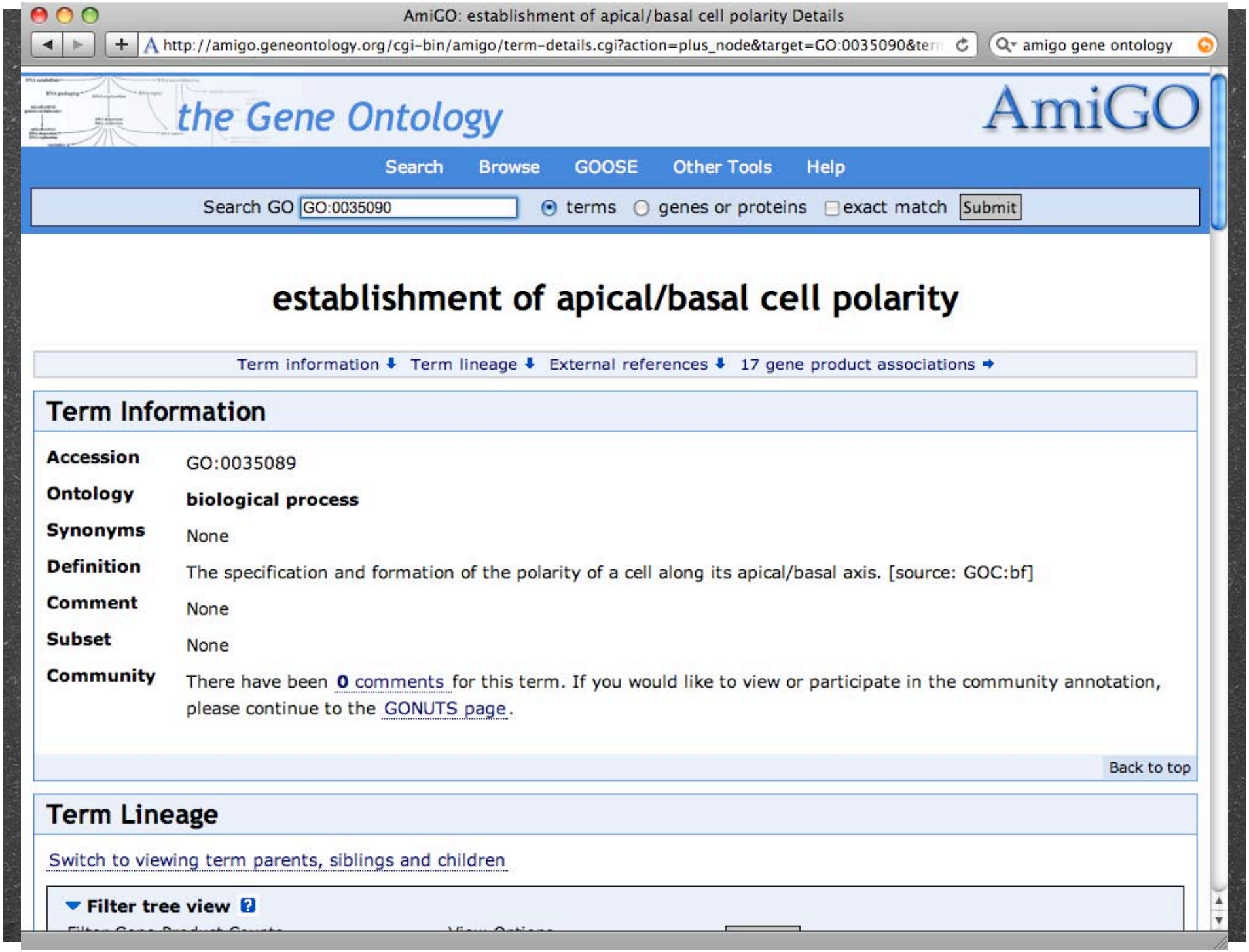
Annotating data with ontologies:
Gene annotation as an example

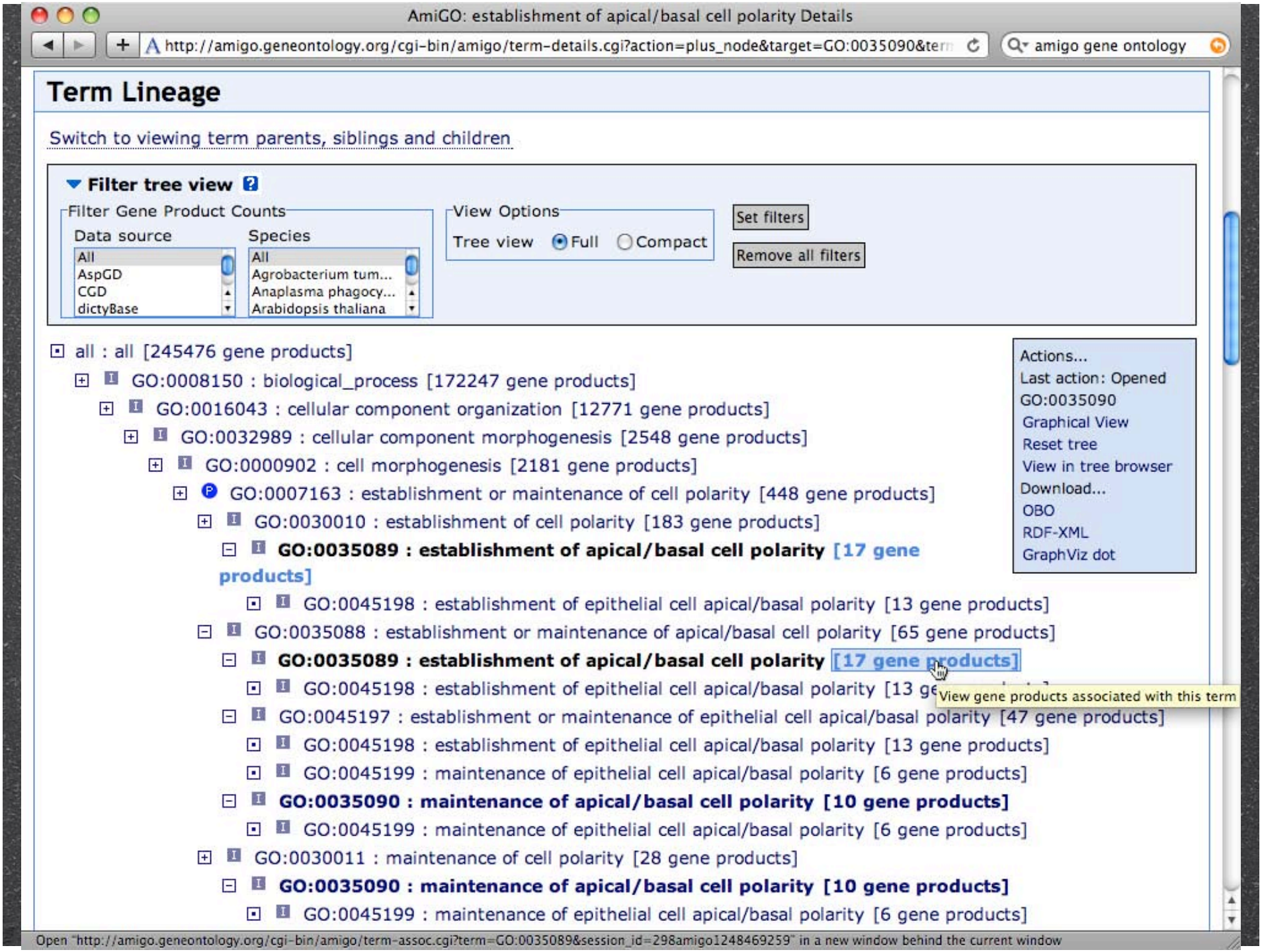
Annotation objectives

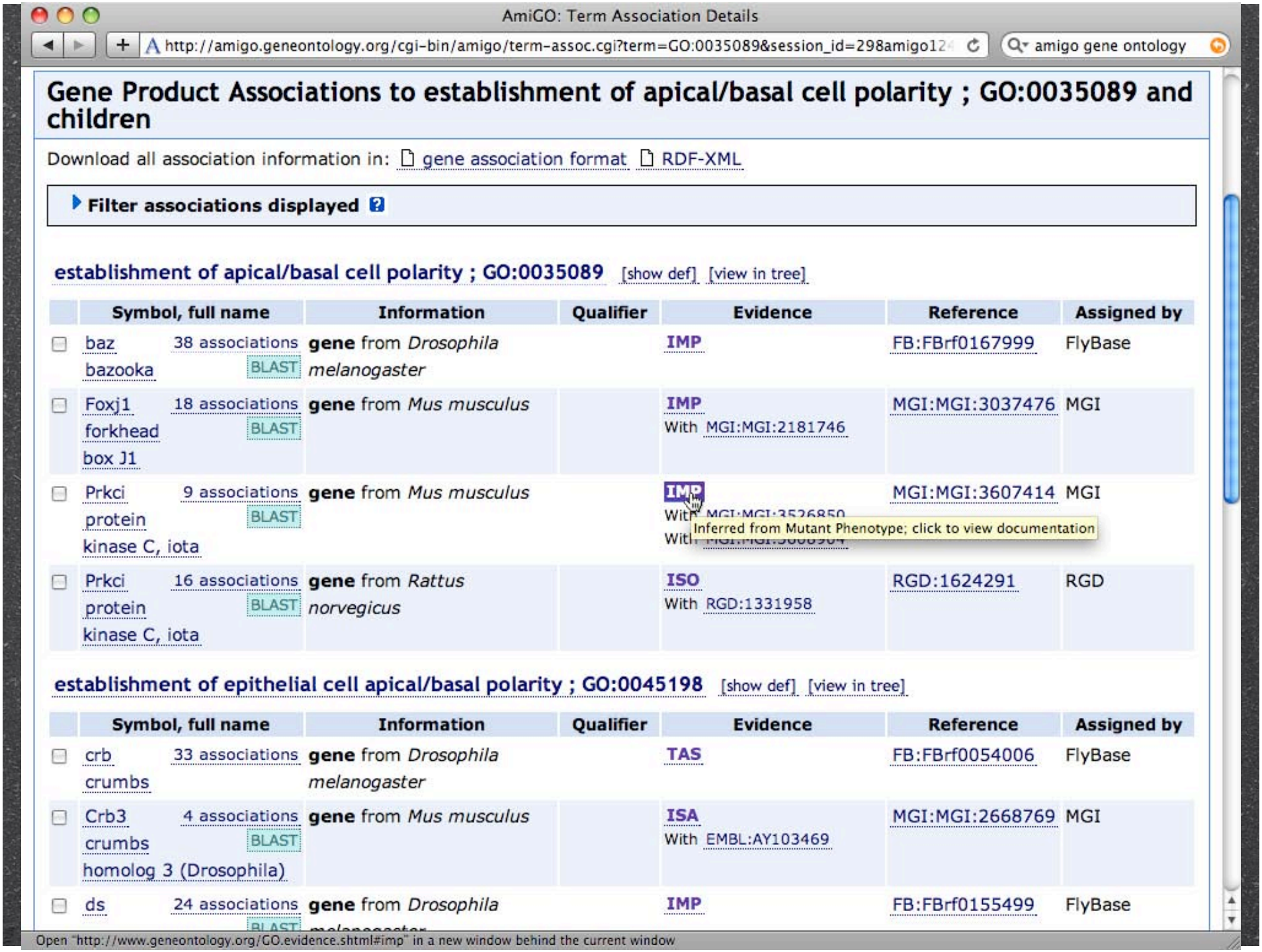
- Where and when is a particular gene product involved (cell part, cell type, body part, development stage)?
- Which functions does the gene product exert?
- With which biological processes is the gene product associated?
- In abnormal or wild-type phenotype?

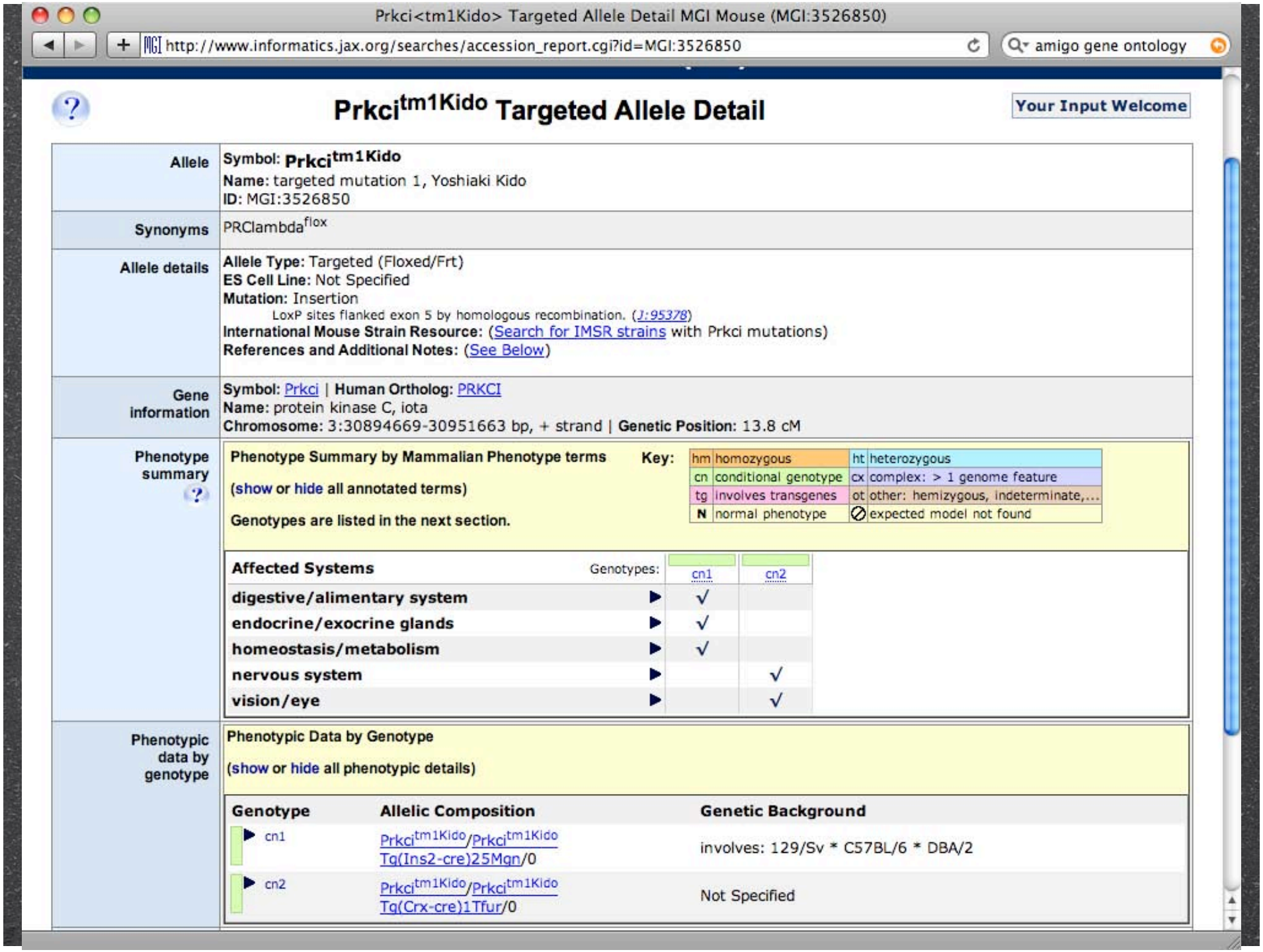
Gene Ontology (GO)

- Covers cellular component, molecular function, biological process
- Multi-species, multi-disciplinary, open-source
- Annotated gene products allow information-theoretic computation
  - E.g., quantitative assessment of commonalities among and across sets of genes

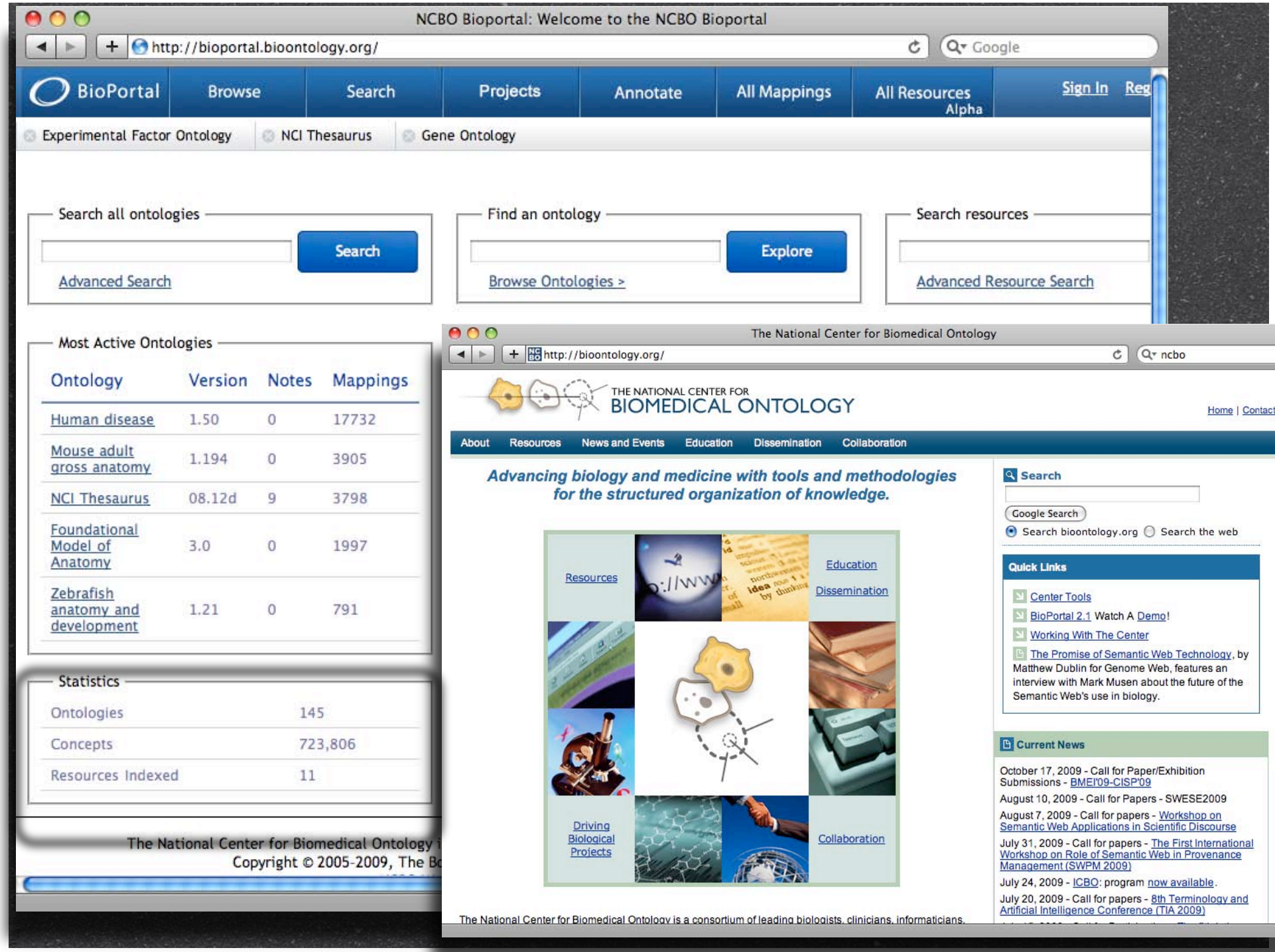

AmiGO: establishment of apical/basal cell polarity Details
http://amigo.geneontology.org/cgi-bin/amigo/term-details.cgi?action=plus_node&target=GO:0035090&ter
amigo gene ontology
the Gene Ontology
AmiGO
Search
Browse
GOOSE
Other Tools
Help
Search GO
GO:0035090
terms
genes or proteins
exact match
Submit
establishment of apical/basal cell polarity
Term information
Term lineage
External references
17 gene product associations
Term Information
Accession
GO:0035089
Ontology
biological process
Synonyms
None
Definition
The specification and formation of the polarity of a cell along its apical/basal axis. [source: GOC:bf]
Comment
None
Subset
None
Community
There have been 0 comments for this term. If you would like to view or participate in the community annotation, please continue to the GONUTS page.
Back to top
Term Lineage
Switch to viewing term parents, siblings and children
Filter tree view


AmiGO: establishment of apical/basal cell polarity Details
http://amigo.geneontology.org/cgi-bin/amigo/term-details.cgi?action=plus_node&target=GO:0035090&ter
amigo gene ontology
Term Lineage
Switch to viewing term parents, siblings and children
Filter tree view
Filter Gene Product Counts
Data source
All
AspGD
CGD
dictyBase
Species
All
Agrobacterium tum...
Anaplasma phagocy...
Arabidopsis thaliana
View Options
Tree view
Full
Compact
Set filters
Remove all filters
all : all [245476 gene products]
GO:0008150 : biological_process [172247 gene products]
GO:0016043 : cellular component organization [12771 gene products]
GO:0032989 : cellular component morphogenesis [2548 gene products]
GO:0000902 : cell morphogenesis [2181 gene products]
GO:0007163 : establishment or maintenance of cell polarity [448 gene products]
GO:0030010 : establishment of cell polarity [183 gene products]
GO:0035089 : establishment of apical/basal cell polarity [17 gene products]
GO:0045198 : establishment of epithelial cell apical/basal polarity [13 gene products]
GO:0035088 : establishment or maintenance of apical/basal cell polarity [65 gene products]
GO:0035089 : establishment of apical/basal cell polarity [17 gene products]
GO:0045198 : establishment of epithelial cell apical/basal polarity [13 ge
View gene products associated with this term
GO:0045197 : establishment or maintenance of epithelial cell apical/basal polarity [47 gene products]
GO:0045198 : establishment of epithelial cell apical/basal polarity [13 gene products]
GO:0045199 : maintenance of epithelial cell apical/basal polarity [6 gene products]
GO:0035090 : maintenance of apical/basal cell polarity [10 gene products]
GO:0045199 : maintenance of epithelial cell apical/basal polarity [6 gene products]
GO:0030011 : maintenance of cell polarity [28 gene products]
GO:0035090 : maintenance of apical/basal cell polarity [10 gene products]
GO:0045199 : maintenance of epithelial cell apical/basal polarity [6 gene products]
Actions...
Last action: Opened GO:0035090
Graphical View
Reset tree
View in tree browser
Download...
OBO
RDF-XML
GraphViz dot
Open "http://amigo.geneontology.org/cgi-bin/amigo/term-assoc.cgi?term=GO:0035089&session_id=298amigo1248469259" in a new window behind the current window


AmiGO: Term Association Details
http://amigo.geneontology.org/cgi-bin/amigo/term-assoc.cgi?term=GO:0035089&session_id=298amigo12
amigo gene ontology
Gene Product Associations to establishment of apical/basal cell polarity ; GO:0035089 and children
Download all association information in: gene association format RDF-XML
Filter associations displayed
establishment of apical/basal cell polarity ; GO:0035089 [show def] [view in tree]
Symbol, full name | Information | Qualifier | Evidence | Reference | Assigned by
baz 38 associations BLAST bazooka | gene from Drosophila melanogaster | IMP | FB:FBrf0167999 | FlyBase
Foxj1 18 associations BLAST forkhead box J1 | gene from Mus musculus | IMP With MGI:MGI:2181746 | MGI:MGI:3037476 | MGI
Prkci 9 associations BLAST protein kinase C, iota | gene from Mus musculus | IMP | MGI:MGI:3607414 | MGI
Inferred from Mutant Phenotype; click to view documentation
Prkci 16 associations BLAST protein kinase C, iota | gene from Rattus norvegicus | ISO With RGD:1331958 | RGD:1624291 | RGD
establishment of epithelial cell apical/basal polarity ; GO:0045198 [show def] [view in tree]
Symbol, full name | Information | Qualifier | Evidence | Reference | Assigned by
crb 33 associations crumbs | gene from Drosophila melanogaster | TAS | FB:FBrf0054006 | FlyBase
Crb3 4 associations BLAST crumbs homolog 3 (Drosophila) | gene from Mus musculus | ISA With EMBL:AY103469 | MGI:MGI:2668769 | MGI
ds 24 associations BLAST | gene from Drosophila | IMP | FB:FBrf0155499 | FlyBase
Open "http://www.geneontology.org/GO.evidence.shtml#imp" in a new window behind the current window


Prkci<tm1Kido> Targeted Allele Detail MGI Mouse (MGI:3526850)
http://www.informatics.jax.org/searches/accession_report.cgi?id=MGI:3526850
amigo gene ontology
Prkci tm1Kido Targeted Allele Detail
Your Input Welcome
Allele
Symbol: Prkci tm1Kido
Name: targeted mutation 1, Yoshiaki Kido
ID: MGI:3526850
Synonyms
PRClambda flox
Allele details
Allele Type: Targeted (Floxed/Frt)
ES Cell Line: Not Specified
Mutation: Insertion
LoxP sites flanked exon 5 by homologous recombination. (J:95378)
International Mouse Strain Resource: (Search for IMSR strains with Prkci mutations)
References and Additional Notes: (See Below)
Gene information
Symbol: Prkci | Human Ortholog: PRKCI
Name: protein kinase C, iota
Chromosome: 3:30894669-30951663 bp, + strand | Genetic Position: 13.8 cM
Phenotype summary
Phenotype Summary by Mammalian Phenotype terms
(show or hide all annotated terms)
Genotypes are listed in the next section.
Key:
hm homozygous
ht heterozygous
cn conditional genotype
cx complex: > 1 genome feature
tg involves transgenes
ot other: hemizygous, indeterminate,...
N normal phenotype
expected model not found
Affected Systems
Genotypes:
cn1
cn2
digestive/alimentary system
endocrine/exocrine glands
homeostasis/metabolism
nervous system
vision/eye
Phenotypic data by genotype
Phenotypic Data by Genotype
(show or hide all phenotypic details)
Genotype
Allelic Composition
Genetic Background
cn1
Prkci tm1Kido/Prkci tm1Kido
Tg(Ins2-cre)25Mgn/0
involves: 129/Sv * C57BL/6 * DBA/2
cn2
Prkci tm1Kido/Prkci tm1Kido
Tg(Crx-cre)1Tfur/0
Not Specified

Ontology community resources & infrastructure: NCBO Bioportal and OBO Foundry


NCBO Bioportal: Welcome to the NCBO Bioportal
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Annotate
All Mappings
All Resources
Alpha
Sign In
Reg
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NCI Thesaurus
Gene Ontology
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Find an ontology
Explore
Browse Ontologies >
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Most Active Ontologies
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Human disease
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0
17732
Mouse adult gross anatomy
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0
3905
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9
3798
Foundational Model of Anatomy
3.0
0
1997
Zebrafish anatomy and development
1.21
0
791
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145
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723,806
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11
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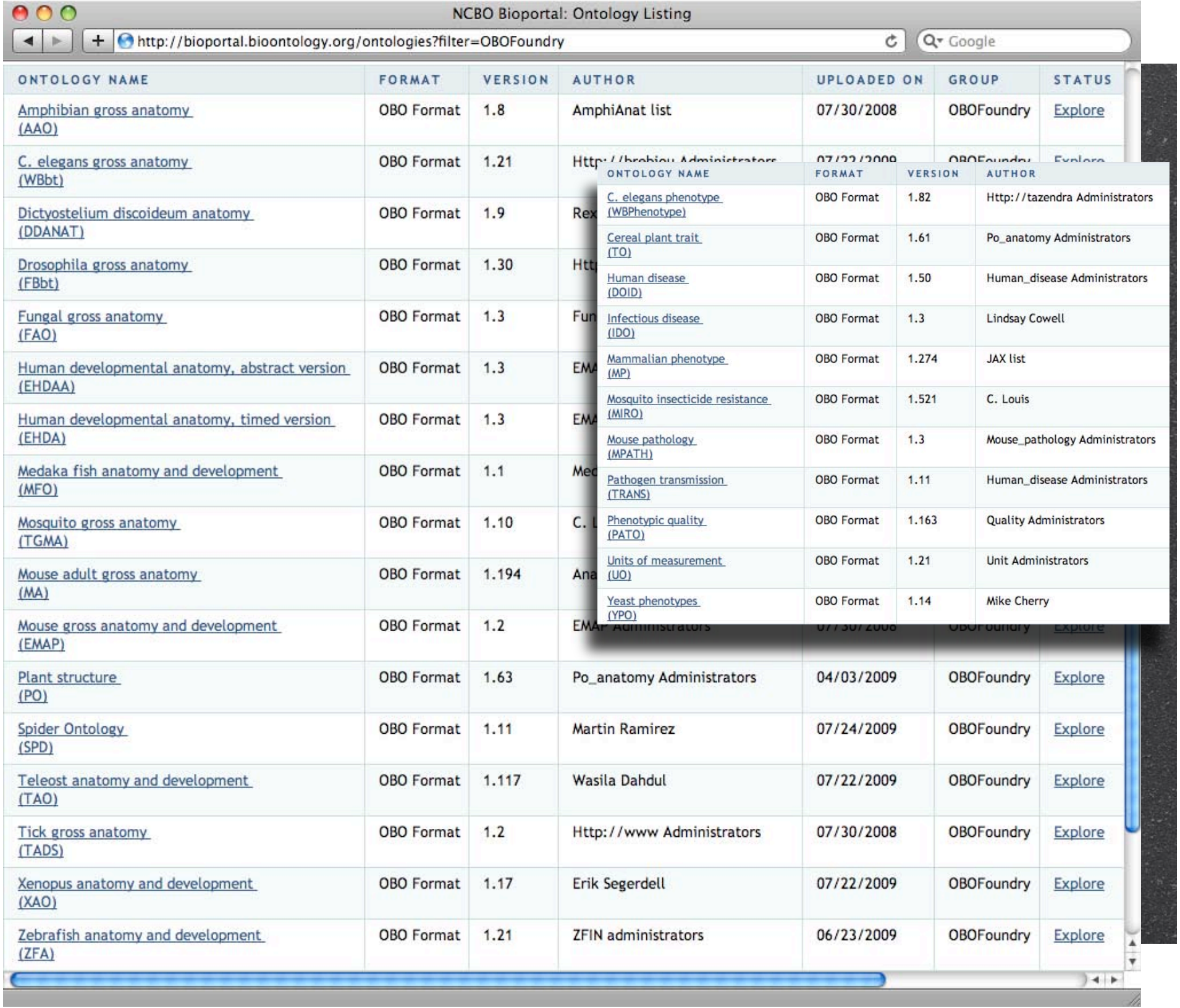
Working With The Center
The Promise of Semantic Web Technology, by Matthew Dublin for Genome Web, features an interview with Mark Musen about the future of the Semantic Web's use in biology.
Current News
October 17, 2009 - Call for Paper/Exhibition Submissions - BMEI'09-CISP'09
August 10, 2009 - Call for Papers - SWESE2009
August 7, 2009 - Call for papers - Workshop on Semantic Web Applications in Scientific Discourse
July 31, 2009 - Call for papers - The First International Workshop on Role of Semantic Web in Provenance Management (SWPM 2009)
July 24, 2009 - ICBO: program now available.
July 20, 2009 - Call for papers - 8th Terminology and Artificial Intelligence Conference (TIA 2009)
The National Center for Biomedical Ontology is a consortium of leading biologists, clinicians, informaticians,



ONTOLOGY NAME	FORMAT	VERSION	AUTHOR	UPLOADED ON	GROUP	STATUS
Amphibian gross anatomy (AAO)	OBO Format	1.8	AmphiAnat list	07/30/2008	OBOFoundry	Explore
C. elegans gross anatomy (WBbt)	OBO Format	1.21	Http://hrobiou Administrators	07/22/2009	OBOFoundry	Explore
Dictyostelium discoideum anatomy (DDANAT)	OBO Format	1.9	Rex			
Drosophila gross anatomy (FBbt)	OBO Format	1.30	Htt			
Fungal gross anatomy (FAO)	OBO Format	1.3	Fun			
Human developmental anatomy, abstract version (EHDAA)	OBO Format	1.3	EMA			
Human developmental anatomy, timed version (EHDA)	OBO Format	1.3	EMA			
Medaka fish anatomy and development (MFO)	OBO Format	1.1	Med			
Mosquito gross anatomy (TGMA)	OBO Format	1.10	C. L			
Mouse adult gross anatomy (MA)	OBO Format	1.194	Ana			
Mouse gross anatomy and development (EMAP)	OBO Format	1.2	EMAP Administrators	07/30/2008	OBOFoundry	Explore
Plant structure (PO)	OBO Format	1.63	Po_anatomy Administrators	04/03/2009	OBOFoundry	Explore
Spider Ontology (SPD)	OBO Format	1.11	Martin Ramirez	07/24/2009	OBOFoundry	Explore
Teleost anatomy and development (TAO)	OBO Format	1.117	Wasila Dahdul	07/22/2009	OBOFoundry	Explore
Tick gross anatomy (TADS)	OBO Format	1.2	Http://www Administrators	07/30/2008	OBOFoundry	Explore
Xenopus anatomy and development (XAO)	OBO Format	1.17	Erik Segerdell	07/22/2009	OBOFoundry	Explore
Zebrafish anatomy and development (ZFA)	OBO Format	1.21	ZFIN administrators	06/23/2009	OBOFoundry	Explore

ONTOLOGY NAME	FORMAT	VERSION	AUTHOR
C. elegans phenotype (WBPhenotype)	OBO Format	1.82	Http://tazendra Administrators
Cereal plant trait (TO)	OBO Format	1.61	Po_anatomy Administrators
Human disease (DOID)	OBO Format	1.50	Human_disease Administrators
Infectious disease (IDO)	OBO Format	1.3	Lindsay Cowell
Mammalian phenotype (MP)	OBO Format	1.274	JAX list
Mosquito insecticide resistance (MIRO)	OBO Format	1.521	C. Louis
Mouse pathology (MPATH)	OBO Format	1.3	Mouse_pathology Administrators
Pathogen transmission (TRANS)	OBO Format	1.11	Human_disease Administrators
Phenotypic quality (PATO)	OBO Format	1.163	Quality Administrators
Units of measurement (UO)	OBO Format	1.21	Unit Administrators
Yeast phenotypes (YPO)	OBO Format	1.14	Mike Cherry

OBO Foundry coverage

RELATION TO TIME	CONTINUANT				OCCURRENT
GRANULARITY	INDEPENDENT		DEPENDENT		
ORGAN AND ORGANISM	Organism (NCBI Taxonomy)	Anatomical Entity (FMA, CARO)	Organ Function (FMP, CPRO)	Phenotypic Quality (PaTO)	**Biological Process** (GO)
CELL AND CELLULAR COMPONENT	Cell (CL)	**Cellular Component** (FMA, GO)	Cellular Function (GO)		
MOLECULE	Molecule (ChEBI, SO, RnaO, PrO)		**Molecular Function** (GO)		Molecular Process (GO)

OBO Foundry as a community resource

- Provides ontology building know-how:
  - Tested ontology building and community best-practices
  - Incremental, modular, bottoms-up approach to evidence-based terminology
  - Principles for developing definitions and relationships
- Provides peer-review and community feedback

Consistent definitions for terms

- Genus-differentia: A is a type of <parent of A> that <differentia>
- Example: premaxilla is-a dermal bone
  - def: "Dermal bone that forms the anteriormost element of the upper jaw. It articulates with the maxilla posterodorsally and its antimere medially. The premaxilla is paired."

Interoperability: Reuse of relations

OBO Relations Ontology (RO)

Foundational	*is_a* *part_of*
Spatial	*located_in* *contained_in* *adjacent_to*
Temporal	*transformation_of* *derives_from* *preceded_by*
Participation	*has_participant* *has_agent*

"Relations in Biomedical Ontologies", Genome Biology, April 2005

Ontological needs for computable phenotypes

"Meckel's cartilage greatly reduced"

Meckel's cartilage
Entity (E)

decreased size
Quality (Q)

Meckel's cartilage
Entity

size:
Attri-bute

Character

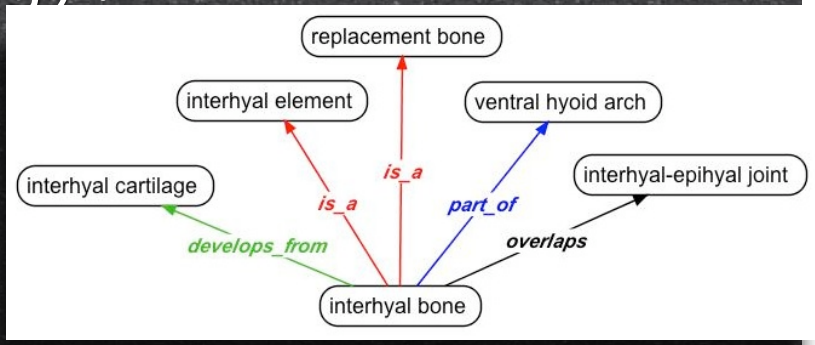
decreased
Value

Character State

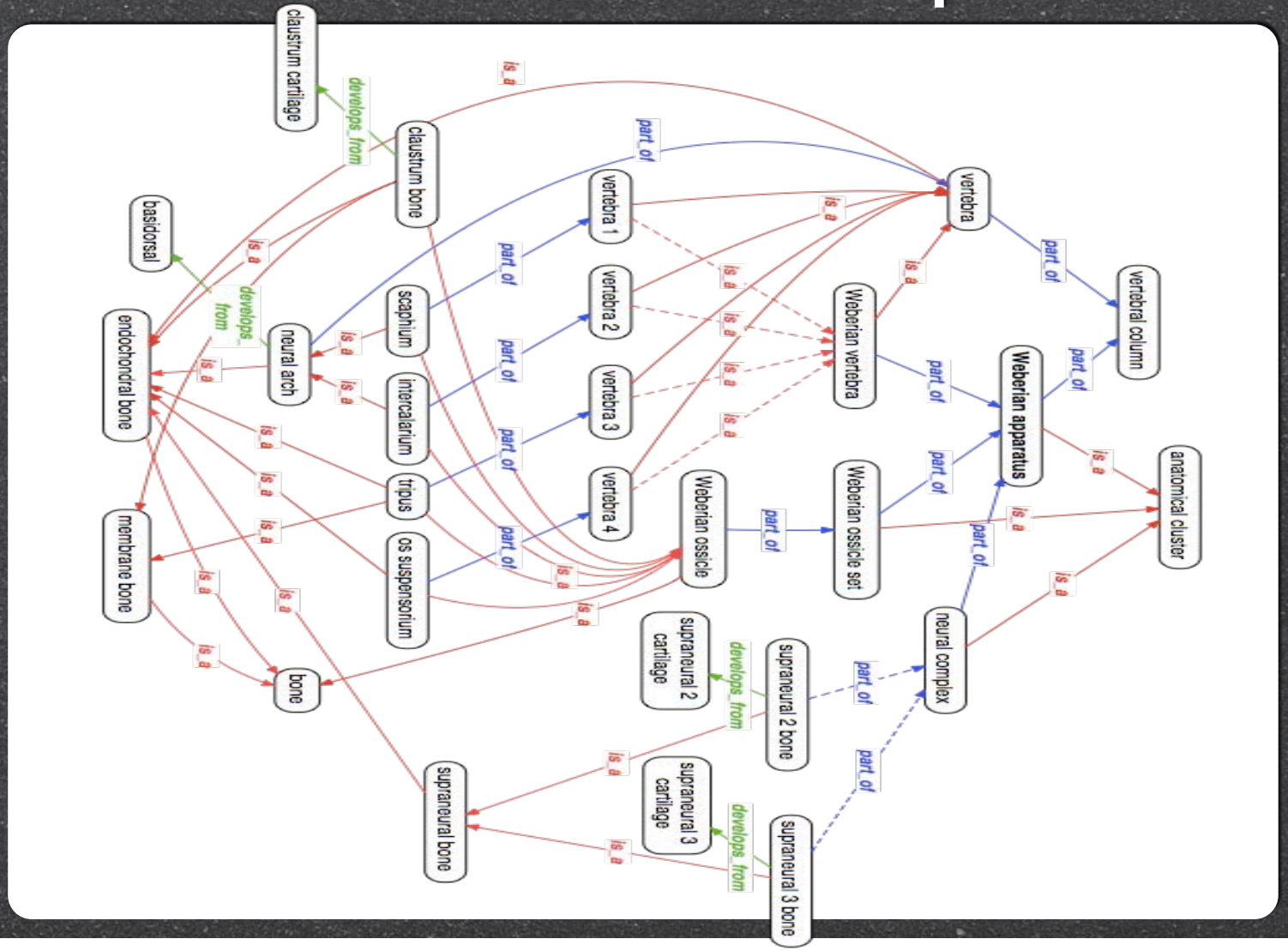
- In addition, need ontologies for
  - who exhibits the phenotype (taxonomy)
  - evidence

Teleost Anatomy Ontology (TAO)

- Initiated in 2007 as a clone of the zebrafish anatomy ontology.
- 2371 terms, 395 new.
- Multi-species: teleosts.
- Terms are defined based on structure, homology is not implied.
- Focus is on the skeletal system as the ontology is driven by annotation.



Taxonomically variable relationships



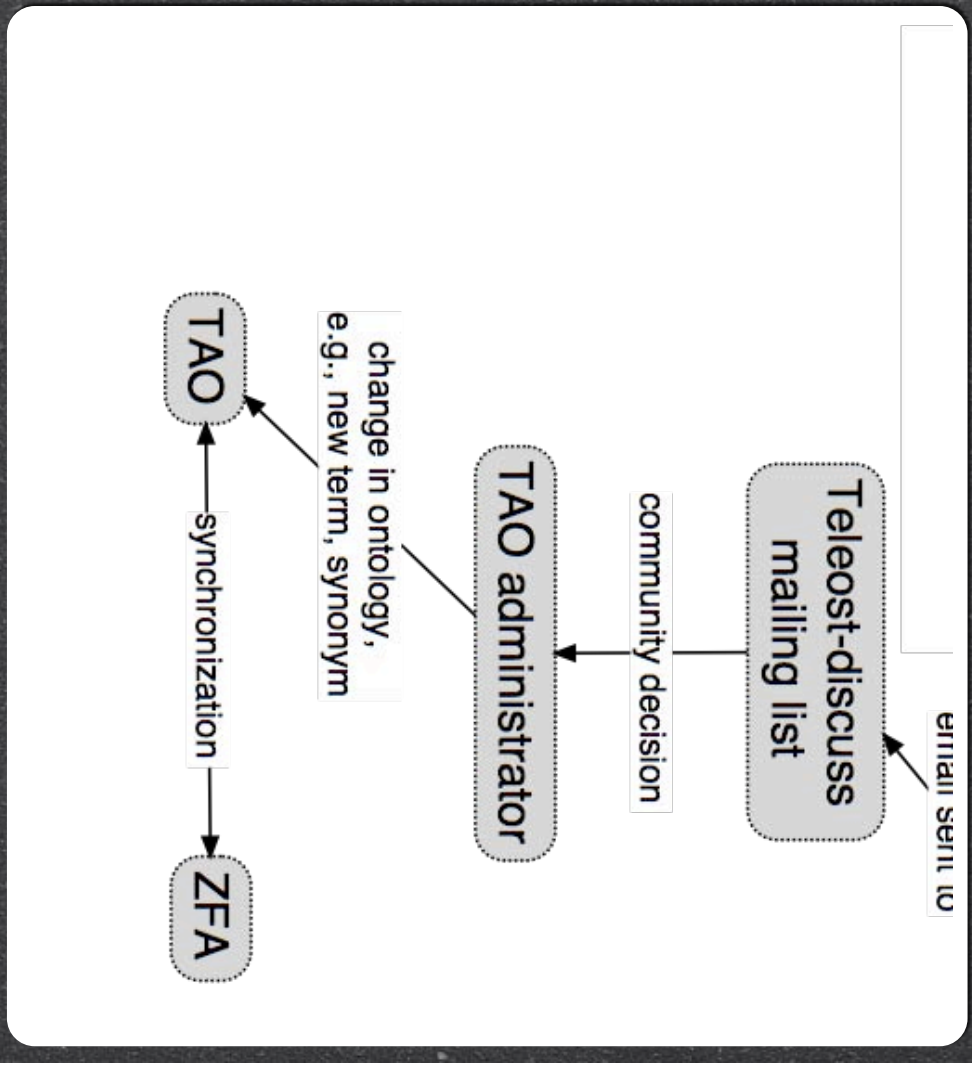
- TAO is already being used to link data

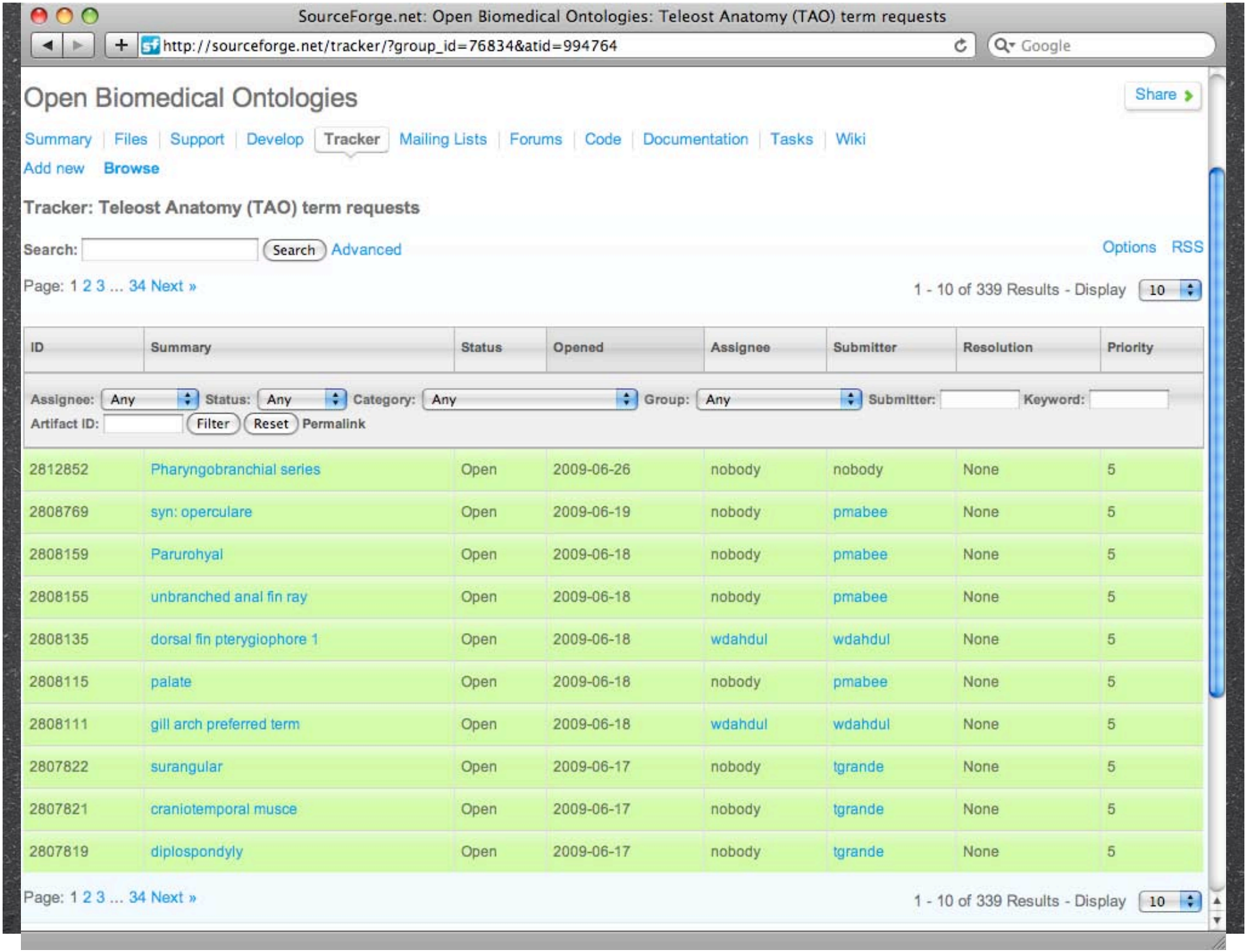
Teleost Taxonomy Ontology (TTO)

- Based on and regularly updated from Bill Eschmeyer's Catalog of Fishes
- Includes custom additions, such as fossil taxa and higher order taxa.
- 36,060 terms (taxa), 38,000 synonyms

Community ownership of ontology development

- OBO ontologies have a request tracker
- Participation is open
- Subject (biology) experts are key to ensure usefulness
- Ontology building is a collaborative effort




SourceForge.net: Open Biomedical Ontologies: Teleost Anatomy (TAO) term requests
http://sourceforge.net/tracker/?group_id=76834&atid=994764
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Page: 1 2 3 ... 34 Next »
1 - 10 of 339 Results - Display 10
ID | Summary | Status | Opened | Assignee | Submitter | Resolution | Priority
Assignee: Any Status: Any Category: Any Group: Any Submitter: Keyword:
Artifact ID: Filter Reset Permalink
2812852 | Pharyngobranchial series | Open | 2009-06-26 | nobody | nobody | None | 5
2808769 | syn: operculare | Open | 2009-06-19 | nobody | pmabee | None | 5
2808159 | Parurohyal | Open | 2009-06-18 | nobody | pmabee | None | 5
2808155 | unbranched anal fin ray | Open | 2009-06-18 | nobody | pmabee | None | 5
2808135 | dorsal fin pterygiophore 1 | Open | 2009-06-18 | wdahdul | wdahdul | None | 5
2808115 | palate | Open | 2009-06-18 | nobody | pmabee | None | 5
2808111 | gill arch preferred term | Open | 2009-06-18 | wdahdul | wdahdul | None | 5
2807822 | surangular | Open | 2009-06-17 | nobody | tgrande | None | 5
2807821 | craniotemporal musce | Open | 2009-06-17 | nobody | tgrande | None | 5
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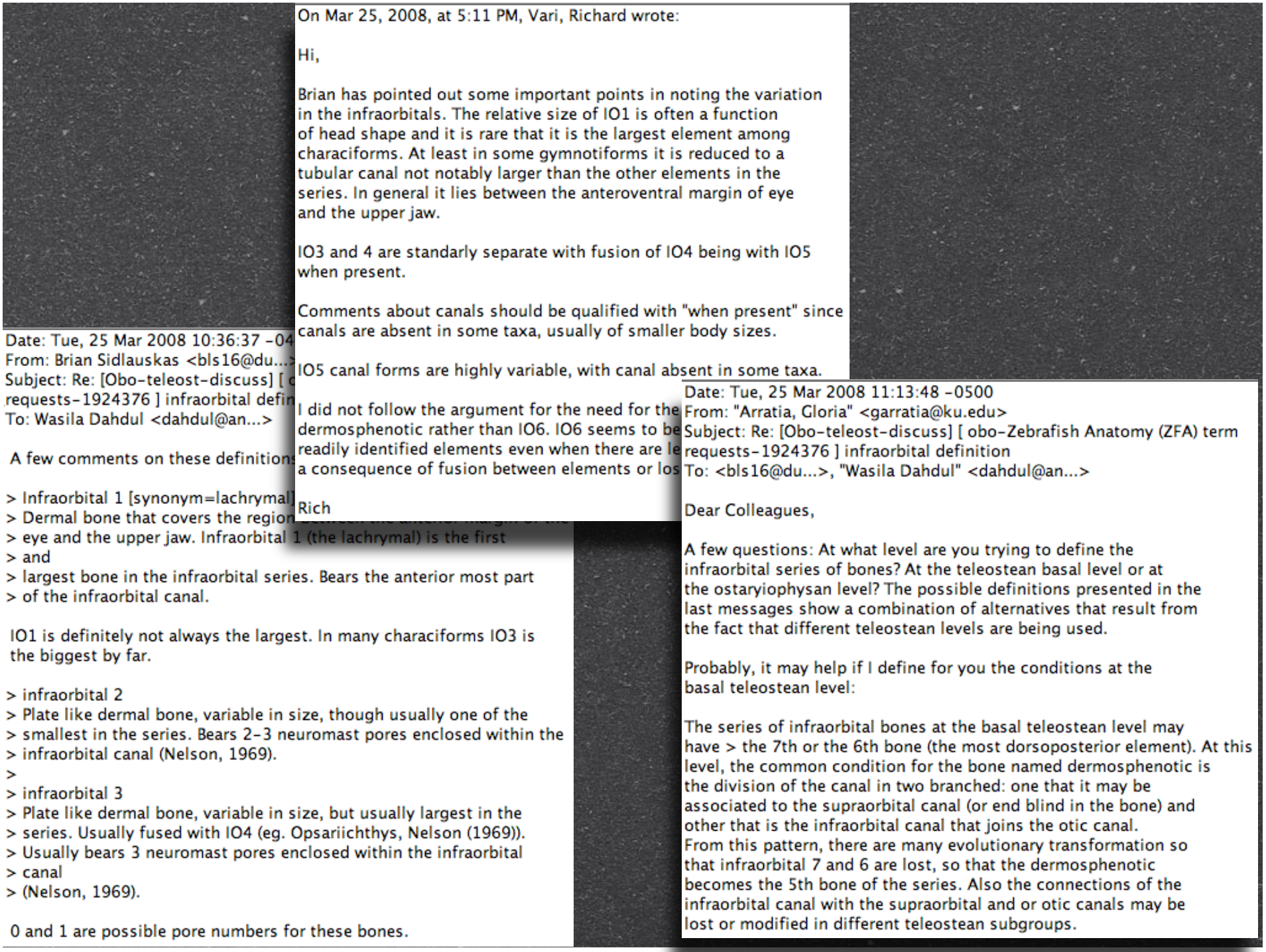
Page: 1 2 3 ... 34 Next »
1 - 10 of 339 Results - Display 10



On Mar 25, 2008, at 5:11 PM, Vari, Richard wrote:

Hi,

Brian has pointed out some important points in noting the variation in the infraorbitals. The relative size of IO1 is often a function of head shape and it is rare that it is the largest element among characiforms. At least in some gymnotiforms it is reduced to a tubular canal not notably larger than the other elements in the series. In general it lies between the anteroventral margin of eye and the upper jaw.

IO3 and 4 are standarly separate with fusion of IO4 being with IO5 when present.

Comments about canals should be qualified with "when present" since canals are absent in some taxa, usually of smaller body sizes.

IO5 canal forms are highly variable, with canal absent in some taxa.

I did not follow the argument for the need for the dermosphenotic rather than IO6. IO6 seems to be readily identified elements even when there are le a consequence of fusion between elements or los

Rich

Date: Tue, 25 Mar 2008 10:36:37 -04
From: Brian Sidlauskas <bls16@du...>
Subject: Re: [Obo-teleost-discuss] [requests-1924376] infraorbital defin
To: Wasila Dahdul <dahdul@an...>

A few comments on these definitions

> Infraorbital 1 [synonym=lachrymal]
> Dermal bone that covers the region
> eye and the upper jaw. Infraorbital 1 (the lachrymal) is the first
> and
> largest bone in the infraorbital series. Bears the anterior most part
> of the infraorbital canal.

IO1 is definitely not always the largest. In many characiforms IO3 is the biggest by far.

> infraorbital 2
> Plate like dermal bone, variable in size, though usually one of the
> smallest in the series. Bears 2-3 neuromast pores enclosed within the
> infraorbital canal (Nelson, 1969).
>
> infraorbital 3
> Plate like dermal bone, variable in size, but usually largest in the
> series. Usually fused with IO4 (eg. Opsariichthys, Nelson (1969)).
> Usually bears 3 neuromast pores enclosed within the infraorbital
> canal
> (Nelson, 1969).

0 and 1 are possible pore numbers for these bones.

Date: Tue, 25 Mar 2008 11:13:48 -0500
From: "Arratia, Gloria" <garratia@ku.edu>
Subject: Re: [Obo-teleost-discuss] [obo-Zebrafish Anatomy (ZFA) term requests-1924376] infraorbital definition
To: <bls16@du...>, "Wasila Dahdul" <dahdul@an...>

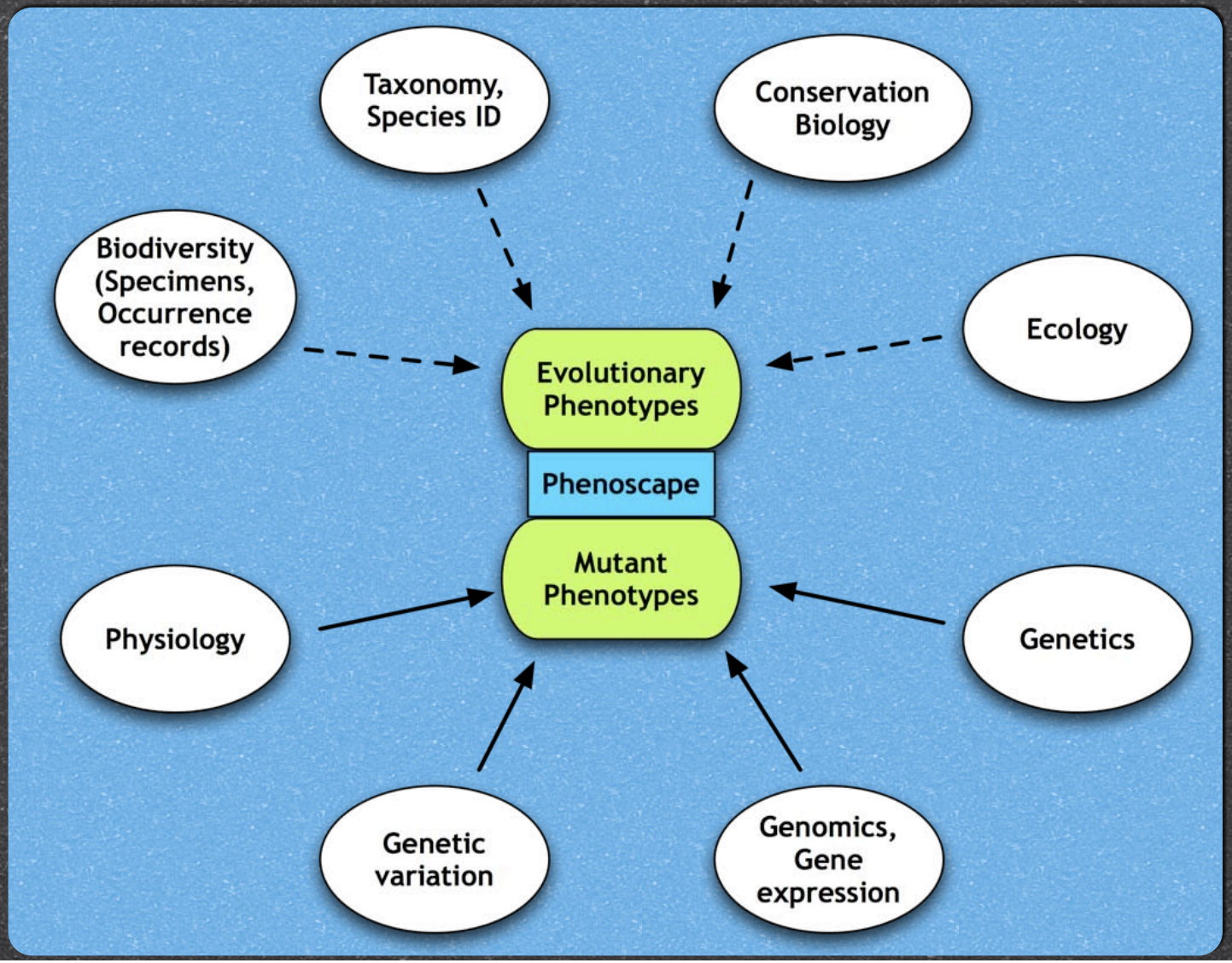
Dear Colleagues,

A few questions: At what level are you trying to define the infraorbital series of bones? At the teleostean basal level or at the ostaryiophysan level? The possible definitions presented in the last messages show a combination of alternatives that result from the fact that different teleostean levels are being used.

Probably, it may help if I define for you the conditions at the basal teleostean level:

The series of infraorbital bones at the basal teleostean level may have > the 7th or the 6th bone (the most dorsoposterior element). At this level, the common condition for the bone named dermosphenotic is the division of the canal in two branched: one that it may be associated to the supraorbital canal (or end blind in the bone) and other that is the infraorbital canal that joins the otic canal.
From this pattern, there are many evolutionary transformation so that infraorbital 7 and 6 are lost, so that the dermosphenotic becomes the 5th bone of the series. Also the connections of the infraorbital canal with the supraorbital and or otic canals may be lost or modified in different teleostean subgroups.

Systematic morphology can be part of data-rich biology



Acknowledgements

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  W. Dahdul
- NSF (DBI 0641025)
- National Evolutionary Synthesis Center (NESCent)
- Berkeley Bioinformatics & Ontologies Project (BBOP):
  S.Lewis, C.Mungall