

A microscopic image of biological tissue, likely an amphibian, showing various cellular structures and colors like red, blue, and green. The image is dark and serves as a background for the text.

# *Development of the Amphibian Anatomical Ontology*

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# Community-identified need (ATOL)

- Highly variable group
- Several model species
- Diverse lexicons



# Challenge

*Ontology that accommodates diversity,  
definitions, literature, phylogenetic character  
codings, and images*

...and include the domain expert community

...and maintain interoperability with other ontologies

...and do it in a reasonable amount of time

# *AmphibAnat*

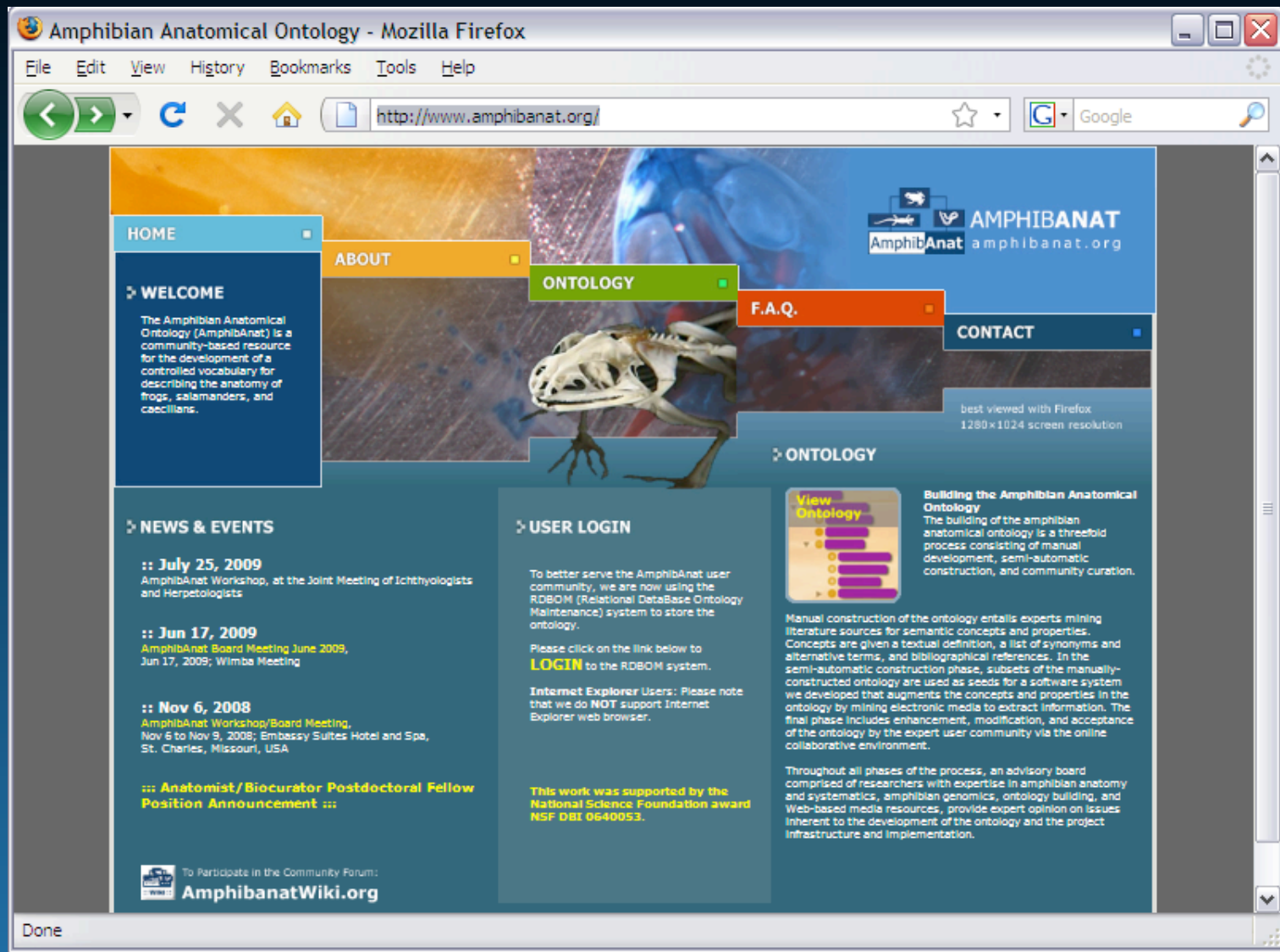
Combine existing tools/methods with new approaches

1. Ontology maintenance system
2. Web-based community curation
3. Semi-automated approach

# 1. Ontology maintenance

- Web-based access/collaboration
- One-stop shop
- Query and update functions
  - concurrent, authorized access
  - node based permissions
- Import/export exchange formats
  - OBO, OWL

# www.amphibanat.org



Amphibian Anatomical Ontology - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.amphibanat.org/

RDBOM | Relational DataBase Ontology Maintenance

HOME QUERY ontology UPDATE ontology EXPORT ontology USER GUIDE

## Query Ontology

best viewed with Firefox  
1280x1024 screen resolution

Search Phrase:

<comments>

- anatomical group <comments>
- anatomical cluster <comments>
- braincase and auditory apparatus <comments>
- braincase and otic capsule opening <comments>
- braincase and otic capsule skeleton <comments>
- arcus praeoccipitalis <comments>
- basioccipital <comments>
- basisphenoid <comments>

- musculoskeletal system
  - skeletal system
    - cranium
      - braincase and auditory apparatus
        - braincase and otic capsule skeleton
          - parasphenoid

**Definitions:**

Azygous, dermal bone of intramembranous origin that underlies the ventral surface of the braincase in anurans and salamanders. In caecilians, the parasphenoid and other bones are fused to form the Os basale [AAO:LAP]

**Parent Classes:**

Done



Amphibian Anatomical Ontology - Mozilla Firefox

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http://www.amphibanat.org/

Google

<comments>

- [P](#) basioccipital

<comments>

- [P](#) basisphenoid

<comments>

- [P](#) cartilago orbitalis

<comments>

- [P](#) cartilago prootico-occipitalis

<comments>

- [P](#) crista parotica

<comments>

- [P](#) eustachian canal

<comments>

- ⊕ [P](#) exoccipital

<comments>

- [P](#) frontal

<comments>

- ⊕ [P](#) frontoparietal

<comments>

- ⊕ [P](#) inner ear

<comments>

- [P](#) mesethmoid

<comments>

- ⊕ [P](#) nasal

<comments>

- [P](#) orbitosphenoid

<comments>

- [P](#) os basale

<comments>

- [P](#) otoccipital

image\_contains:

[Image 1](#) image\_contains [Acris blanchardi \(Harper 1947\)](#)

, [Image 1](#) image\_contains [ascending process](#)

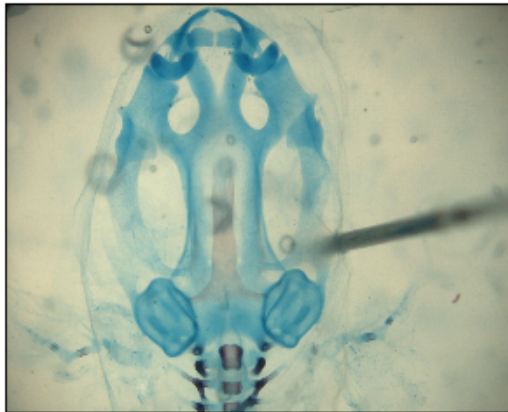
, [Image 1](#) image\_contains [chondrocranium](#)

, [Image 1](#) image\_contains [infrarostral cartilage](#)

, [Image 1](#) image\_contains [otic capsule](#)

, [Image 1](#) image\_contains [parasphenoid](#)

Image:

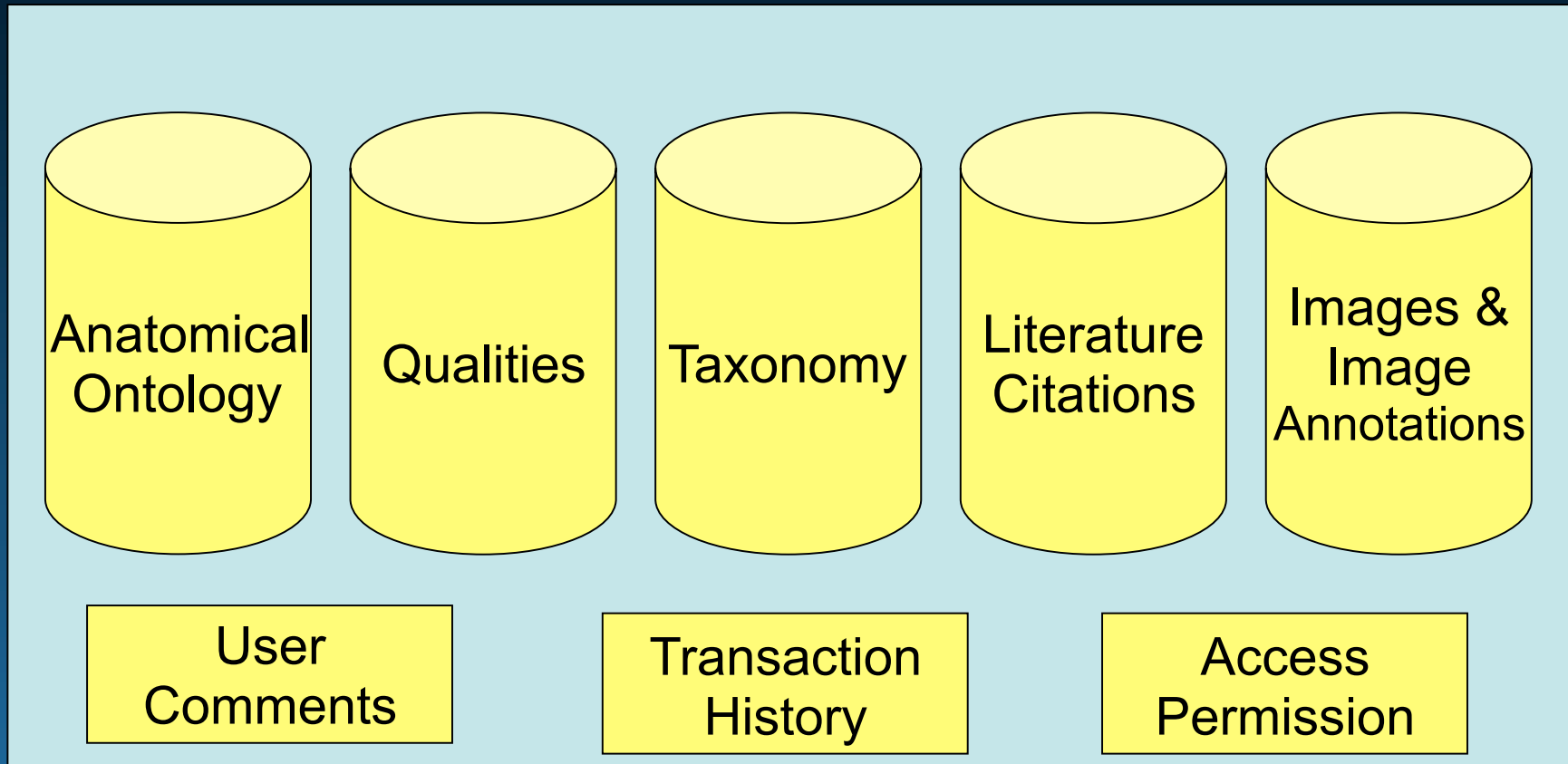


Home :: Query :: Update :: Export :: Help

Done



# Modularity



## 2. Community curation

- User commenting by node
- “Super-user” node-based curation



The screenshot shows a Mozilla Firefox browser window titled "RDBOM Comments ::: - Mozilla Firefox". The address bar displays the URL: [http://174.133.140.86/AmphibAnatRDBOM/comment\\_add.aspx?Nodeint=232187](http://174.133.140.86/AmphibAnatRDBOM/comment_add.aspx?Nodeint=232187). The page content includes a heading "View / Add Comments: 'M. adductor magnus'" and a welcome message. Below this is a table with one row of data.

View / Add Comments: "M. adductor magnus"

Welcome to the View / Add Comments: "M. adductor magnus" page.  
If you want to **add comments** to this page. Please go to the **Home page** to login as a registered user.

Node Name	Firstname	Lastname	Comments	DateTime
M. adductor magnus	Julio	Hoyos	This name was done by Ledebøer (1829) and adopted by some authors (Ecker, 1864; Beddard, 1908; Dunlap, 1966). They did not distinguish two heads of the Adductor magnus (ventralis and dorsalis), then, we need to define both heads, calling each one as mm.adductor magnus caput dorsalis (Noble, 1922), and caput ventralis (Noble, 1922). These names have been also used by Duellman & Trueb (1986). Synonyms for the m. adductor magnus caput ventralis: Triceps (Kloetze, 1816), Adductor magnus (Ledebøer, 1829), Triceps adductor (van Alstena, 1829), Sous-ischio-pubi-fémoral (adductor I et II) (Dugès, 1835), Adductor brevis (Collan, 1847), Adductor magnus and extensor femoris profundus (Klein, 1850), Adductor ischiadicus secundus (Stannius, 1857), Pubo-ischio-femoralis medialis (pectineus) (Hoffmann, 1873-1878), Pubo-ischio-femoralis externus posterior (De Man, 1874-1875), Adductor magnus (Ecker, 1864; Beddard, 1908; Dunlap, 1966), Adductor magnus externus (Burton, 1983). Synonyms for the m. adductor magnus caput dorsalis: Idem and Long fléchisseur du fémur (Perrin, 1892) and Adductor magnus internus (Burton, 1983). Although the names of the last two muscles are longer than others proposed, they are more informative, descriptive, and accurate.	6/25/2009 9:26:07 AM

Done

# Privilege assignment

Amphibian Anatomical Ontology

http://www.amphibanat.org/

RDBOM | Relational DataBase  
Ontology Maintenance

HOME QUERY ontology UPDATE ontology EXPORT ontology VIEW LOG

**RDBOM Home**  
best viewed with Firefox  
1280x1024 screen resolution

**AMPHIBANAT**  
AmphibAnat amphibanat.org

Welcome

Welcome to RDBOM!

We present a functionally comprehensive, generic approach to maintaining an ontology as a relational database. Implemented as a web-based software system called RDBOM (Relational DataBase Ontology Maintenance), this approach exploits the traditional features of a relational database management system in terms of concurrency control, security, and consistency checking in order to facilitate querying and updating of the ontology.

**User Login**

Login (E-mail)

Password

Not a registered user?

**Register Now!**

If you are a registered user of the website, you can update or add comments to the under-development ontology. You can also access the UPDATE ontology page.

Home :: Query :: Update :: Export :: View Log

# “Super-user” functions

# Simple interface

The screenshot shows a web browser window titled "Amphibian Anatomical Ontology" with the URL "http://www.amphibanat.org/". The page features a navigation bar with links: HOME, QUERY ontology, UPDATE ontology, EXPORT ontology, and VIEW LOG. A banner for "UPDATE Ontology" includes the text "best viewed with Firefox 1280x1024 screen resolution" and the AMPHIBANAT logo with the website "amphibanat.org".

On the left, a sidebar contains a link: **Concepts <comments>**

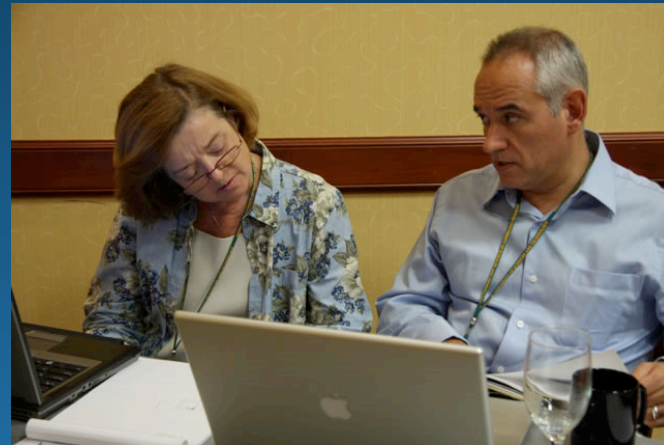
The main content area is titled "Create Child Node for Concepts" and contains the following form fields:

- RDBOM ID:  \*
- Term Name:  \*
- Definition:
- Relation Type:  \*
- Term Type: Class

A "Submit Form" button is located below the form fields. At the bottom, a note states: "\* Required fields".

# Web-based community curation

- Inclusion of experts
- Forum for argumentation
- Community ownership
- Unites diverse groups toward common goal



### 3. Semi-automated approach

1. Manually construct subset ontology
2. Community input
3. Develop information extraction (IE) tools
4. Seed with few concepts
5. Benchmark, modify, repeat



# IE tools

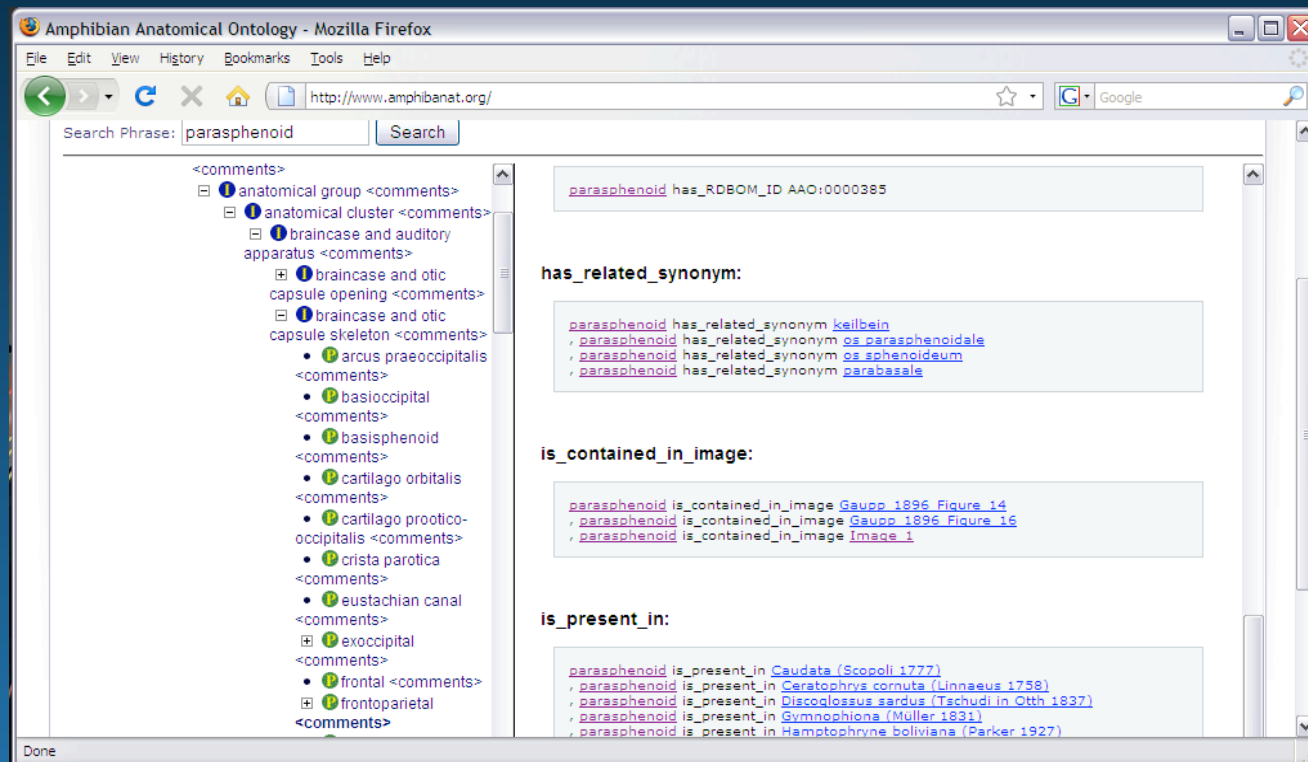
1. Spider queries web
2. Collects relevant documents
3. Extracts info/builds ontology
  - pattern-based
  - statistical natural language processing algorithms
  - identify/weight most important elements

## Early IE results

- 5 concepts to spider
- 600 docs returned → 96 relevant → 60 final
- Extract terms
- Compare to manual
  - 960 vs. 623 terms
  - iteration accuracy: avg. 77.5% (up to 88%)

Luong, H et al. *In review*. Int J Adv Life Sci

- Build backbone of ontology
- Create links between terms



# Summary

- Combine existing tools and novel approaches
- RDBOM: diverse data/functionality and interoperability
- Semi-automated approach: reduced effort
- Community-based curation: ownership, expertise

# Acknowledgements

- Supported by National Science Foundation award DBI 0640053
- Sarah Havens, Bonnie Beasley, Analia Pugener, Leong Lee, Heip Luong, Alton Coalter
- Users, contributors, evaluators, workshop participants, AmphibAnat board