

# Image Driven Ontology Editing

Timothy Rowe<sup>o</sup>, Julian Humphries<sup>o</sup>, Daniel P. Miranker<sup>\*</sup>, Syed Hamid Tirmizi<sup>\*</sup>, Kerin M. Claeson<sup>o</sup>,  
Juan F. Sequeda<sup>\*</sup>, Willard S. Willard<sup>\*</sup>, Ferner Cilloniz-Bicchi<sup>\*</sup>, Nirav Savjani<sup>\*</sup>.  
Department of Geological Sciences<sup>o</sup>, Department of Computer Sciences<sup>\*</sup>. The University of Texas at Austin



## Introduction

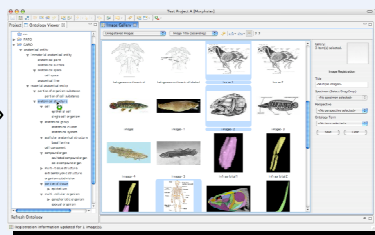
Our 3D Phyloinformatics project concerns distributed data integration, data provenance and morphological image data management. The larger context is the uniting of information standards across the NSF grand challenge to assemble the tree of life (AToL), NIH model organism efforts (e.g. ZFIN), and global biodiversity information efforts (GBIF, TDWG). Our targeted effort is the creation of a productivity tool for systematic biologists. The tool enables users to create, organize and annotate an image database of morphological characters and features. Resulting illustrated ontologies may be published on the Web. The interface metaphor is succinctly described as image-driven ontology editing. Users may import annotation vocabulary from diverse externally defined ontologies and extend those ontologies as needed.

## Image Driven Ontology Tools

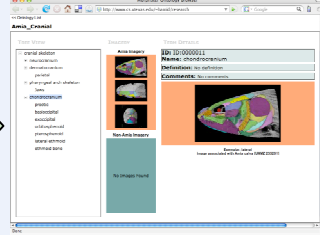
**We have:** Our OntoIllustrator tool is capable of illustrating OBO and OWL ontologies with images. It is powered by a triple store, an image database and an integrated search and retrieval of taxa from uBio. We have successfully tested ontologies including Nomina Anatomica: anatomical is-part-of ontologies for both fish and mouse, emerging vocabularies for comparing anatomies, CARO, and describing phenotypes, PATO. We have also deployed some illustrated ontologies for browsing through our OntoBrowser.



Input



Export

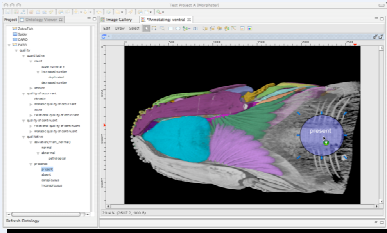


OntoIllustrator projects use standard ontologies, images, and taxon information imported using integrated search and format transition methods.

A screenshot of OntoIllustrator showing illustration of an ontology by attaching images to corresponding ontology terms through a drag and drop mechanism. Images can be filtered and sorted in a number of ways. As shown in the screenshot, multiple ontologies can be illustrated with images simultaneously. Illustrated ontologies can be quickly exported to OntoBrowser.

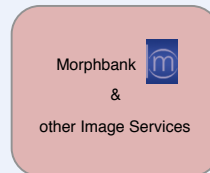
The results of OntoIllustrator can be exported directly to OntoBrowser. OntoBrowser is a web application making illustrated ontologies browsable from any machine on the Internet. Large illustrated ontologies can be browsed quickly using the dynamic tree view. The image thumbnail strip can be used to browse through a list of images.

We are working on:



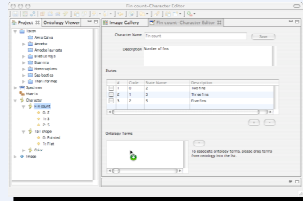
A screenshot of ontology driven image annotation interface. Terms from ontologies can be dragged and dropped on to the images as labels. The connection between ontology terms and labels is stored, and can be used to search for images that contain a particular label.

Import  
Export



Labeled images and associated metadata can be stored in repositories provided by Morphbank and other services. Effort is underway where an illustrated ontology can be used as a query-by-example method for retrieving related imagery from Morphbank.

In the future:



In near term, our tools will support comprehensive morphology studies of various kinds by providing support for character/state definitions and matrix management. We aim to organize and facilitate these studies through ontology driven matrix management.



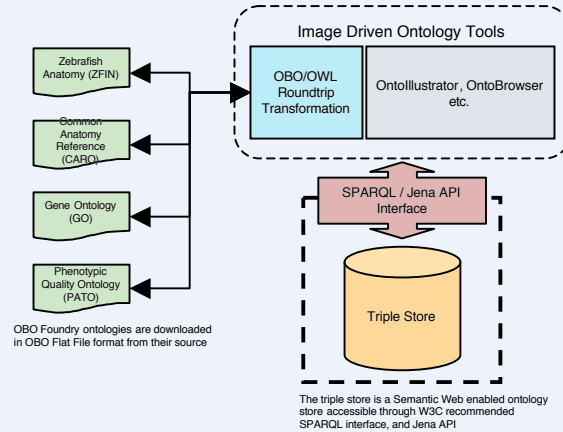
We aim to provide integrated LSID tagging with Nexus files to enable exports to Treebase II (pending APIs) and Mesquite project.



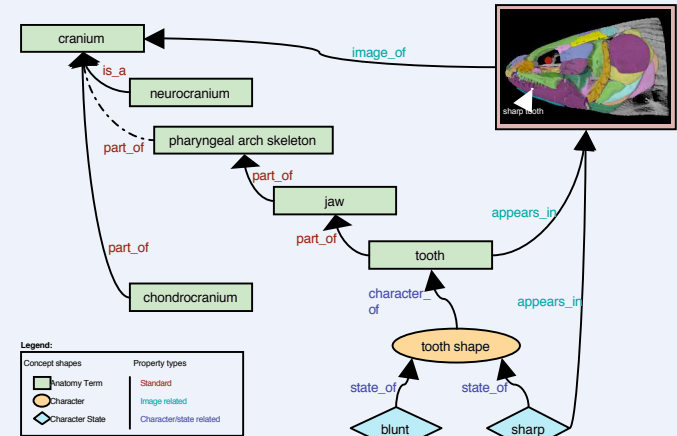
Specimen search and data import from GBIF and TDWG TAPIR portals will be enabled in later versions.

## OBO Triple Store

By developing a lossless roundtrip transformation mechanism between OBO and Semantic Web (OWL) ontologies, we have opened the Semantic Web infrastructure for biomedical ontologies. As a result, we have successfully deployed a triple-store backend for OBO ontologies, powered by an engine for W3C recommended SPARQL language and Jena API.



## It's All An Ontology



## Contact Information

Timothy Rowe: rowe@mail.utexas.edu  
Daniel Miranker: miranker@cs.utexas.edu

Julian Humphries: humphries@mail.utexas.edu  
Syed Hamid Tirmizi: hamid@cs.utexas.edu