### Representing Scholars and Scholarship: Use of Ontologies in VIVO

Mike Conlon, PhD Professor Emeritus, University of Florida VIVO Project Director, Duraspace



Person:Paper authorOf, hasAuthor

Person:Grant fundedBy, funds

Person:Resource userOf, hasUser

Person:Data creatorOf, hasCreator curatorOf, hasCurator userOf, hasUser

- VIVO is ontologies, software, data, and a community for representing scholars and their works
- Ontologies 1 core ontology (VIVO-ISF), 4 additional VIVO-specific ontologies, 19 related ontologies, including the Basic Formal Ontology (BFO)
- Software a semantic web application consisting of a triple store for subject-predicate-object assertions (Apache Jena), a web-based ontology editor and generic assertion manager (Vitro) and scholarship assertion management and display (VIVO). See <u>http://github.com/vivo-project</u>
- Data assertions about scholars and their scholarly works.
  - At UF, 23M assertions for 63K people, 62K papers, 24K grants, 87K courses taught. 1.7M assertions of the form "uri rdfs:type obo:BF0\_0000001" See <u>http://vivo.ufl.edu/all-uf-triples.tar.gz</u>
  - OpenVIVO. 3.9M triples at <u>http://openvivo.org/data</u>
- Community 147 sites in 26 countries, 200K scholars, 1M+ works. See http://vivoweb.org, Twitter: @VIVOCollab

# What is VIVO?

### Domains of Representation



The people in your VIVO -your faculty, staff and trainees, and their collaborators at other organizations





e		
	Faculty	
	Staff	
	Trainees	
	Collaborators	







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People

**Organizations** 

Research

Eve



⊘ 器 **Contact Info** ⊠ mconlon@ufl.edu Websites UF VIVO Profile Google Scholar profile > <u>Twitter</u> Facebook LinkedIn

### and Emeritus Faculty Member, University of Florida

### **Positions**

of Florida 2015 -

Dr. Conlon is an Emeritus Faculty member of the University of Florida and serves as VIVO Project Director for Duraspace. Dr. Map of Science Conlon formerly served as Co-director of the University of Florida Clinical and Translational Science Institute, and as Director of Biomedical Informatics, UF College of Medicine. His responsibilities included expansion and integration of research and clinical resources, and strategic planning for translational research. Previously, Dr. Conlon served as PI of the VI (... more)

### Research Areas

<u>Clinical trials--Data processing</u> (FAST) <u>Clinical trials--Design</u> (FAST) Experimental design--Study and teaching (FAST) Knowledge representation (Information theory)--Data processing (FAST) Medical statistics (FAST) Ontology (FAST) Semantic Web (FAST)

Geographic Focus

**United States of America** Country

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**Conlon, Michael** | VIVO Project Director, Duraspace

Emeritus Faculty, University of Florida, State University System





### 24 Ontologies used in VIVO

PREFIX	rdf:
PREFIX	rdfs:
PREFIX	xsd:
PREFIX	owl:
PREFIX	swrl:
PREFIX	swrlb:
PREFIX	bibo:
PREFIX	c40:
PREFIX	cito:
PREFIX	event:
PREFIX	fabio:
PREFIX	foaf:
PREFIX	geo:
PREFIX	vlocal:
PREFIX	obo:
PREFIX	ocrer:
PREFIX	ocresd:
PREFIX	skos:
PREFIX	vcard:
PREFIX	vpublic:
PREFIX	vivo:
PREFIX	vlocal:
PREFIX	scires:
PREFIX	vitro:

<http://www.w3.org/1999/02/22-rdf-syntax-ns#> <http://www.w3.org/2000/01/rdf-schema#> <http://www.w3.org/2001/XMLSchema#> <http://www.w3.org/2002/07/owl#> <http://www.w3.org/2003/11/swrl#> <http://www.w3.org/2003/11/swrlb#> <http://purl.org/ontology/bibo/> <http://purl.org/spar/c4o/> <http://purl.org/spar/cito/> <http://purl.org/NET/c4dm/event.owl#> <http://purl.org/spar/fabio/> <http://xmlns.com/foaf/0.1/> <http://aims.fao.org/aos/geopolitical.owl#> <http://vivo.mydomain.edu/ontology/vlocal#> <http://purl.obolibrary.org/obo/> <http://purl.org/net/OCRe/research.owl#> <http://purl.org/net/OCRe/study design.owl#> <http://www.w3.org/2004/02/skos/core#> <http://www.w3.org/2006/vcard/ns#> <http://vitro.mannlib.cornell.edu/ns/vitro/public#> <http://vivoweb.org/ontology/core#> <http://my.domain.edu/ontology/vlocal#> <http://vivoweb.org/ontology/scientific-research#> <http://vitro.mannlib.cornell.edu/ns/vitro/0.7#>



## APerson

- Has type(s) faculty, staff, graduate student, etc
- Has a vcard for contact information
- Has various identifiers SCOPUS, ResearcherID, ORCiD, eRACommons
- Has a photo, home department, research areas (concepts)
- Is related to positions, education, and roles in grants, papers, courses, organizations, and other activities

The ontologies are sufficient to represent scholars and their works



Entering data in VIVO involves "mapping" data values to appropriate places in the graph of VIVO data, either replacing literal values in the graph (eg, an updated phone number), or adding new nodes to the graph (eg, a new published paper)

## Data in VIVO

### Representing a mentoring relationship

- Example: Gyda is Erik's doctoral thesis advisor since May 2014
- The data values: lacksquare
  - Advisor (identified unambiguously through the use of a property): Gyda
  - Advisee (identified unambiguously through the use of a property): Erik
  - Type of relationship, such as "faculty mentoring," "undergraduate advising," "gradate advising,": graduate advising
  - The degree being pursued by the advisee: PhD
  - Start date: May 2014



### Assertions

### Inverse assertions and inferences omitted

n7924448848	а
n7924448848	vivo:degreeCandid
n7924448848	vivo:relates
n7924448848	vivo:dateTimeInte
n7924448848	а
n3209541243	obo:R0_0000052
n3209541243	а
n3739541303	obo:R0_0000052
n3739541303	а
n9616523741	а
n9616523741	vivo:start

vivo:AdvisingRelationship

dacy vivo:academicDegree4 (Ph.D.)

n2503 (Gyda)

n3209541243

n3739541303

n8066 (Erik)

erval n9616523741

vivo:GraduateAdvisingRelationship

n2503

vivo:AdvisorRole

n8066

vivo:AdviseeRole

vivo:DateTimeInterval

n2871342684 (May 2014)

## Issue: The Middle Ground

- VIVO occupies the "middle ground" in ontologies
  - Above VIVO (more abstract) is the BFO
  - Below VIVO (less abstract) are domain specific ontologies and vocabularies (clinical trials, agriculture, cultural heritage, ...)
  - Most ontologies "below" VIVO introduce their own "middle concepts" — person, paper, project — these must be "reconciled" with VIVO. This is fundamental collaborative work across projects

# Issue: Missing Ontologies

To represent scholarship, VIVO must represent detail that is best defined by authoritative sources

- Example: Academic Degrees
  - one)
- Example: Research Areas
  - Application of Subject Terminology) from OCLC (Online Computer Library Center).
- Example: Contribution Ontology

• VIVO supports its own vocabulary of 173 academic degrees (because the world doesn't have

• Many vocabularies exist for expressing research areas of faculty members. What might be "useful" for faculty to find people working in related areas? OpenVIVO uses FAST (Faceted

The contribution ontology developed by the Force16 Attribution Work Group, VIVO Project, and OpenRIF is new. It will need to be refined based on experience and further analysis

### Issue: Assertions about Assertions

a scholar:

- "these assertions were made by the University of Florida"
- "these assertions are provided under license x"
- "these assertions were verified as of date y"

assertions about assertions.

We want to be able to make assertions about a graph of assertions for

VIVO is considering the use of the Provenance Ontology (W3C) to add

### Issue: Managing Ontological Change

- Many institutions and projects use VIVO (150) and the VIVO VIVO.
- data and interfaces to use updated ontologies.
- and other systems to web sites, software, and reports

ontology (another 250?). Work is being done to align SciENcv and

VIVO has a process for updating ontologies it uses, and updating its

But many sites depend on the ontology to retrieve data from VIVO

How to propose change? Govern change? Implement change?