

# Ontological Domains for Representing Scholarship

Michael Conlon, University of Florida, Violeta Ilik, Columbia University, Brian Lowe, Ontocale SRL, Christian Hauschke, German National Library of Science and Technology, Marijane White, Oregon Health Science University

## Ontological Domains

Ontologies should focus their representations on their domains. The VIVO Ontology focuses on the domain of scholarship. As an early effort in representation (2007), the VIVO ontology required representation of domains related to, but outside the domain of scholarship. A recent analysis of the VIVO ontology identified several such domains. Each could, and in some cases has been, represented ontologically by a focused effort. New ontologies are proposed to address gaps in representation. Each meets criteria established for using ontologies from other domains.

## Using Ontologies from other Domains

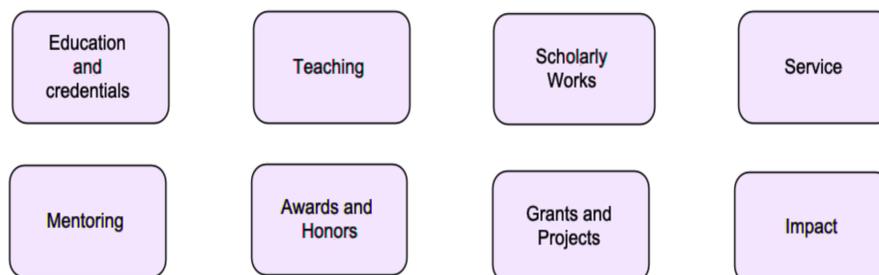
Based on significant project experience, we find that for ontologies to be reused productively, they should be 1) actively maintained; 2) open license; 3) BFO-based; 4) OBO-compliant; and 5) domain-focused. Few ontologies can meet these criteria. In future work, the VIVO ontology will focus on representing the people, organizations, processes, and works of scholarship. Related domains will be represented in separate ontologies that work well with the VIVO ontology. Related ontologies and their terms will typically be referenced rather than used directly.

*The VIVO Ontology represents entities from various domains to represent scholarship. Some of these entities are outside the domain of scholarship.*

## Dates

The W3C Time Ontology<sup>1</sup> provides semantics for dates and times, including intervals and instants. A complete set of date RDF data is available on-line with open license<sup>2</sup>.

The activities and accomplishments of your people



## Locations

Gazatteer<sup>3</sup> (GAZ) is an OBO-compliant, actively maintained, BFO-based, ontology with over 90,000 locations of the world including continents, countries, provinces, and cities.

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



## Journals

JOURNAL is a proposed ontology providing a controlled vocabulary of journals with ISSN, EISSN. OpenVIVO<sup>4</sup> created a preliminary version of JOURNAL.

Entities referred to in your scholarly work. Your internal organization, organizations related to the scholarly work of your people.



## Research Impact

RIO is a proposed ontology for presenting the impact of research in policy, scholarship, economics, practice.

## Academic Events

AEON<sup>5</sup> is a proposed ontology for representing events such as conferences, and workshops, and their processes, participants, outputs.

## Organizations

ORG<sup>9</sup> is a proposed ontology using data from ROR<sup>10</sup> and GRID<sup>11</sup> regarding 90,000 research organizations in the world. ROR and GRID are actively maintained.

## Research Resources

The Eagle-i Resource Ontology<sup>17</sup> (ERO) is an OBO-compliant, BFO-based ontology representing research resources. VIVO-ISF is an integrated ontology based on VIVO and ERO.

## Topics

The FAST vocabulary<sup>18</sup> uses SKOS<sup>19</sup> to represent 500,000 topic areas. Available in RDF and currently accessible via API from OpenVIVO.

## Roles

Roles are integral to the representation of scholarship. The Contribution Role Ontology<sup>12</sup>, the MARC<sup>13</sup> contributor roles and other sources will be aligned. More than 700 roles have been identified.

## Upper Level Ontology

VIVO uses the Basic Formal Ontology<sup>20</sup> (BFO) as an upper level ontology. The upper level ontology is outside the domain of scholarship and used by VIVO to align its classes with those of BFO and ontologies using BFO.

## Academic Degrees

ADO<sup>6</sup> is a proposed OBO-compliant, actively maintained, BFO-based, ontology providing a controlled vocabulary of degrees with simple classification -- doctoral, masters, bachelors, associate, others.

## Languages

The Language Ontology<sup>6</sup> is an OBO-compliant, actively maintained, BFO-based, ontology based on ISO 639<sup>7</sup>, and CEFR<sup>8</sup>, providing a controlled vocabulary of the languages of the world for use in describing works and language competencies.

## Additional Ontologies

The Information Artifact Ontology<sup>14</sup> (IAO), Ontology for Biomedical Investigations<sup>15</sup> (OBI), and the Software Ontology<sup>16</sup> (SWO) all have clear domains, are actively maintained and are BFO-based.

## References

1. Time Ontology in Owl. <https://www.w3.org/TR/owl-time/>
2. UK Reference Data. See eg: <http://reference.data.gov.uk/id/gregorian-instant/2006-01-01T00:00:00>
3. Gazatteer Ontology. <http://www.obofoundry.org/ontology/gaz.html>
4. Ilik, et. al. OpenVIVO: Transparency in Scholarship. <https://doi.org/10.3389/frma.2017.00012>
5. Early Thoughts on Representing Academic Degrees in VIVO. <http://bit.ly/2Jo4ws9>
6. Early Thoughts on Representing Language Capabilities in VIVO. <http://bit.ly/2Rbi8XY>
7. ISO 639. [https://en.wikipedia.org/wiki/ISO\\_639](https://en.wikipedia.org/wiki/ISO_639)
8. Common European Framework of Reference for Languages. <http://bit.ly/2YE8LXC>
9. Early Thoughts on Representing Organizations in VIVO. <http://bit.ly/2YHIMQt>
10. Research Organization Registry. <http://ror.org>

## References continued

11. Global Research Identifier Database. <http://grid.ac>
12. Contributor Role Ontology. <http://www.obofoundry.org/ontology/cro.html>
13. MARC Contributor relators. <http://id.loc.gov/vocabulary/relators.html>
14. Information Artifact Ontology. <http://www.obofoundry.org/ontology/iao.html>
15. Bandrowski, et. al., Ontology for Biomedical Invest. <https://doi.org/10.1371/journal.pone.0154556>
16. Software Ontology. <http://www.obofoundry.org/ontology/swo.html>
17. Eagle-i Resource Ontology. <http://www.obofoundry.org/ontology/ero.html>
18. Faceted Application of Subject Terminology. <http://bit.ly/2N06b7z>
19. Simple Knowledge Organization System. <https://www.w3.org/2004/02/skos>
20. Basic Formal Ontology. <http://www.obofoundry.org/ontology/bfo.htm>

*Interested? Have ideas for ontology to represent scholarship?  
All are welcome at the VIVO Ontology Interest Group. See <http://bit.ly/vivo-oig>*