

Data and ontology modeling and the RelReS project



Roxanne Wyns

Innovation manager @ KU Leuven - LIBIS

Roxanne.Wyns@libis.kuleuven.be



Bijbel van Anjou, KU Leuven Libraries - Maurits Sabbe Library, <http://resolver.libis.be/IE3562253/representation>

Context and content



Context and content



- The ReIReS project
- Ontologies and Linked Data
- Which ontology to catch?





Teneo Help Bookmark Change Layout Full Screen

F 14: Einleitung in die Phänomenologie. Vorlesungen aus dem Sommer 1912

Gang der Vorlesung in Touren 1912.
 4te : e d r p s l u s . p. 2 FI 4/2
 d s u c s f p p h i n o m e n o l o g i e n u .
 = 2 d 2 / 2 d s d e f . , y c l u e r
 p l o c e a u f , e y s , = l u n e t o .
e p l a z d s = - e i d e t i f e . e p l o c = d e f e i d e t . r e f .
o r e e i d e t . p s . e i d e t . r e f .
 p s y e e i d o s , e c o m m , y e s s e n z l e d e f n .

FI 4-1a FI 4-1a-24b... FI 4-1b-24a... FI 4-2a FI 4-2b FI 4-3a FI 4-3b FI 4-4a FI 4-4b FI 4-5a FI 4-5b FI 4-6a FI 4-6b FI 4-7a FI 4-7b FI 4-8a



Bijbel van Anjou, KU Leuven Libraries - Maurits Sabbe Library, <http://resolver.libis.be/IE3562253/representation>

The RelReS project

Access to resources





The ReIReS project (reires.eu)



Access to collections



ReIReS offers scholars from any academic discipline the opportunity to spend typically two weeks in one of fourteen outstanding European research centres (libraries and archives) in Belgium, Bulgaria, France, Germany, and Italy to carry out their research project in historical Religious Studies. The fourth call for applications is open from January 6, 2020 to February 16, 2020.

ReIReS grants:



- Free access to physical and virtual sources under the guidance of experts.
- Free travel and accommodation.



The ReIReS project

Virtual access



ReIReS

Research Infrastructure
on Religious Studies

[Home](#) [ReIReS](#) [Help](#) [About](#) [Profile : Roxanne Wyns](#) [Logout](#)

[Simple Search](#) [Advanced Search](#)

	Title	contains the words	aristotelis de naturali	-
AND	Author	contains the words	titelmannus	-
				+

[Search](#) [Clear](#)

N° of hits : 43

Sort by : [Relevance](#)



Publication date

From :

1528

Until :

1596

Contributor

Titelmannus, Franciscus (1)

Metadata provider



BOOK

Physicae Franc. Titelmanni Compendivm, ad libros Aristotelis de naturali philosophia vtilissimum. Accessit Libellus de mineralibus, plantis, & animalibus ..

Titelmannus, Franciscus
apud Michaëlem Roigny, Parisiis



BOOK

Physicæ Franc. Titelmanni compendivm, ad libros Aristotelis de naturali philosophia vtilissimum. Accessit Libellus de mineralibus, plantis, &



The RelReS project

Virtual access



Simple Search
Logout

AND

Search

N° of hits:

Publication date From: 1528 Until: 1596

Distributor

Metadata provider

Author

Publisher

BOOK

Physicae Franc. Titelmanni Compendium, ad libros Aristotelis de naturali philosophia vtilissimum. Accessit Libellus de mineralibus, plantis, & animalibus

Physicae compendium, ad libros Aristotelis de naturali philosophia utilissimum

Description : Period of publication : 1541-1600
Signature statement: A-C8 : 39, [8], [1 blank] p.

Authors : Titelmannus, Franciscus

Creationdate : 1577

Publicationdate : 1577

Publisher : apud Michaëlem Roigny, Parisiis

Language : Latin

Identifier : REIRES_KULeuven_BijzondereCol_9911057980101488

Data provider : KULeuven

License : <https://creativecommons.org/licenses/>

Source record : https://limo.libis.be/primo-explore/search?query=any,contains,9911057980101488&vid=KULeuven&lang=en_US


Record publication date : 2020-01-23

Record publisher : RelReS consortium, Europe

Media : [KU Leuven Libraries BIBC BRES CaaA419](#)

Citation
 E-mail
 Persistent link

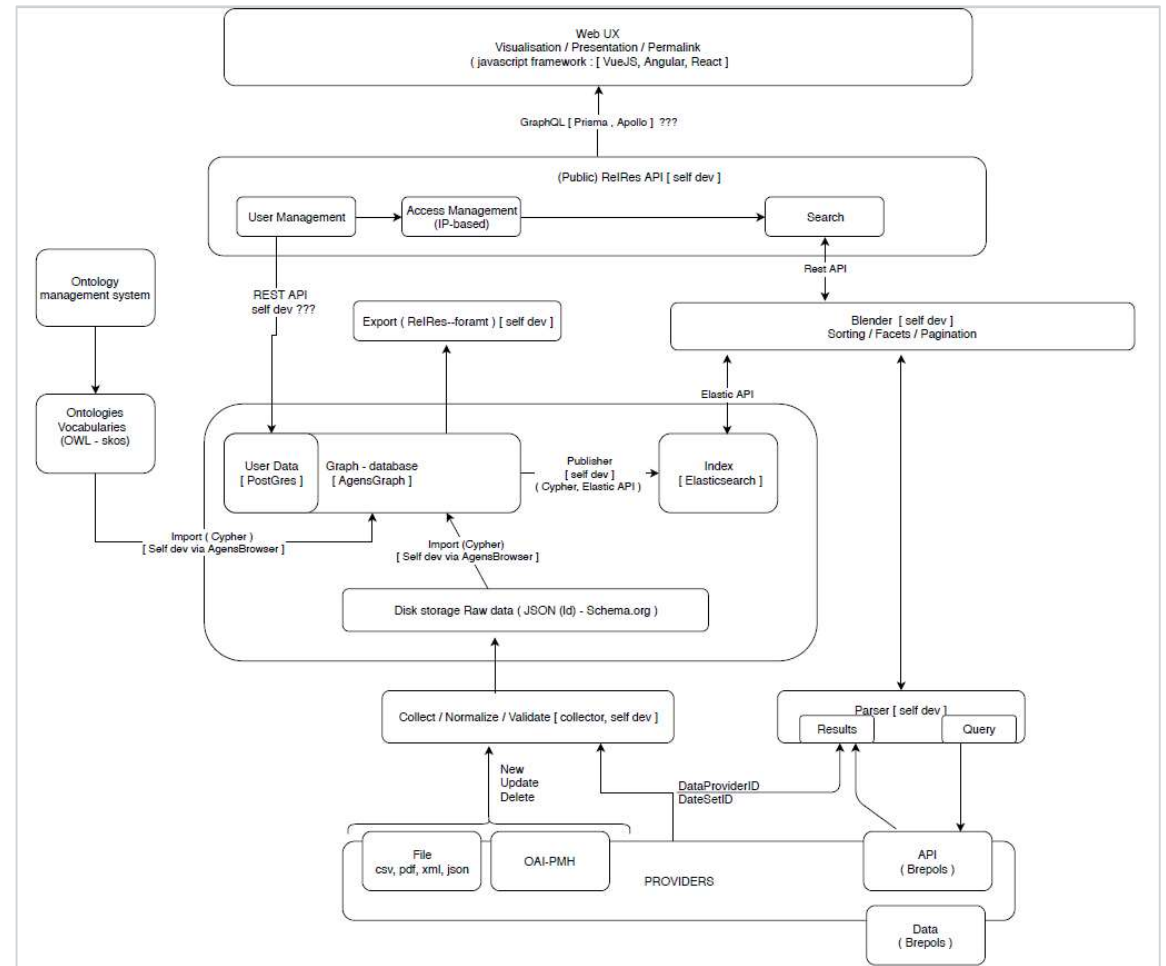
>>

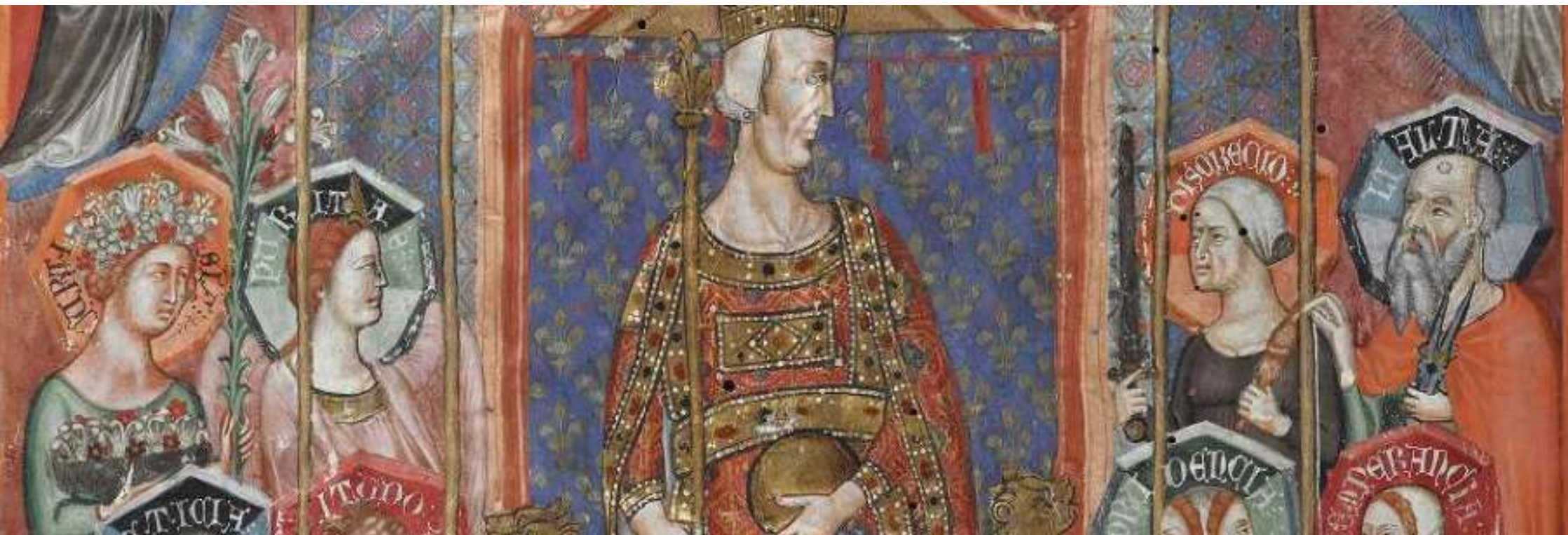


●●●● A future proof infrastructure



- ReIReS application model based on Schema.org ontology
- Powerful graph-DB and search engine
- Selection of existing open source components in combination with own development





Bijbel van Anjou, KU Leuven Libraries - Maurits Sabbe Library, <http://resolver.libis.be/IE3562253/representation>

Ontology schema's and Linked Data





Ontology schema modeling

schema.org



- [CreativeWork](#)
 - [3DModel](#)
 - [ArchiveComponent](#)
 - [Article](#)
 - [AdvertiserContentArticle](#)
 - [NewsArticle](#)
 - [AnalysisNewsArticle](#)
 - [AskPublicNewsArticle](#)
 - [BackgroundNewsArticle](#)
 - [OpinionNewsArticle](#)
 - [ReportageNewsArticle](#)
 - [ReviewNewsArticle](#)
 - [Report](#)
 - [SatiricalArticle](#)
 - [ScholarlyArticle](#)
 - [MedicalScholarlyArticle](#)
 - [SocialMediaPosting](#)
 - [BlogPosting](#)
 - [LiveBlogPosting](#)
 - [DiscussionForumPosting](#)
 - [TechArticle](#)
 - [APIReference](#)
 - [Atlas](#)
 - [Blog](#)
 - [Book](#)
 - [Audiobook](#)



Article

[Thing](#) > [CreativeWork](#) > [Article](#)

An article, such as a news article or piece of investigative report. Newspapers and magazines have articles of many different types and this is intended to cover them all.

See also [blog post](#).

[\[more...\]](#)

Property	Expected Type	Description
Properties from Article		
articleBody	Text	The actual body of the article.
articleSection	Text	Articles may belong to one or more 'sections' in a magazine or newspaper, such as Sports, Lifestyle, etc.
backstory	CreativeWork or Text	For an Article , typically a NewsArticle , the backstory property provides a textual summary giving a brief explanation of why and how an article was created. In a journalistic setting this could include information about reporting process, methods, interviews, data sources, etc.
pageTotal	Integer or	The page on which the work ends; for example "138" or "xvi".



Ontology schema modeling



MARC to Schema.org

```

- <record xsi:schemaLocation="http://www.loc.gov/MARC21/slim http://www.loc.gov/standards/marcxml/schema/MARC21slim.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="http://www.loc.gov/MARC21/slim">
  <leader>00000nam a22 a 4500</leader>
  <controlfield tag="FMT">BK</controlfield>
  <controlfield tag="LDR">00000nam a22 a 4500</controlfield>
  <controlfield tag="001">000000142</controlfield>
  <controlfield tag="005">20080626154410.0</controlfield>
  <controlfield tag="008">070710s1974 000 chi d</controlfield>
  - <datafield tag="210" ind2=" " ind1=" ">
    <subfield code="a">Zhang Tingyu, 'Ming shi'</subfield>
  </datafield>
  - <datafield tag="242" ind2="0" ind1="0">
    <subfield code="a">Ming shi</subfield>
  </datafield>
  - <datafield tag="245" ind2="0" ind1="0">
    <subfield code="a">明史</subfield>
    <subfield code="9">chi</subfield>
  </datafield>
  - <datafield tag="260" ind2=" " ind1="9">
    <subfield code="a">Beijing</subfield>
    <subfield code="b">Zhong hua shu ju</subfield>
    <subfield code="c">1974</subfield>
  </datafield>
  - <datafield tag="260" ind2="9" ind1=" ">
    <subfield code="a">北京</subfield>
    <subfield code="b">中华书局</subfield>
  </datafield>
  - <datafield tag="529" ind2=" " ind1=" ">
    <subfield code="a">Reprint of the original Qing dynasty work</subfield>
  </datafield>

```

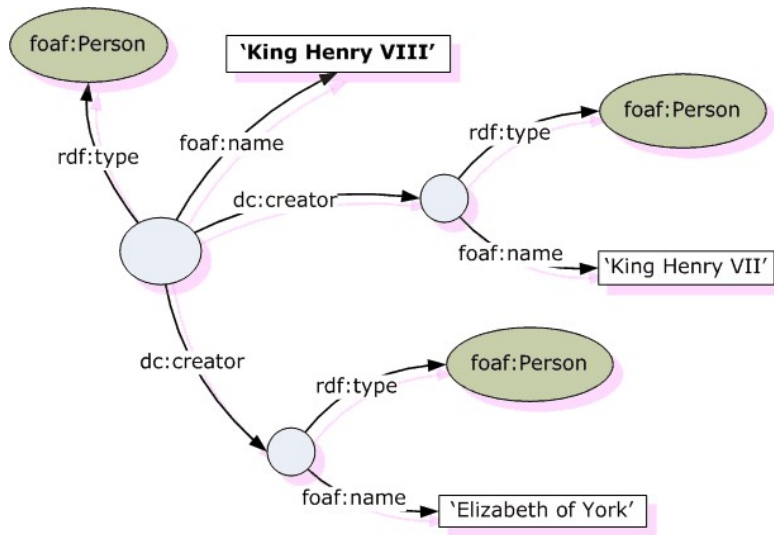
The diagram illustrates an ontology model for the provided MARC record. It features several classes and instances:

- Classes (green ovals):** `schema:Book` and `schema:Person`.
- Instances (white boxes):**
 - "明史" (Ming shi)
 - "Ming shi"
 - "Zhang Tingyu"
 - "Shi shi yi nian lu"
 - "釋氏疑年錄"
 - "Zhong hua shu ju"
 - "中华书局"
- Relationships (arrows):**
 - `schema:Book` is an `rdf:type` of the instance "Ming shi".
 - The instance "Ming shi" is the `schema:name` of the instance "明史".
 - The instance "Zhang Tingyu" is the `schema:author` of the instance "Ming shi".
 - The instance "Zhang Tingyu" is an `rdf:type` of `schema:Person`.
 - The instance "Shi shi yi nian lu" is the `schema:name` of the instance "釋氏疑年錄".
 - The instance "Zhong hua shu ju" is the `schema:name` of the instance "中华书局".
 - The instance "Zhong hua shu ju" is an `rdf:type` of `schema:Person`.
 - The instance "Shi shi yi nian lu" is the `schema:publisher` of the instance "Ming shi".
 - The instance "Zhong hua shu ju" is the `schema:publisher` of the instance "Ming shi".
 - The instance "Shi shi yi nian lu" is the `schema:publisher` of the instance "Shi shi yi nian lu".
 - The instance "Zhong hua shu ju" is the `schema:publisher` of the instance "Shi shi yi nian lu".
 - The instance "Shi shi yi nian lu" is an `rdf:type` of `schema:Book`.



Ontology schema modeling

An example in FOAF and Schema.org

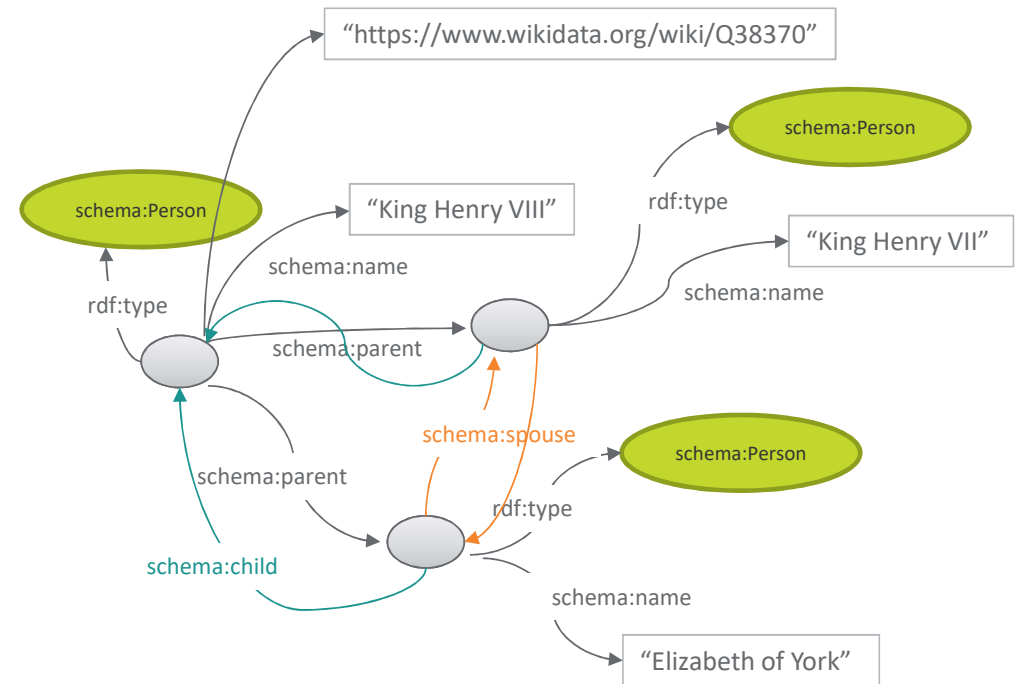


```

prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
prefix dc: <http://purl.org/dc/elements/1.1/>
prefix foaf: <http://xmlns.com/foaf/0.1/>

```

FOAF representation



Schema.org representation



Mashing up ontologies

GeoNames ontology



```

<gn:alternateName xml:lang="sr">Лувен</gn:alternateName>
<gn:alternateName xml:lang="bg">Льовен</gn:alternateName>
<gn:alternateName xml:lang="zh">鲁汶</gn:alternateName>
<gn:featureClass rdf:resource="http://www.geonames.org/ontology#P"/>
<gn:featureCode rdf:resource="http://www.geonames.org/ontology#P.PPL"/>
<gn:countryCode>BE</gn:countryCode>
<gn:population>92892</gn:population>
<gn:postalCode>3000</gn:postalCode>
<wgs84_pos:lat>50.87959</wgs84_pos:lat>
<wgs84_pos:long>4.70093</wgs84_pos:long>
<gn:parentFeature rdf:resource="http://sws.geonames.org/2792483/">
<gn:parentCountry rdf:resource="http://sws.geonames.org/2802361/">
<gn:parentADM1 rdf:resource="http://sws.geonames.org/3337388/">
<gn:parentADM2 rdf:resource="http://sws.geonames.org/3333250/">
<gn:parentADM3 rdf:resource="http://sws.geonames.org/2792481/">
<gn:parentADM4 rdf:resource="http://sws.geonames.org/2792483/">
<gn:nearbyFeatures rdf:resource="http://sws.geonames.org/2792482/nearby.rdf"/>
<gn:locationMap rdf:resource="http://www.geonames.org/2792482/leuven.html"/>
<gn:wikipediaArticle rdf:resource="http://ru.wikipedia.org/wiki/%D0%9B%D1%91%D0%B2%D0%B5%D0%BD"/>
</gn:Feature>
<foaf:Document rdf:about="http://sws.geonames.org/2792482/about.rdf">
  <foaf:primaryTopic rdf:resource="http://sws.geonames.org/2792482/">
  <cc:license rdf:resource="http://creativecommons.org/licenses/by/3.0/">
  <cc:attributionURL rdf:resource="http://sws.geonames.org/2792482/">
  <cc:attributionName rdf:datatype="http://www.w3.org/2001/XMLSchema#string">GeoNames</cc:attributionName>
  <dcterms:created rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2006-01-15</dcterms:created>
  <dcterms:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2008-07-11</dcterms:modified>
</foaf:Document>
</rdf:RDF>

```





Linking Data and authority databases



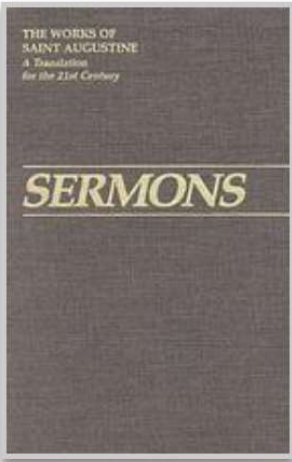
VIAF

← → ↻ 🏠 viaf.org/viaf/66806872/#Augustine_of_Hippo,_Saint,_354-430 150% ⋮ 📄 ☆

VIAF
Virtual International Authority File

Search

Select Field: Select Index: Search Terms: **Search**



- Augustinus, Aurelius, 354-430. 🇮🇪 🇨🇭 🇰🇾 🇩🇪 🇫🇷
- Augustine, of Hippo, Saint, 354-430 🇮🇪 🇺🇸 🇮🇹 🇦🇺
- Augustin, 0354-0430, saint 🇫🇷 🇩🇪
- Augustyn (święty ; 354-430). 🇵🇱 🇺🇸
- Augustine, Saint, Bishop of Hippo 🇮🇪 🇮🇹 🇪🇸
- Augustinus, Aurelius 🇩🇰 🇳🇱 🇮🇪 🇫🇷
- Augustín, svätý, 354-430 🇨🇪 🇵🇸
- Augustinus, saint, 354-430 🇵🇹
- Agustí, sant, bisbe d'Hipona, 354-430 🇪🇸
- Agustín, Santo, Obispo de Hipona 🇪🇸



Linking Data and authority databases



GeoNames

Name	Country	Feature class	Latitude	Longitude
1 Ghent GNE, Gaent, Gand, Gandavum, Gandawa, Gande, Gant, Gante, Ganti, Gent, Gentas, Gente, Gento, Ghent, Gint, Gænt, gen t...	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Gent	populated place population 231,493	N 51° 3' 0"	E 3° 43' 0"
2 Evergem Ehvergem, Evergem, Everghem Rabot, ai fu hai mu, aywrzhm, Евре́м, Эверге́м, إيورژم, 埃弗海姆	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Evergem	populated place population 31,615	N 51° 6' 47"	E 3° 42' 35"
3 Deinze Dajnze, Deinze, Dejnze, Deynze, dai yin ze, dnz, Дайнзе, Дейнзе, دين, 代因泽	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Deinze	populated place population 29,815	N 50° 58' 54"	E 3° 31' 51"
4 Aalter Aalter, Aeltre, Alter, Gemeente_Aalter, a er te, alth, Ααλτερ, Алтер, آلتير, 阿尔特	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Aalter	populated place population 18,802	N 51° 5' 24"	E 3° 26' 48"
5 Merelbeke Meirelbeke, Merelbeke, mei lei er bei ke, mwrlbwk, Мерелбеке, مورليوبك, 梅勒尔贝克	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Merelbeke	populated place population 22,047	N 50° 59' 40"	E 3° 44' 46"
6 Melle Melle	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Melle	populated place population 10,687	N 51° 0' 8"	E 3° 48' 18"
7 Lochristi Lochristi, Lokhristi, Loochristi, Loochristy, luo ke li si di, lwkrysty, Лохристи, لوكريسيتي, 洛克里斯蒂	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Lochristi	populated place population 19,696	N 51° 5' 47"	E 3° 49' 55"
8 Gavere Gavere, gwr, ha fu er, Гавере, غور, 哈菲尔	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Gavere	populated place population 11,888	N 50° 55' 45"	E 3° 39' 42"
9 Destelbergen Destelbergen, dai si te er bei heng, dtlbrzhan, Дестелберген, ديتيرزان, 代斯特尔贝亨	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Destelbergen	populated place population 16,853	N 51° 3' 34"	E 3° 47' 56"
10 Oosterzele Oosterzeele, Oosterzele, Osterzele, ao si te er ze lai, awztrzl, Острээле, اورزول, 奥斯特尔泽莱	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Oosterzele	populated place population 13,151	N 50° 57' 9"	E 3° 47' 53"
11 Ledeberg Ledeberg	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Gent	populated place population 8,454	N 51° 2' 18"	E 3° 44' 40"
12 Nevele Nevele	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Deinze	populated place population 11,153	N 51° 2' 7"	E 3° 32' 44"
13 Nazareth Nazareth	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Nazareth	populated place population 10,890	N 50° 57' 24"	E 3° 35' 39"
14 Knesselare Knesselaere, Knesselare	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Aalter	populated place population 7,889	N 51° 8' 21"	E 3° 24' 46"
15 De Pinte De Pinte, La Pinte, de ping te, dw pnt, Де Пинте, دپنت, 德平特	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > De Pinte	populated place population 10,020	N 50° 59' 36"	E 3° 38' 50"
16 Zulte Zulte	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Zulte	populated place population 14,670	N 50° 55' 10"	E 3° 26' 54"
17 Zomergem Somergein, Somergem, Zomergem	Belgium , Flanders East Flanders Province > Arrondissement of Ghent > Lievegem	populated place population 8,158	N 51° 7' 11"	E 3° 33' 53"
18 Ghent City of Ghent, Ghent	United States , Minnesota Lyon > City of Ghent	populated place population 367, elevation 357m	N 44° 30' 45"	W 95° 53' 28"



Bijbel van Anjou, KU Leuven Libraries - Maurits Sabbe Library, <http://resolver.libis.be/IE3562253/representation>

Which ontology to catch?





Linguistic Linked Open Data

<https://linguistic-lod.org/>



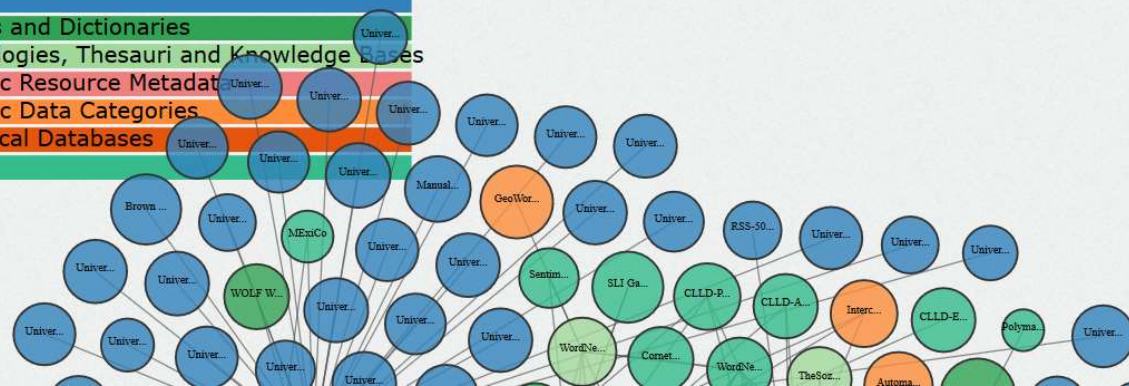
[Home](#) [About](#) [LLOD Cloud](#)

Linguistic Linked Open Data.

Information about the current status of the growing cloud of linguistic linked open data.

Legend

- Corpora
- Lexicons and Dictionaries
- Terminologies, Thesauri and Knowledge Bases
- Linguistic Resource Metadata
- Linguistic Data Categories
- Typological Databases
- Other





Lexicon Model for Ontologies



<https://lemon-model.net/>, [W3C](#)


 W3C Community Group Final Report

TABLE OF CONTENTS

1. **Overview**
2. **Introduction**
 - 2.1 Purpose of the model
 - 2.2 Namespaces
 - 2.3 Conventions in this document
3. **Core**
 - 3.1 Lexical Entries
 - 3.2 Forms
 - 3.3 Semantics
 - 3.4 Lexical Sense & Reference
 - 3.5 Usage
 - 3.6 Lexical Concept
4. **Syntax and Semantics (synsem)**
 - 4.1 Syntactic Frames
 - 4.2 Ontology Mappings
 - 4.3 Complex ontology mappings /

§ 3. Core

The following diagram depicts the core model (ontolex). Boxes represent classes of the model. Arrows with filled heads represent object properties, while arrows with empty heads represent subclass relations. In arrows labeled 'X/Y' (e.g. *sense/isSenseOf*), X (*sense*) is the name of the object property and Y (*isSenseOf*) the name of the inverse property.

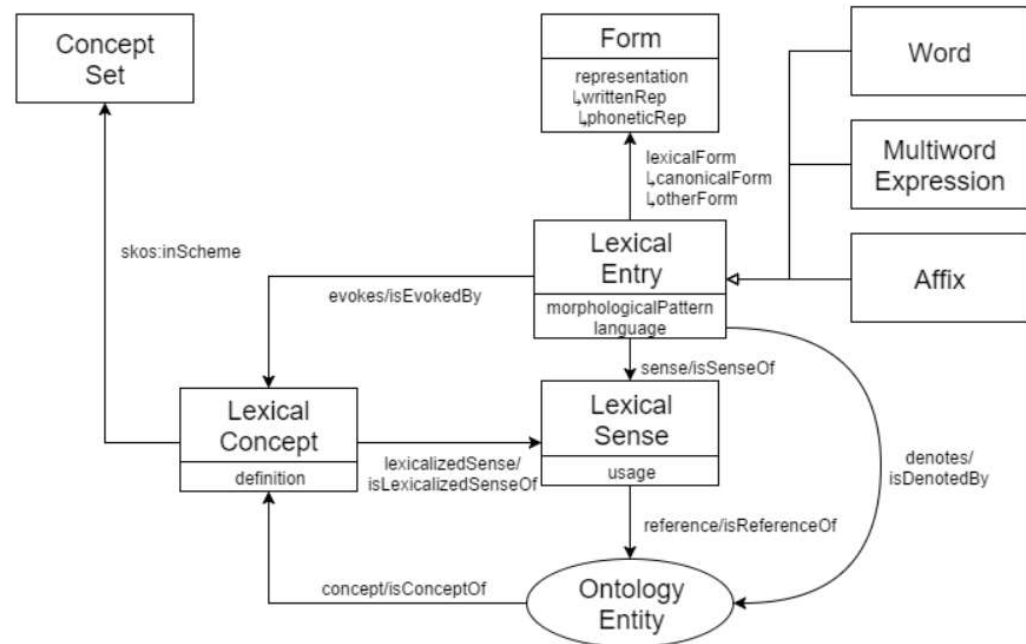


Figure 1 Lemon_OntoLex_Core.png

Do we need a shared vision?



“I envision a complex Web of semantics ruled by the same sort of anarchy that rules the rest of the Web. Instead of a few large, complex, consistent ontologies that great numbers of users share, I see a great number of small ontological components consisting largely of pointers to each other.”

Hendler, James. “Agents and the Semantic Web.” *IEEE Intelligent Systems* 16.2 (2001): 30-37.



Thank you!

Bijbel van Anjou, KU Leuven Libraries - Maurits Sabbe Library, <http://resolver.libis.be/IE3562253/representation>

Roxanne Wyns - Roxanne.Wyns@kuleuven.be