



## Introduction to LOD

revised December 2018

Patricia Harpring  
Managing Editor, Getty Vocabulary Program

Additional slides thanks to Joan Cobb, Gregg Garcia,  
Marcia Zeng, Vladimir Alexiev



# Table of Contents

What are the Getty vocabularies? 5

What is Linked Open Data (LOD)? 22

The Getty vocabularies as LOD 46

See full documentation and SPARQL endpoint here

<http://vocab.getty.edu/>

# Find the Getty Vocab Online

- For information about the Getty vocabularies, see this site
- Search the data, access data releases, how to contribute, editorial guidelines, training materials, news
- Contact us: [vocab@getty.edu](mailto:vocab@getty.edu)

<http://www.getty.edu/research/tools/vocabularies/index.html>

The Getty Research Institute

Exhibitions & Events | Special Collections | Library | **Search Tools & Databases** | Scholars & Projects | Publications | About the GRI

Print | Share

**Getty Vocabularies**

**NEW**

The Getty vocabularies are now available as Linked Open Data. [Learn more.](#)

*What is cinnabar? What is a rhyton?* The Getty vocabularies contain structured terminology for art, architecture, decorative arts, archival materials, visual surrogates, conservation, and bibliographic materials. Compliant with international standards, they provide authoritative information for catalogers, researchers, and data providers. The vocabularies grow through contributions. In the new linked, open environments, they provide a powerful conduit for research and discovery for digital art history. To search the vocabularies, click on the links below.

 **The Art & Architecture Thesaurus (AAT)®**  
*Catherine wheel or rose window?* AAT is a structured vocabulary, including terms, descriptions, and other metadata for generic concepts related to art, architecture, conservation, archaeology, and other cultural heritage. Included are work types, styles, materials, techniques, and others.

 **The Cultural Objects Name Authority (CONA)®**  
*Mona Lisa or La Gioconda?* CONA compiles titles, attributions, depicted subjects, and other metadata about works of art, architecture, and other cultural

 **The Getty Thesaurus of Geographic Names (TGN)®**  
*Thebes or Diospolis?* TGN is a structured vocabulary, including names, descriptions, and other metadata for extant and historical cities, empires, archaeological sites, and physical features important to research of art and architecture. TGN may be linked to GIS, maps, and other geographic resources.

 **The Union List of Artist Names (ULAN)®**  
*Titian or Tiziano Vecellio?* ULAN is a structured vocabulary, including names, biographies, and other

Linked Open Data  
GETTY VOCABULARIES

See What's New

- Multilingual & multi-cultural  
AAT: Conservation terms;  
Dutch: 60,600; Spanish:  
55,000; Chinese: 26,000;  
German: 20,500

Have a Question?

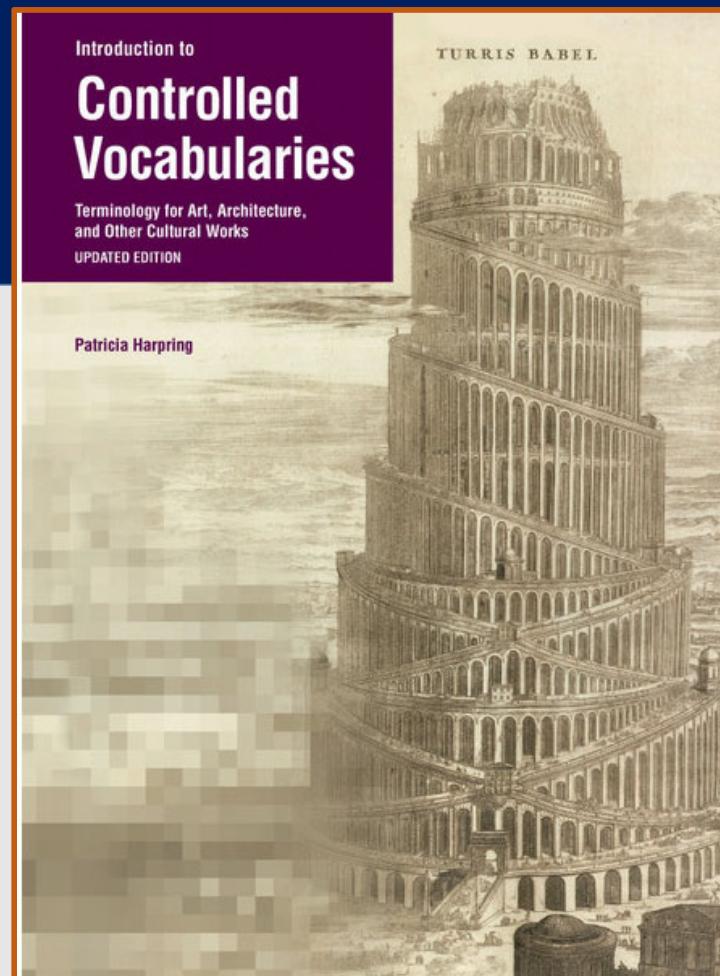
- Contact the Vocabulary Program
- Subscribe to GRI News

Images may be under additional copyright

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.

# Introduction to Controlled Vocabularies

- For information about controlled vocabularies
- Author:  
Patricia Harpring
- Series Editor:  
Murtha Baca



Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.

Images may be under additional copyright



# What are the Getty vocabularies?

Catalog, index, document, access, research, discover

# What are the Getty vocabularies?

Catalog, index, document, access, research, discover

- The Getty vocabularies are resources containing structured terminology for art, architecture, decorative arts, archival materials, visual surrogates, conservation, and bibliographic materials
- Compliant with international standards, they provide authoritative information for catalogers, researchers, and data providers
- The vocabularies grow through contributions. In the new linked, open environments, they provide a powerful conduit for research and discovery for digital art history



- AAT (*Art & Architecture Thesaurus* ©): e.g., *orthographic drawings, amphora, oil paint, oliveperf, peintures à l'huile, acetolysis, sintering, 玉器, Jadekünste, Olmeca, Rinascimento, Chen-Yen (Buddhism), watercolors, and asa-no-ha-toji*
- TGN (*Getty Thesaurus of Geographic Names* ©) : e.g., *Diospolis, Acalán, Ottoman Empire, Mogao, Ch'en-fu-tung, Ganges River, ສາ ນະ*
- ULAN (*Union List of Artist Names* ©): e.g., *Charles Vandenhove et associés, Mark Rothko, Cai Xiang, 蔡襄, Creole Master, Rajaraja Museum*
- IA (*Getty Iconography Authority*): e.g., *Bouddha couché, शिव (Hindu deity), Shiva, French Revolution, Adoration of the Magi, Flood of Deucalion, Xibalba, Niflheim*
- CONA (*Cultural Objects Name Authority* ©): e.g., *Chayasomesvara Temple, Empire State Building, Hagia Sofia, Αγία Σοφία, Mona Lisa, Portrait of Lisa Gherardini, La Gioconda, Livre de la Chasse, Le déjeuner sur l'herbe*

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.

Images may be under additional copyright

# Context of the Getty vocabularies

Getty processes contributions

- The Getty vocabularies comply with standards for thesaurus construction (NISO and ISO)
- Grow through contributions from the user community
- Compiled and disseminated by the Getty Vocabulary Program (GRI) and Getty Digital
- Released in online search (refreshed every month), XML, Relational Tables, Web Services, JSON, RDF, N3/Turtle, N-Triples; analysis going on now for other formats

**Batch loading of data**  
*From various contributors,  
 In our prescribed format*

**Processing Data**  
*Global edits, VCS system,  
 Merging, editing/adding info  
 Moving/adding links*

**Releasing Data**  
*Release formats  
 Web, LOD,  
 XML, Rel Tables*

# Context of the Getty vocabularies

Getty processes contributions

- **300 contributing institutions** to the Getty vocabularies  
[www.getty.edu/research/tools/vocabularies/contributors.html](http://www.getty.edu/research/tools/vocabularies/contributors.html)

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	
Brief Name	Full Name
A	
AS-Academia Sinica	Academia Sinica (Academia Sinica; Nankang, Taiwan)
AAM	Ackland Art Museum (Chapel Hill, North Carolina)
AKAG	Albright-Knox Art Gallery (Buffalo, New York)
AC	Allegheny College (Allegheny, Pennsylvania)

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.

**Batch loading of data**  
*From various contributors,  
 In our prescribed format*

**Processing Data**  
*Global edits, VCS system,  
 Merging, editing/adding info  
 Moving/adding links*

**Releasing Data**  
*Release formats  
 Web, LOD,  
 XML, Rel Tables*

Images may be under additional copyright

## Context of the Getty vocabularies

Getty processes contributions

- Valued as authorities =
  1. quality is reliable (compiled by experts and sources are cited)
  2. the data is linkable
- Use of Getty vocabularies = very high for the domain
- Online search page = around 100,000 searches / month, top resources at Getty Research Institute (GRI)
- Linked Open Data (LOD), typical month in 2018 =
 

over 1,000,000 records (92.95 GB of data)
- Implemented in collection management systems and Web sites around the world, new implementations

**Batch loading of data**  
*From various contributors,  
 In our prescribed format*

**Processing Data**  
*Global edits, VCS system,  
 Merging, editing/adding info  
 Moving/adding links*

**Releasing Data**  
*Release formats  
 Web, LOD,  
 XML, Rel Tables*

# How are the Getty vocabbs used?

**LINKS to vocabs**



<b>Catalog Level</b>	item
<b>Classification</b>	sculpture   antiquities
<b>Work Type</b>	statuette <span style="border: 1px solid red; padding: 2px;">AAT</span>
<b>Titles</b>	Female Figure of the Kilia Type Female Figure (Star Gazer)
<b>Creator</b>	unknown Anatolian
<b>Creation Date</b>	2800/2200 BCE
<b>Style/period:</b>	Chalcolithic
<b>General Subject</b>	human figures
<b>Specific Subject</b>	fertility   human female
<b>Current Location</b>	J. Paul Getty Museum, Getty Villa Malibu (Los Angeles, California, USA)
<b>Repository Number</b>	88.AA.122 <span style="border: 1px solid red; padding: 2px;">ULAN</span> <span style="border: 1px solid red; padding: 2px;">TGN</span>
<b>Dimensions</b>	14.3 cm height (5 5/8 inches)
<b>Mat &amp; Tech</b>	carved marble <b>Index:</b> marble <span style="border: 1px solid red; padding: 2px;">AAT</span>
<b>Style</b>	Kilia type

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.

## AAT record

## Fields controlled by vocabs

[Semantic View \(JSON, RDF, N3/Turtle, N-Triples\)](#)

ID: 300011443

Page Link: <http://vocab.getty.edu/page/aat/300011443>

 <b>marble (rock)</b> (metamorphic rock, rock (inorganic material), ... Materials (hierarchies))
<b>marbles (rocks)</b> (C,U,English,AD,U,N)
<b>marmor</b> (C,U,English,UF,U,N)
大理石 (C,U,Chinese (traditional)-P,D,U,U)
大理岩 (C,U,Chinese (traditional),UF,U,U)
dà lì shí (C,U,Chinese (transliterated Hanzi))
da li shi (C,U,Chinese (transliterated Pinyin))
ta li shih (C,U,Chinese (transliterated Wade-Giles))
marmer (C,U,Dutch-P,D,U,U)
marmerplaat (C,U,Dutch,UF,U,U)
marmerplaten (C,U,Dutch,UF,U,U)
marbre (roche) (C,U,French-P,D,U,U)
marbres (roche) (C,U,French,AD,U,N)
marmo (C,U,Italian-P,D,U,N)
mármol (C,U,Spanish-P,D,U,U)
Marmor (C,U,German-P,D,U,N)

Images may be under additional copyright

## Scope of each Getty vocabulary



AAT

*Art & Architecture Thesaurus®*

Includes **generic terms**, dates, relationships, sources, and notes for **work types, roles, materials, styles, cultures, techniques, and other concepts**

## Five Getty vocabularies

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.

### Sample record

**AAT\_ID:** 300011329

#### Terms:

bas-reliefs (pref, en, fr)  
 bas-relief (en, fr)  
 low reliefs (en)  
 bas-reliëfs (nl)  
 travertino (es)  
 bassorilievo (it)  
 bajos relieve (es)  
 travertin (fr)  
 Flachreliefs (de)  
**淺浮雕 (雕塑)**(zh; Chinese traditional)  
**qiǎn fú diāo** (Chinese (transliterated Hanyu Pinyin))  
**qian fu diao** (Chinese (transliterated Pinyin without tones))  
**ch'ien fu tiao** (Chinese (transliterated Wade-Giles))

#### Hierarchical Relationships

Objects Facet  
 ... Visual and Verbal Communication  
 .... Visual Works  
 ..... <visual works by material or technique>  
 .... sculpture (visual works)  
 ..... <sculpture by technique>  
 .... reliefs (sculptures)  
 ..... bas-reliefs (sculpture)

#### Associative Relationships

produced by ...  
 bas-relief (technique) [300053623]  
 distinguished from ...  
 high reliefs (sculpture) [300184782]

#### Scope Notes:

- Refers to works executed in relatively shallow relief. (en)
- Beeldhouwwerken uitgevoerd in relatief laag reliëf. (nl)
- Úsese para obras ejecutadas en relieve relativamente superficial. (es)
- 指浮雕圖案較淺的作品。 (zh)
- Bezeichnet eine Arbeit, die in relativ flachem Relief ausgeführt ist. (de)

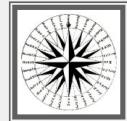
**Contributors:** AS-Academia Sinica, CDBP-DIBAM, GCI, ICCD, IfM-SMB-PK, RKD, AAT-Ned, VP

**Sources:** AATA database (2002-) 120890; Avery Index (1963-); Grove Art Online; Oxford English Dictionary; Lucie-Smith, Thames & Hudson Dictionary of Art Terms (2006); Ching, Diccionario Visual de Arquitectura (1997); Preble and Preble, Artforms (1989); RIBA, Architectural Keywords (1982); Van Dale groot woordenboek (1994); IfM Berlin; TAA database (2000-); AAT-Ned (1994-)



Images may be under additional copyright

# Scope of each Getty vocabulary



TGN

*Getty Thesaurus of  
Geographic Names®*

Focuses on places relevant to **art, architecture**, and related disciplines, recording names, relationships, place types, dates, notes, and coordinates for **current and historical cities, nations, empires, archaeological sites, lost settlements, and physical features**

Is a thesaurus, but through LOD  
TGN may be linked to  
GIS and maps

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.

## Sample record

**TGN\_ID:** 300011329

### Names:

Siena (pref, en,it,de,nl,fr,es)  
Sienna (en, it)  
Sienne (fr)  
Σιένα (el)  
锡耶纳 (zh)  
Сиена (ru)  
הינה (he)  
シェーナ(ja)  
Sienese (en,adj)  
Senae (historical, la)  
Saena Julia (historical, la)  
Sena (historical, Etruscan)

### Hierarchical Rel. (*polyhierarchical*)

- World (facet)
  - .. Europe (continent)
  - ... Italy (nation)
  - .... Tuscany (region)
  - ..... Siena (province)
  - ....... Siena (inhabited place)

- World (facet)
  - .. Europe (continent)
  - ... Italian Peninsula (peninsula)
  - .... Etruria (former confederation)
  - ..... Siena (inhabited place)

Historical: Late Etruscan

**Associative Rel**  
ally of Pisa ..(inhabited place) [7006082]  
Ghibelline allies, 13th-14th centuries

**Place Types** AAT

- inhabited place AAT
- ... founded by Et
  - (flourished by 6th century BCE)
- city
- archiepiscopal see
- commune (administrative) since 1125
- cultural center
- university center
- world heritage site

*Lat:* 43 19 07 N (43.3180)

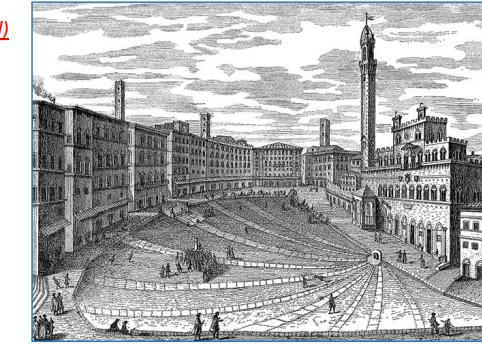
*Long:* 011 19 50 E (11.3300)

*Elevation:* 1056.430 feet (322.0000 meters)

**Note:** Siena was founded as an Etruscan hill town; later was the Roman city of Sena Julia (3rd century BCE). It flourished under the Lombard Kings (6th century CE) and was Medieval self-governing commune ...

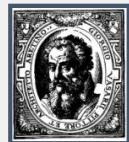
*Contributors:* BHA, FDA, GRLPSC, VP

*Sources:* Annuario Generale (1980); Canby, *Historic Places* (2007) 2/861; *Dizionario Corografico Toscana* (1977) 1508; Library of Congress Subject Headings (2002-); Milanesi, *Storia dell'Arte Senese* (1969) *passim*; NGA/NIMA database (2003-) -129709; TCI: *Toscana* (1984) 479 ff; *Times Atlas of the World* (1992) 183; UNESCO World Heritage Centre [online] (1992-) accessed 20 July 2010; Webster's Geographical Dictionary (2007) 1114



Images may be under additional copyright

# Scope of each Getty vocabulary



**ULAN**

Union List of Artist Names®

Includes names, relationships, notes, sources, and biographical information for **artists, architects, firms, studios, repositories, patrons, sitters, and other individuals and corporate bodies, both named and anonymous**

## Sample record

**ULAN\_ID:** 500014514

### Names:

Gaudí, Antoni (ca,es,en,fr,it)  
 Antoni Gaudí  
 Cornet, Antoni Gaudí  
 Cornet, Antonio Gaudí y  
 Gaudí, Antoní  
 Gaudí i Cornet, Antonio  
 Gaudí Jornet, Antoni  
 Gaudí y Cornet, Antoni  
 Gaudí Jornet, Antoni  
 Gaodi, Antoni  
 Gaudi, Antonio  
 安东尼·高迪 (he)  
 安东尼·高迪 (zh)

### Contributors:

VP,JPGM,Avery,FRICK, WCI,Prov,GRLPSC,BHA,CCA

**Sources:** Avery Authority files (1963-); Avery Index to Architectural Periodicals (1963-); Grove Art artist database (1989-); Grove Dictionary of Art online (1999-2002) accessed 13 August 2003; Harald Szeemann papers, Finding Aid, GRI Special Collections (2011-); Library of Congress Authorities database (n.d.) n 79079077

### Nationalities:

Spanish (pref)  
 Catalan

### Roles:

AAT  
 artist (pref)  
 architect  
 landscape architect  
 furniture designer

**LINKS**



### Gender:

male

**Birth and Death Places:** TGN  
 Born: Reus (Tarragona province, Catalonia, Spain)  
 (inhab place)  
 Died: Barcelona (Barcelona province, Catalonia, Spain)  
 (inhab place)

### Associative Relationships:

collaborated with .... Torres-García, Joaquín (Uruguayan painter and theorist, 1874-1949) 1903-1904 [500031259]  
 worked with ... Martorell y Montells, Joan (Spanish architect, 1833-1906) [500072753]  
 student of .... Sala Cortes, Emilio (Spanish architect, active late 19th century) [500287019]

# Scope of each Getty vocabulary



IA

Getty Iconography Authority

New resource that focuses on subjects and topics relevant to art, architecture, and related disciplines

Includes multilingual and multicultural proper names, relationships, and dates for **iconographical narratives, religious or fictional characters, themes, historical events, and named literary works and performing arts**

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.

## Sample record

**IA\_ID:** 1000085

### Names:

Avalokitesvara (en)

Avalokiteśvara (en)

Avalokitesvara (en)

अवलोकितेश्वर (sa)

শুভ্রাস্তা'শ্বিণ্ণ (bo)

Spyan ras gzigs (Tibetan transliterated)

### AAT links

role/characteristic is ... bodhisattva  
symbolic attribute is ... lotus  
culture/religion is ... Mahayana (Buddhism)  
culture/religion is ... Theravada (Buddhism)

AAT  
TGN  
ULAN  
CONA

**LINKS**

### Hierarchical Relationships

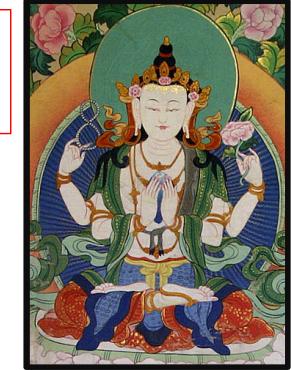
Top of the IA hierarchies

Legend, Religion, Mythology

Buddhist iconography

Buddhist characters

Avalokitesvara (Buddhist iconography)



### Associative Relationships

associated with .... Krishna (Hindu ideity)  
counterpart is .... Guanyin (Buddhist bodhisattva)  
counterpart is .... Tara (Hindu-Buddhist deity)  
has as manifestation .... Amoghapasa (Buddhist character)  
author of .... Great Compassion Mantra (incantation, Buddhist, translated 7th/8th century)

**Note** The bodhisattva of infinite compassion and mercy; embodies the compassion of all Buddhas. This bodhisattva is portrayed in different cultures as either female or male...

### Contributors & sources

[VP, Rijksmuseum] Encyclopedia Britannica Online (2002-); Bowker, Oxford Dictionary of World Religions (1997); Huntington, Art of Ancient India (1985); **LC: LC control no.: sh 85010492**

**LINKS to other resources: LOC, Iconclass**

Images may be under additional copyright

## Scope of each Getty vocabulary



**CONA**

Cultural Objects Name Authority®

Compiles titles/names and other information for works of art, architecture, and other cultural works, **current and historical, documented as items or in groups, whether works are extant, destroyed, or never built**

### Sample record

**CONA ID:** 700000141

#### **Titles/Names:**

Hagia Sophia (en)  
Ayasofya (tr)  
Αγία Σοφία (el)  
Agia Sofia  
Agia Sophia  
Haghia Sophia  
Sainte-Sophie (fr)  
Santa Sofía (es)  
Sancta Sophia (la)  
Sancta Sapientia (la)  
Holy Wisdom (en)  
Saint Sophia (en)  
圣索菲亚大教堂 (zh)

#### **Catalog Level:** item

**Work Types:**  
church (historical) AAT  
mosque (historical)  
museum  
basilica

**Classification:**  
architecture

**Creation Date:**  
original structure dated from 4th century CE; present structure built 532-537 CE; rebuilt in 12th century



ULAN

LINKS

#### **Locations:**

Current: İstanbul (Turkey)

**Address Note:** 41.008548°N; 28.979938°E

**Mat & Tech:** system bearing masonry, centralized plan; ashlar and brick; interior surfaces are sheathed with polychrome marble, porphyry, and mosaics

**Dimensions:** central dome: diameter 31 meters (102 feet); height 56 meters (184 feet)

#### **Styles:**

Byzantine | Ottoman

TGN

AAT

AAT

#### **General Subject:**

architecture **Type:** isness  
religion and mythology **Extent:** purpose

#### **Specific Subjects:**

Holy Wisdom (Christian allegory)

AAT  
TGN  
ULAN  
CONA  
IA

#### **Contributors:**

VP; BWR

**Sources:** Maidstone, Hagia Sophia (1988); Built Works Registry database (2015-) BWR3782560; Fleming, Penguin Dictionary of Architecture (1999); Theoharidou, Architecture of Hagia Sophia (1988); UNESCO World Heritage Centre [online] (1992-) C356

Images may be under additional copyright

Relationships and linking are built into and among the Getty vocabularies

## Merging data in one record

- Compiled resources = multiple contributors, separate records for same entity
- Published as unified records for end users
- Rather than clustering, Getty vocabularies merge the data into a homogenous whole
- The attribution to the contributor and sources are retained

**LINK back to contributed data**

Getty vocabularies merge contributed records

JPGM: tmsid\_3041  
Guardi, Francesco

Witt: WCI\_20934875  
Guardi, Francesco

Avery: avery\_49856  
Guardi, Francesco

BHA: bha\_8476  
Guardi, Francesco

GRIPA: pa\_50\_4cc  
Guardi, Francesco

PROV: pr\_2071665  
Guardi, Francesco



detail of portrait, by Pietro Longhi,  
in Ca Rezzonico, Venice

**ULAN\_500017409**

Names:

Guardi, Francesco  
Francesco Guardi  
Gardi, Francesco  
Garde, Francesco  
Gardis, Francesco  
François Guardi

Nationalities:

Italian  
Venetian

[Links to images](http://www.getty.edu/art/collection/objects/226156)



Roles:

artist  
painter  
landscapist

Images may be under additional copyright

Relationships and linking are built into and among the Getty vocabularies

## Merging data in one record



Getty vocabularies merge  
contributed records

ULAN ID	Matching name	Display biography	Roles (AAT-controlled)	Nationality (AAT-controlled)	Estimated birth date	Estimated death date
500017409	Guardi, Francesco	Venetian painter, 1712-1793	artist painter landscapist	Venetian Italian	1712	1793
500312969	Guardi, Francesco	Italian noble, born 1514	noble	Italian	1514	1614
500412666	Guardi, Francesco	Italian artist, ca. 1712-1793	artist	Italian	1707	1793

A name matches exactly; role matches; a nationality matches; dates within range?

- Candidates for merging
- Automatically merged or rejected for merging
- Possible but not enough firm data = passed to human editors
- Long experience in perfecting algorithms → Reconciliation tools are under development by Getty Digital

**ULAN record is a merged, homogenous entity**

Union List of Artist Names® Online  
Full Record Display

Click the icon to view the hierarchy.

Semantic View (JSON, JSONLD, RDF, N3/Turtle, N-Triples) ■ Represent

**Guardi, Francesco** (Italian painter, 1712-1793)

**Note:** Venetian painter, during the first half of his life worked on decorations and church paintings; later became a vedutista (view painter) of Venetian urban life.

**Names:**

- Guardi, Francesco (**preferred**, [V](#), [index](#), [LC](#))
- Francesco Guardi ([V](#), [display](#))
- Gardi, Francesco ([V](#))
- Garde, Francesco ([V](#))
- Gardis, Francesco ([V](#))
- Gauda, Francesco ([V](#))
- Guada, Francesco ([V](#))
- Guarda, Francesco ([V](#))
- Guarda, Francesco ([V](#))
- Guardet, Francesco ([V](#))
- Gvardi, Franchesko ([V](#))
- Guardi, François ([V](#))
- Guardi, Francisco ([V](#))

**Nationalities:**  
Italian (**preferred**)  
Venetian



**Contributors:**  
AVERY, BHA, C  
WL-Courtauld  
**Sources:**  
Avery Authorit  
Harald Szeem  
Collections (20  
J. Paul Getty M  
Library of Con  
M. Knoedler &  
Collections (20  
Provenance In  
RILA/BHA (19  
Witt Library, A

**Roles:**  
artist (**preferred**)  
painter  
landscapist

**Gender:** male

**Attribution to contributor and source is maintained, but merged, unified, and "preferred" is flagged**

**Birth and Death Places:**  
Born: [Venice \(Venezia province, Veneto, Italy\) \(inhabited place\)](#)  
Died: [Venice \(Venezia province, Veneto, Italy\) \(inhabited place\)](#)

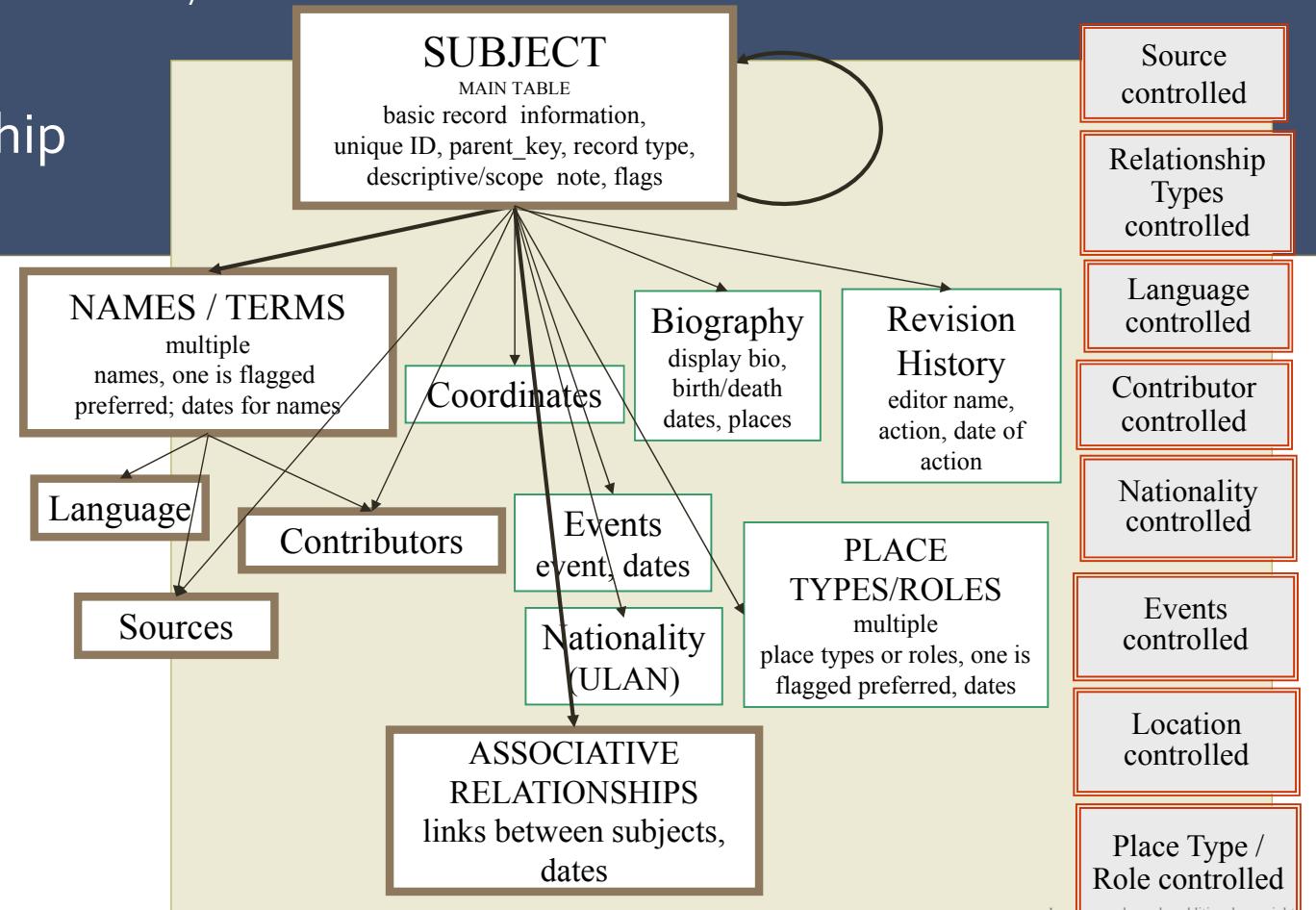
**Related People or Corporate Bodies:**  
member of .... [Guardi family](#)  
(Italian painters, active 18th century) [500060865]  
parent of .... [Guardi, Giacomo](#)  
(Italian painter, 1764-1835) [500023608]  
sibling by marriage (in-law) of .... [Tiepolo, Giovanni Battista](#)  
(Venetian painter, 1696-1770)  
[500018523]  
Cecilia Guardi married Tiepolo in 1719  
sibling of .... [Guardi, Antonio](#)  
(Italian painter, 1699-1760) [500025094]  
sibling of .... [Guardi, Niccolò](#)  
(Italian painter, 1715-1785) [500029088]

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.

Relationships and linking are built into Getty vocabularies

## simplified Entity Relationship Diagram

- All 5 vocabularies have same core structure
- Tables then added for specific needs



Relationships and linking are built into Getty vocabularies

# The Getty Vocabularies Are Thesauri

- Thesaurus: A semantic network of unique concepts
- Thesauri may be monolingual or multilingual
- Thesauri may have the following three relationships:
  - Equivalence Relationships
  - Hierarchical Relationships
  - Associative Relationships

**LINKS via thesaurus**

**AAT**



**hierarchical**

Objects Facet  
 .. Built Environment  
 .... Single Built Works  
 ..... <single built works by function>  
 ....... monuments  
 ....... memorial arches  
 ....... triumphal arches

**associative**

triumphal processions  
 triumphal procession  
 Triumphzug  
 processione triumphale  
 processione trionfale  
 procesion triunfal

locus/setting for

**equivalence**

triumphal arches  
 triumphal arch  
 凱旋門 (紀念性拱門)  
 kǎi xuán mén  
 triomfbogen  
 Triumphbögen  
 archi trionfali  
 arcos de triunfo



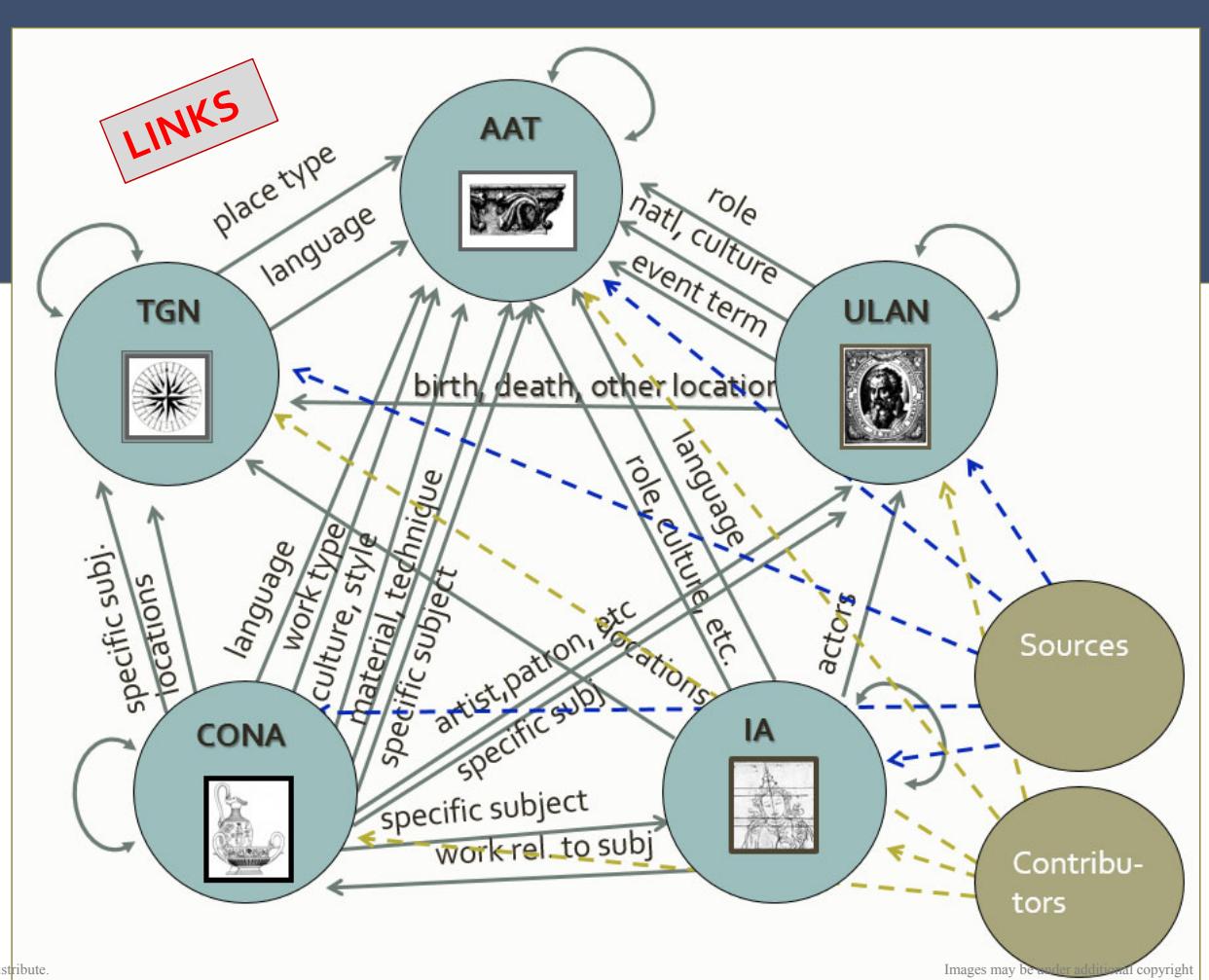
© J. Paul Getty Trust, author: Patricia Harpring. August 2018. For educational purposes only. Do not distribute.

Images may be under additional copyright

Relationships and linking

## Links between vocabularies

- Certain data within each Getty vocabulary = controlled through links to other vocabularies
- E.g., **roles** in ULAN (e.g., *artist, watercolorist, portraitist, patron, emperor*) = controlled by Agents Facet in AAT



Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.

Images may be under additional copyright



# What is Linked Open Data?

Catalog, index, document, access, research, discover

# What is Linked Open Data (LOD)?

```
{ "Subject": { "type": "uri", "value": "http://vocab.getty.edu/aat/300198841" }, "Predicate": { "type": "uri", "value": "http://www.w3.org/2000/01/rdf-schema#label" }, "Object": { "xml:lang": "el-latn", "type": "literal", "value": "rhyta" } }, { "Subject": { "type": "uri", "value": "http://vocab.getty.edu/aat/300198841" }, "Predicate": { "type": "uri", "value": "http://www.w3.org/2000/01/rdf-schema#label" }, "Object": { "xml:lang": "es", "type": "literal", "value": "rhyta" } }, { "Subject": { "type": "uri", "value": "http://vocab.getty.edu/aat/300198841" }, "Predicate": { "type": "uri", "value": "http://www.w3.org/2000/01/rdf-schema#label" }, "Object": { "xml:lang": "en", "type": "literal", "value": "rhyton" } }
```

**The AAT, TGN, and ULAN are now available as LOD  
They are published under the Open Data Commons Attribution License (ODC-By) 1.0**

- When data is linked and open, it means that data is structured and published according to the principles of Linked Data = both interlinked and made openly accessible and shareable on Semantic Web
- Goal = allow data from different resources to be interconnected and queried

# Linked Open Data (LOD)

- **Linked Data**
  - A set of best practices for publishing and connecting structured data on the Web to enable the interlinking possibilities.
  - It builds upon standard Web technologies such as HTTP and URIs.
  - But, rather than using them to serve web pages for human readers, it extends them to share information in a way that can be read automatically by computers.
- **Open data**
  - The idea that certain data should be freely available to everyone to use and republish as they wish, without restrictions from copyright, patents or other mechanisms of control.
- **Linked Open Data (LOD)**
  - A community project, sponsored by the Semantic Web Education and Outreach group of the W3C, to extend the Web with a data commons by publishing various open datasets as RDF on the WEB and by setting RDF links between data items from different data sources.
  - Both linked and open.

Joan Cobb

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

Images may be under additional copyright

# Basics of Linked Open Data

Unique,  
persistent IDs  
are critical

- Universal Resource Identifier (URI) - an ASCII string used to identify things on the Semantic Web  
**<http://vocab.getty.edu/aat/300198841>**

- URIs are linked to each other through triples composed of subject-predicate-object relationships  
**<aat:300198841> <gvp:aat2100\_distinguished\_from> <aat:300197140>**



subject

**rhyta** – [are] distinguished from –

predicate

object



- The definitions of data elements and links are described by ontologies  
<http://www.w3.org/2004/02/skos/core#>  
<http://www.w3.org/ns/prov#>  
<http://purl.org/dc/elements/1.1/>
- Data is delivered to a requesting agent through a standard triple serialization using HTTP  
**RDF/XML, Notation-3 (N3), Turtle, N-Triples, RDFa, JSON, JSON-LD**

Revised, based on Gregg Garcia

## Linked Documents vs Linked Data

- Linked Documents on the Web
  - Connected by hypertext
  - Allows users to traverse via Web browsers
  - Data is made available in formats such as CSV, XML, or marked up as HTML tables
- Linked Data on the Web
  - Connects data from diverse domains such as people, books, scientific publications, films, genes, drugs and clinical trials, online communities, statistical and scientific data.
  - Enables new generation of search engines that follow the links between data sources to deliver more complete answers as new data sources appear
  - Operate on top of an unbound, global data space.
  - Uses the Web to create typed links between data from different sources.

Joan Cobb

# Basics of Linked Open Data

ID: 300198841



rhyta (drinking vessels, <vessels for serving and consuming food>, ... Furnishings and Equipment (Hierarchy Name))

Note: Refers to vessels from Ancient Greece, eastern Europe, or the Middle East! with two openings, one at the top for filling and one at the base so that liquid could the shape of a horn or an animal's head, and were typically used as a drinking cup another vessel. Drinking was done by holding the rhyton above the drinker's head liquid in the mouth.

Terms:

rhyta (preferred, C,U,LC,English-P,D,U,  
(Greek (transliterated)-P,D,U,PN)  
(Spanish,AD,U,SN)

rhyton (C,U,English,AD,U,SN)  
(Greek (transliterated),AD,U,SN)  
(Spanish,AD,U,SN)

rhytons (C,U,English,UF,U,N)  
(French-P,D,U,PN)  
(Spanish-P,D,U,PN)

rhea (vessel) (C,U,English,UF,U,N)

rheon (C,U,English,UF,U,N)

rheon (C,U,English,UF,U,N)

rhytōn (C,U,Ancient Greek,UF,U,U)

rhytōn (C,U,Ancient Greek (transliterated),UF,U,U)

rhytōn (C,U,Dutch-P,D,U,U)

rhyton (C,U,Dutch,UF,U,U)

rhytons (C,U,French,UF,U,N)

rhyton (C,U,French,UF,U,N)

rhytons (C,U,Spanish,UF,U,N)

rhyton (C,U,Spanish,UF,U,N)

escanciadora (C,U,Spanish,UF,U,SN)

HTML



Facet/Hierarchy Code: VTQ

Hierarchical Position:

```

    Objects Facet
      .... Furnishings and Equipment (Hierarchy Name) (G)
        .... Containers (Hierarchy Name) (G)
          .... containers (receptacles) (G)
            .... <containers by function or context> (G)
              .... <culinary containers> (G)
              .... <containers for serving and consuming food> (G)
                .... <vessels for serving and consuming food> (G)
                  .... <drinking vessels> (G)
                    .... rhyta (G)
  
```

Additional Parents:

```

    Objects Facet
      .... Furnishings and Equipment (Hierarchy Name) (G)
  
```

```

<?xml version="1.0" encoding="utf-8"?>
<Vocabulary xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="http://vocabservices.getty.edu/vocab.xsd">
<Subject Subject_ID="300198841">
  - <Preferred_Parent>
    <Parent_Subject_ID>300194567</Parent_Subject_ID>
    <Relationship_Type>Parent/Child</Relationship_Type>
    <Historic_Flag>Current</Historic_Flag>
    <Parent_String>drinking vessels [300194567] vessels for serving food [or context] or containers [300198938], containers [300197197], and Equipment (Hierarchy Name) [300000000] [300000000]</Parent_String>
    <Hier_Rel_Type>Genus/Species-BTG</Hier_Rel_Type>
  </Preferred_Parent>
  - <Non-Preferred_Parent>
    <Parent_Subject_ID>300198865</Parent_Subject_ID>
    <Relationship_Type>Parent/Child</Relationship_Type>
    <Historic_Flag>Current</Historic_Flag>
    <Parent_String>plastic vases (ancient vessels) [300198865], vessels (containers) [300193015], containers by form [301971971], receptacles [300197197], Containers (Hierarchy Name) and Equipment (Hierarchy Name) [300264551], Objects Facet [300000000] [300000000]</Parent_String>
    <Hier_Rel_Type>Genus/Species-BTG</Hier_Rel_Type>
  </Non-Preferred_Parent>
  - <Non-Preferred_Parent>
    <Parent_Subject_ID>300198333</Parent_Subject_ID>
    <Relationship_Type>Parent/Child</Relationship_Type>
    <Historic_Flag>Current</Historic_Flag>
    <Parent_String>ceremonial vessels [300198333], ceremonial containers by function or context [300197200], containers [300197197], Containers (Hierarchy Name) [300045611], Equipment (Hierarchy Name) [300264551], Objects Facet [300000000]</Parent_String>
    <Hier_Rel_Type>Genus/Species-BTG</Hier_Rel_Type>
  </Non-Preferred_Parent>
  </Parent_Relationships>
  - <Descriptive_Notes>
    <Note_Text>Refers to vessels from Ancient Greece, eastern that typically have a closed form with two openings, one at the top for filling and one at the base so that liquid could stream out. They are often in the shape of an animal's head, and were typically used as a drinking cup another vessel. Drinking was done by holding the rhyton and catching the stream of liquid in the mouth.</Note_Text>
    <Note_Language>English</Note_Language>
  </Descriptive_Notes>

```

XML

SUBJECT #300198841	
skos:altLabel	escanciadora
skos:altLabel	rhea
skos:altLabel	rheon
skos:altLabel	rheons
skos:altLabel	rhyton
skos:altLabel	rhytons
skos:altLabel	rhytōn
skos:altLabel	riton
skos:altLabel	ritons
skos:altLabel	ritón
skos:altLabel	ritóns
is_broader	<http://karma.getty.edu/2020/resource/AAT/Subject/300265000>
skos:broader	<http://karma.getty.edu/2020/resource/AAT/Subject/300194567>
gvp:broaderNonPreferred	<http://karma.getty.edu/2020/resource/AAT/Subject/300198333>
gvp:broaderNonPreferred	<http://karma.getty.edu/2020/resource/AAT/Subject/300198865>
is_gvp_btgRelationshipType_of	<http://karma.getty.edu/2020/resource/AAT/Subject/300194567>
is_gvp_btgRelationshipType_of	<http://karma.getty.edu/2020/resource/AAT/Subject/300198333>
is_gvp_btgRelationshipType_of	<http://karma.getty.edu/2020/resource/AAT/Subject/300198865>
gvp:btgRelationshipType	<http://karma.getty.edu/2020/resource/AAT/Subject/300265000>
gvp:faceCode	V.TQ
is_gvp_historicFlagCurrent_of	<http://karma.getty.edu/2020/resource/AAT/Subject/300194567>
is_gvp_historicFlagCurrent_of	<http://karma.getty.edu/2020/resource/AAT/Subject/300198333>
is_gvp_historicFlagCurrent_of	<http://karma.getty.edu/2020/resource/AAT/Subject/300198865>
gvp:historicFlagCurrent	<http://karma.getty.edu/2020/resource/AAT/Subject/300265000>
SUBJECT #300198841	
rdfs:label	
skos:note	Refers to vessels from Ancient Greece, eastern Europe, or the Middle East that typically have a closed form with two openings, one at the top for filling and one at the base so that liquid could stream out. They are often in the shape of an animal's head, and were typically used as a drinking cup another vessel. Drinking was done by holding the rhyton and catching the stream of liquid in the mouth.
skos:note	Refers to vessels from Ancient Greece, eastern Europe, or the Middle East that typically have a closed form with two openings, one at the top for filling and one at the base so that liquid could stream out. They are often in the shape of an animal's head, and were typically used as a drinking cup another vessel. Drinking was done by holding the rhyton and catching the stream of liquid in the mouth.

RDF

Joan Cobb

# Basics of Linked Open Data

## Triple Store vs. RDBMS

### Triple Stores (OWLIM, 4store, Virtuoso)

- Built for storage and retrieval of triples
- Queried using SPARQL
- Import/export using RDF and SPARQL Update

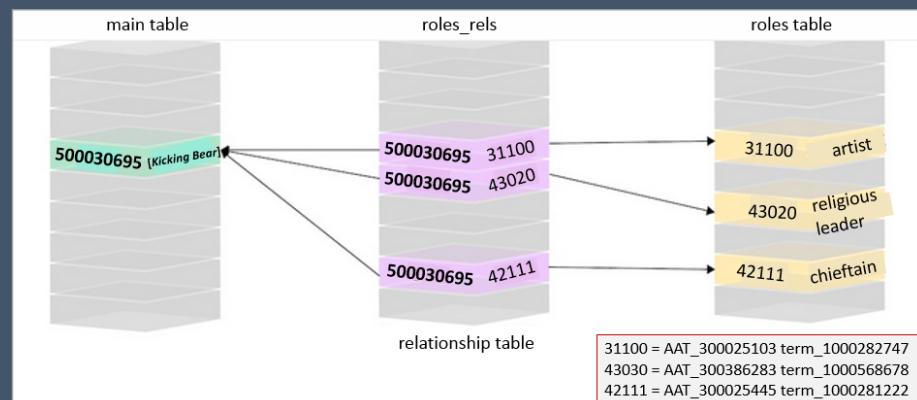
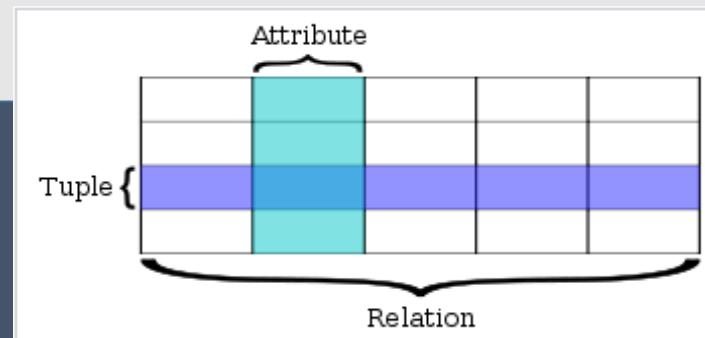
### Relational Database Management Systems (Oracle, SQL Server, MySQL)

- Data is organized into flat, two-dimensional tables containing fields
- Queried using SQL
- Import/export using DML statements along with whatever formats are supported by RDBMS such as comma-delimited files and XML

Gregg Garcia

# What is a relational data model

- A relational database is a set of formally described tables from which data can be accessed or reassembled in many different ways without having to reorganize the database tables
- The standard user and application programming interface (API) of a relational database is the Structured Query Language (SQL)
- Each table (called a relation) in a relational database contains one or more data categories in columns (called attributes)
- Each row (called a record or tuple) contains a unique instance of data, or key, for the categories defined by the columns
- Each table has a unique primary key, which identifies the information in a table
- The relationship between tables can then be set via the use of foreign keys



## What is an SQL query?

- **Structured Query Language** is the standard means of manipulating and *querying* data in relational databases
- SELECT <data> FROM <table>
- WHERE <condition exists>
- Example queries one table; you can search multiple tables by using a JOIN
- You can do sub-queries to accumulate a set, and then do another query on that set
- As with any report, formulating results in a friendlier format is a separate step

finds IDs of ULAN records for people having nationality “Native American” in the DB

The screenshot shows the 'Ad hoc SQL Tool' window. At the top, there are two buttons: 'Get SQL' and 'Save SQL'. Below them is a text area containing the SQL query:

```
SELECT distinct subject_id FROM nationality
WHERE nationality_code LIKE '992010'
```

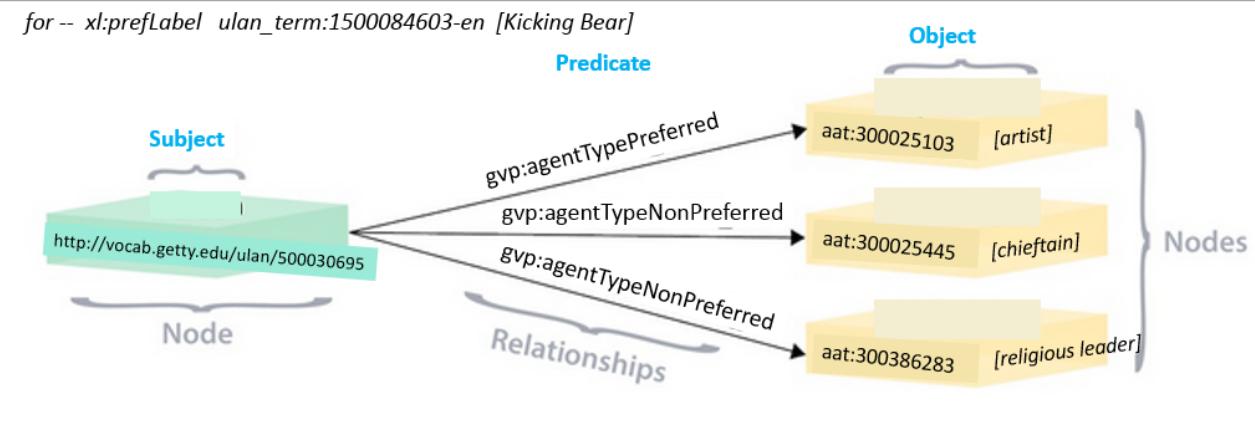
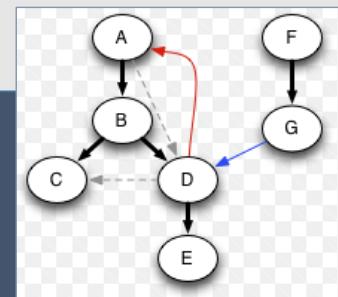
Below the query, there are two sections: 'Output Filename' and 'Output Data'. The 'Output Filename' section shows the path: C:\Users\pharpring\Documents\AAA-Patricia-1\aaa temp folder\ulan.txt. The 'Output Data' section displays a list of Subject IDs:

Subject ID
500019401
500029423
500030695
500034054
500034056
500034059
500034178

At the bottom right of the window is a 'Execute SQL' button.

# What is a graph-based data model

- A graph database (GDB) is a database that uses graph structures for semantic queries with nodes, edges and properties to represent and store data
- Querying relationships within a graph database is fast because they are perpetually stored within the database itself
- Native *graph* processing (called index-free adjacency) is the most efficient means of processing data in a *graph* because connected nodes physically point to each other in the *database*



Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

Neo4j

Images may be under additional copyright

## What is a SPARQL query?

- SPARQL Protocol RDF Query Language was made a standard by the RDF Data Access Working Group (DAWG) of the W3C
- SPARQL endpoint is a service that accepts SPARQL queries and returns results
- As with SQL, you SELECT where conditions apply  
FROM is optional
- As with any report, formulating results in a friendlier format is a separate step

finds IDs of ULAN records for people having nationality “Native American” and role “artist”

```
select * {  
  {select distinct ?x {  
    ?x foaf:focus/(schema:nationality|(schema:nationality/  
    gvp:broaderGenericExtended)) aat:300017437;  
    gvp:agentType|(gvp:agentType/gvp:  
    broaderGenericExtended) aat:300025136}}}  
  ?x gvp:prefLabelGVP/xl:literalForm ?name;  
  foaf:focus/gvp:biographyPreferred/schema:description  
  ?bio}
```

# Five-star data

Sir Tim Berners-Lee, the inventor of the WWW and the initiator of Linked Data, presented a Star Scheme for measuring the rank of a dataset



Available on the Web (any format) with an open license, to be Open Data



Available as machine-readable structured data (e.g., Excel instead of image scan of a table)



Available in a non-proprietary format (e.g., CSV instead of Excel)



All of the above plus using open standards from W3C (RDF and SPARQL) to identify things so that users can point to your data



All of the above plus linking your data to other data sets to provide context

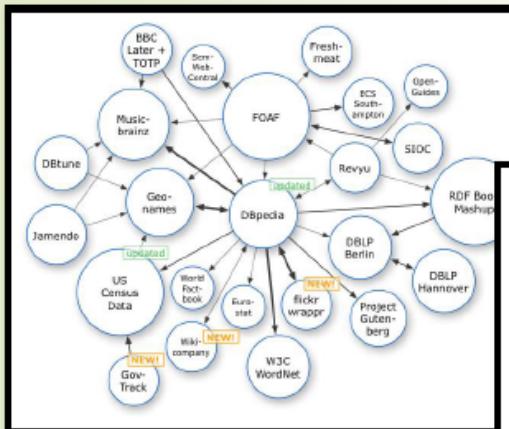
<https://www.w3.org/DesignIssues/LinkedData.html>

Marcia Zeng

Images may be under additional copyright

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

## Growth of the LOD Cloud since 2007



View of LOD as of October 2007

12 Datasets

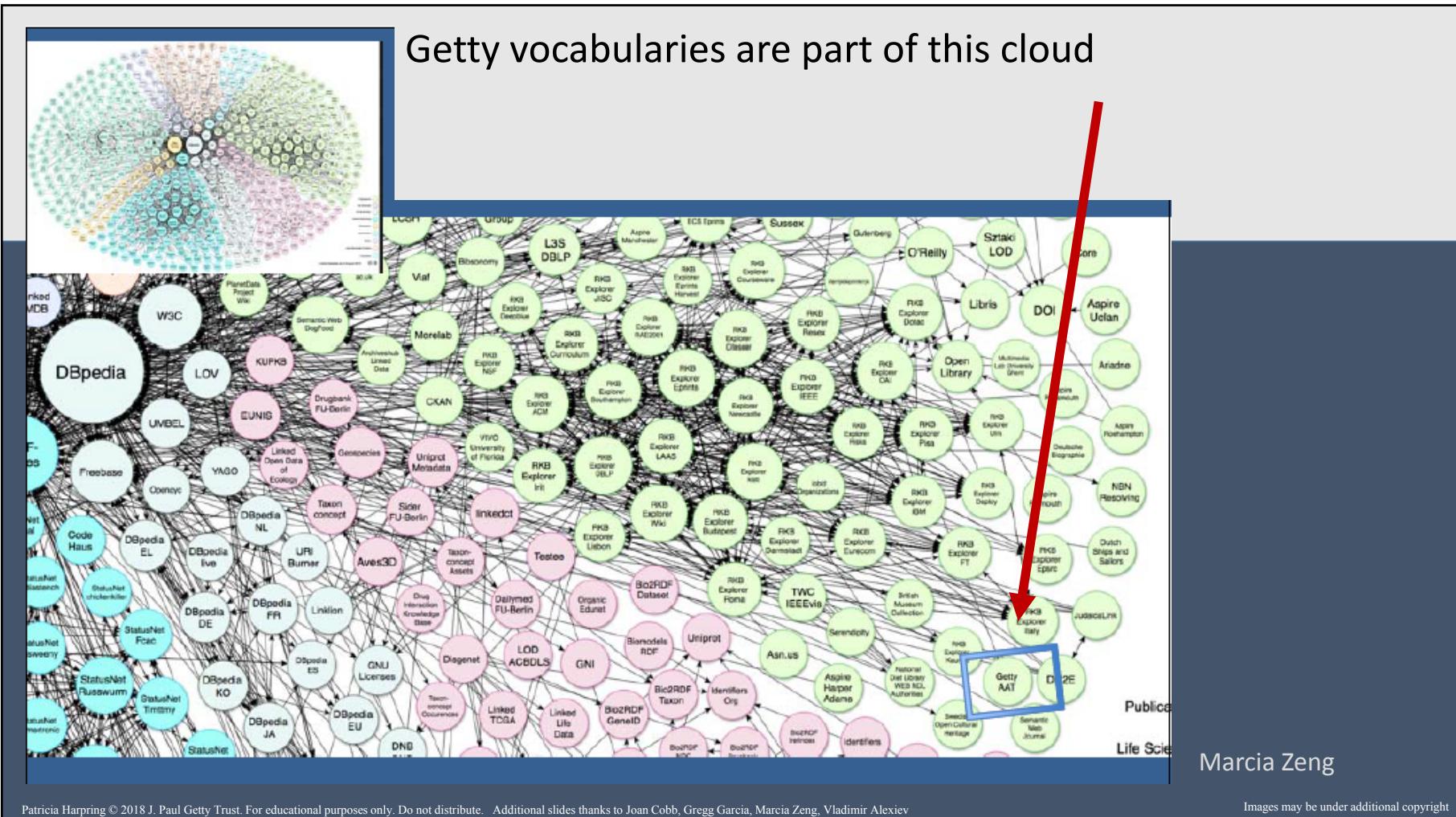
LOD as of 2018  
5,000 datasets

<http://lod-cloud.net/>

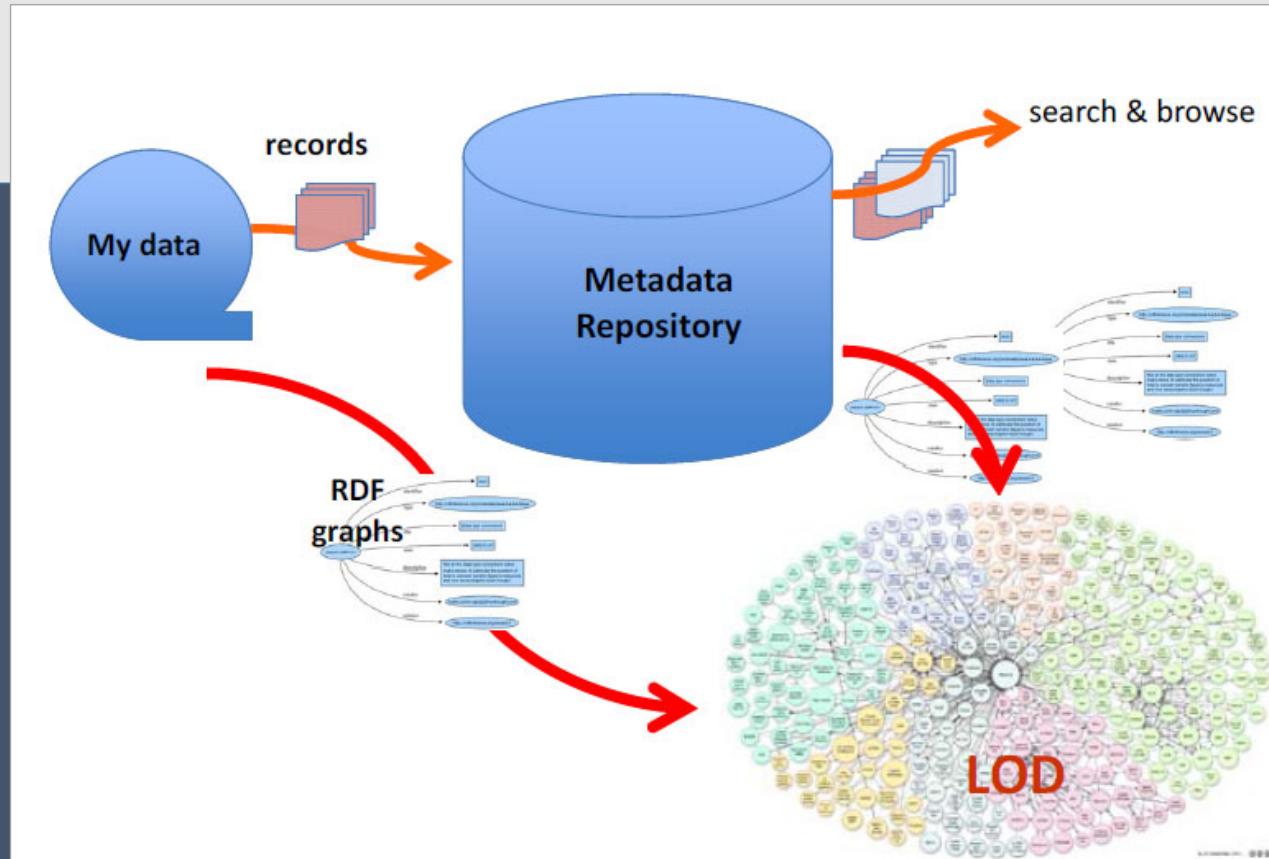
Revised from Joan Cobb

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

Images may be under additional copyright



# Using LOD



Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

Marcia Zeng

Images may be under additional copyright

## Resource Description Framework (RDF)

One of the key ingredients of Linked Data.

Provides a generic graph-based data model for describing things, including their relationships with other things.

- Three column format – known as a *triple* – forms the fundamental building block of semantic representations.

*Subject* - corresponds to the entity – a ‘thing’

*Predicates* – property of the entity - names, birth/death dates

*Objects* - Subjects in another triple OR Literal values

Conceptualized anything (and everything) in the universe as a resource.

Specifically supports evolution of schemas over time without requiring all the data consumers to be changed

RDF has varying representations (e.g., XML, text, JSON)

# LOD Ontologies & Vocabularies

- Ontology
  - Used to capture knowledge about some domain of interest. An ontology describes the concepts in the domain and also the relationships that hold between those concepts.
- Vocabulary
  - A vocabulary in the sense of knowledge systems or ontologies are controlled vocabularies. They provide a way to organize knowledge for subsequent retrieval.
- Semantic Web Ontology
  - This is a formal specification of a shared conceptualization of the information to be published.
  - Examples of the vocabulary used in ontologies: class, object property, role, category, property, resource, etc.

# Uniform Resource Identifier (URI)

- Identifies a resource either by location (URL), or name (URN). It usually includes some type of unique and persistent identifier.
- URIs are not URLs but every URL is a URI
- The URI for a resource represented in an RDF statement is called the URI reference (URIref) for that graph node.
- URIs are used as ‘strong keys’ that are assigned to each of the nodes so that we can refer to them consistently across all the triples that describe their relationships.
- The URN that will be the base URI for AAT will be <http://vocab.getty.edu/aat>.

# Web Ontology Language (OWL)

- Developed by the W3C
- Built as an extension to RDFS
- Provides a precise vocabulary that enables more powerful reasoning and inference over relationships with which knowledge can be represented.
- Can be seen as a social contract between a data provider and a data consumer.

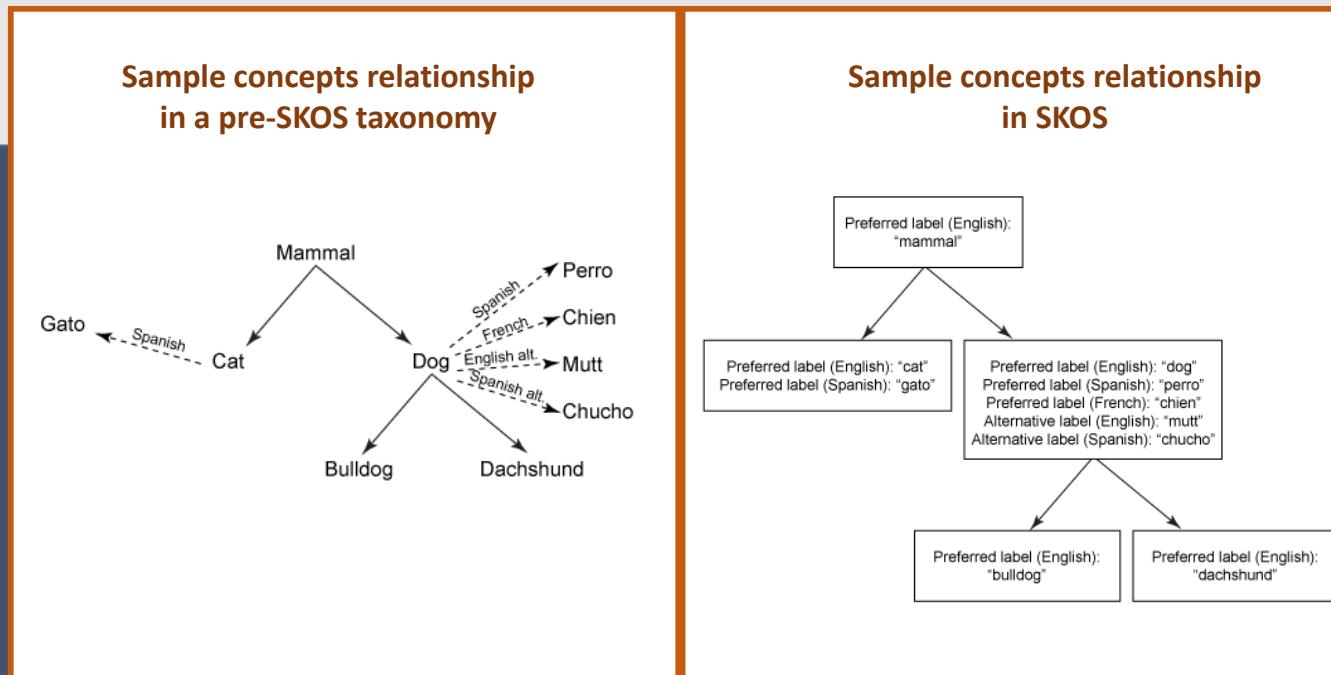
## Simple Knowledge Organization System (SKOS)

A language designed for representation of thesauri, classification schemes, taxonomies, subject-heading systems, or any other type of structured controlled vocabulary.

Based on RDF

- SKOS is currently developed within the W3C framework  
Can be used on its own, or in combination with other ontologies.

## LOD: Simple SKOS example



<http://www.ibm.com/developerworks/xml/library/x-skostaxonomy/index.html>

# Triplestores

- Are purpose-built databases for the storage and retrieval of the type of unstructured information express in RDF triples that makes up the Semantic Web.
- Are not relational databases.
- Query language used with triplestores is typically SPARQL
- In addition to queries, triples can usually be imported/exported using RDF and other formats.
- Some triplestores store billions of triples.

# Why do we care?

- The way data is being published on the web is currently in transition.
- A current trend in managing art information is to increasingly make data art, architecture, and cultural heritage objects available as Linked Open Data.
- This applies to the information directly describing the objects, but also the vocabularies used in the descriptions.
- For years now, the Getty Vocabulary team has been receiving legitimate requests to publish our thesauri as LOD.
- It was time to stop asking “why” and to start exploring “how”.

## Key advantages of Linked Open Data

- **Open** means Everyone can access, reuse, enrich and share the data published in agreed-upon formats = LOD formats
  - Using common formats makes “interworkability” more feasible
- LOD disambiguates your search; eliminates the noise you sometimes get in Google search; what you are seeking is more precise because of the way you tag the information you are converting to LOD
- LOD connects you to all kinds of relevant information creating a playground for serendipity and it updates that information dynamically within the same web space
- LOD is able to connect data from the Web that was not previously connected



See full documentation and SPARQL endpoint here

<http://vocab.getty.edu/>

# The Getty vocabularies as LOD

Catalog, index, document, access, research, discover

# Why Linked Open Data?

- The time was right for the Getty, particularly as the LOD project coincides with the Getty's Open Content initiative
  - The J. Paul Getty Museum and Getty Research Institute (GRI) make available, without charge, all available digital images to which the Getty holds the rights or that are in the public domain to be used for any purpose. No permission is required
  - [www.getty.edu/about/opencontent.html](http://www.getty.edu/about/opencontent.html)
- Also, GRI Portal: The Getty Research Portal™ is an online search platform providing global access to growing number of digitized art history texts
- The Getty Conservation Institute (GCI), GRI, and the Getty Museum are also releasing information as LOD

<http://vocab.getty.edu/aat/300198841> <http://www.w3.org/1999/02/22-rdf-schema#label> "AAT"  
<http://vocab.getty.edu/aat/300198841> <http://www.w3.org/1999/02/22-rdf-schema#type> "RDFSClaim"  
<http://vocab.getty.edu/aat/300198841> <http://www.w3.org/2000/01/rdf-schema#isPartOf> <http://vocab.getty.edu/aaa/2000/01/rdf-scilist>  
<http://vocab.getty.edu/aat/300198841> <http://www.w3.org/2000/01/rdf-schema#isPartOf> <http://vocab.getty.edu/aaa/2000/01/rdf-scilist>  
<http://vocab.getty.edu/aat/300198841> <http://www.w3.org/2000/01/rdf-schema#isPartOf> <http://vocab.getty.edu/aaa/2000/01/rdf-scilist>

# Licensing the data

- Historically, the Getty vocabularies relational tables, XML, (MARC) were licensed, with use somewhat restricted; fees adjusted for not-for-profit and for-profit licensees
- Policy makers and legal experts analyzed which licensing was best for LOD

## Open Data Commons Attribution License (ODC-By) v1.0

Allows that you (the users) are free to do the following:

- To Share: To copy, distribute, and use the database
- To Create: To produce works from the database
- To Adapt: To modify, transform, and build upon the database
- As long as you Attribute: You must attribute any public use of the database, or works produced from the database, in the manner specified in the license
  - For any use or redistribution of the database, or works produced from it, you must make clear to others the license of the database and keep intact any notices on the original database
- **<http://opendatacommons.org/licenses/>**

# Getty vocabularies as Linked Open Data

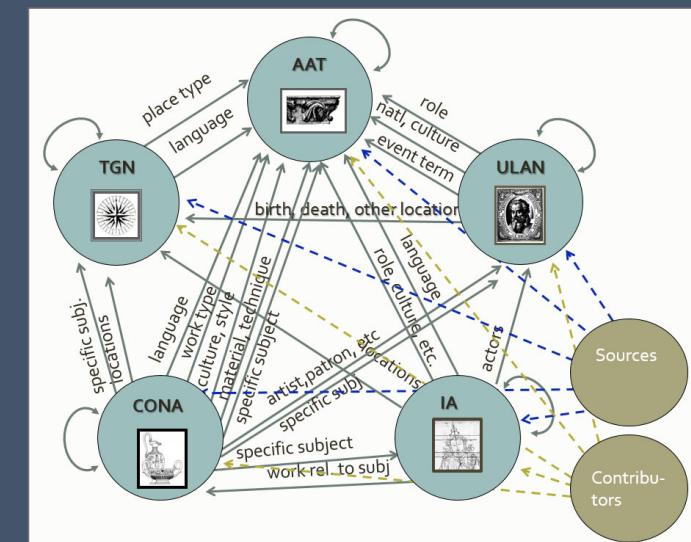
- Getty Vocabularies are valued as authorities because
  1. quality is reliable (compiled by experts, sources cited)
  2. the data is linkable
- Vocabs were planned from beginning to be linked, to aid in answering complex art historical questions  
(e.g., return records for *oil paintings that are now located in North America having non-Christian iconography and created by Netherlandish or French painters active in Tuscany or Umbria, Italy between 1410 and 1630*)
- Vocabs contain thesaural and other rich links
- Unique, persistent IDs for records, terms, other data
- Include IDs of outside resources too, to allow linking

## Examples of unique, persistent IDs in AAT

**AAT\_ID:** 300132869

### Terms:

- triumphal arches [1000007003] **Qual:** (memorial arches)  
**Pref:** pref **Type:** D **Lang:** (en) **Con.:** FDA, GCI, VP
- triumphal arch [1000290974] **Qual:** (memorial arch)  
**Type:** ALT **Lang:** (en) **Con.:** FDA, VP
- 凱旋門 **Qual:** (紀念性拱門) [1000545314]  
**Type:** D **Lang:** (zh, Chinese (traditional)) **Con.:** AS



# Getty vocabularies as Linked Open Data

<aat:300198841> <skos:prefLabel> "rhyta"@en  
 <aat:300198841> <skos:altLabel> "ritions"@fr  
 <aat:300198841> <rdf:type> <gvp:Concept>  
 <aat:300198841> <gvp:broaderPreferred> <aat:300194567>  
 <aat:300198841> <gvp:aat2100\_distinguished\_from> <aat:300197140>

[Semantic View \(JSON, RDF, N3/Turtle, N-Triples\)](#)
■ Representative Images: [1](#) [2](#) [3](#)

**ID:** 300198841
 **Record Type:** concept

 **rhyta** (drinking vessels, <vessels for serving and consuming food>, ... Furnishings and Equipment (Hierarchy Name))

**Note:** Refers to vessels from Ancient Greece, eastern Europe, or the Middle East that typically have a closed form with two openings, one at the top for filling and one at the base so that liquid could stream out. They are often in the shape of a horn or an animal's head, and were typically used as a drinking cup or for pouring wine into another vessel. Drinking was done by holding the rhyton above the drinker's head and catching the stream of liquid in the mouth.

**Terms:**

- rhyta** ([preferred](#), C, U, LC, English-P, D, U, PN)  
(Greek (transliterated)-P, D, U, PN)  
(Spanish, UF, U, PN)
- rhyton** ([C](#), U, English, AD, U, SN)  
(C, U, English, AD, U, SN)

Patricia Harpring © 2018 J. Paul Getty Trust

# Getty vocabularies as Linked Open Data

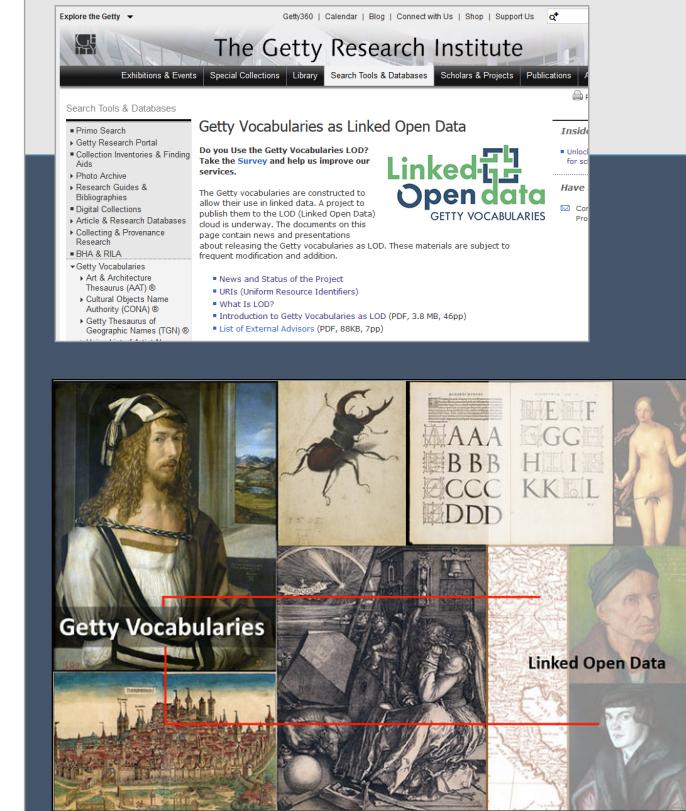
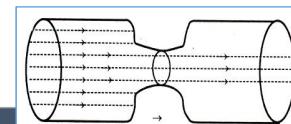
- AAT, TGN, and ULAN are available as LOD
- Under Open Data Commons Attribution License (ODC-By) 1.0
- Linked Open Data (LOD) is popular, in a typical month in 2018 = over 1,000,000 records (92.95 GB of data) downloaded
- JSON, RDF, N3/Turtle, N-Triples; analysis now for other formats too
- Available at SPARQL end point: download entire datasets or subsets
- Also released in online search (refreshed every month), XML, Relational Tables, Web Services, implemented in collection management systems and Web sites around the world, new implementations are being explored

## Parsing the Getty vocabularies to LOD was not simple

- Needed institutional support, coincided with new open policy at Getty
- Required research and mapping Vocab data to which was best fit for LOD, retaining the full richness and integrity of the vocabulary data
- Required decisions regarding which open license is best
- Edited data to make it consistent and linkable, virtual links and cross-references had been maintained by hand for decades → now real links
- LOD = more contributions; streamline processing, while maintaining content quality;

contribution → processing → publication

must avoid bottleneck



# Links to outside

There are many examples of datasets aligning or co-referencing the Getty Vocabularies; below are some examples

- Wikidata. Here are the pages that detail the current status of that alignment:  
 ULAN: <https://tools.wmflabs.org/mix-n-match/#/catalog/27>  
 AAT: <https://tools.wmflabs.org/mix-n-match/#/catalog/48>

The project relies on volunteers making manual matches over time after the initial automatic matching process. Here is the home page for the overall Wikidata authority control process.  
 The Getty Vocab are mentioned a number of times.

[https://www.wikidata.org/wiki/Wikidata:WikiProject\\_Authority\\_control](https://www.wikidata.org/wiki/Wikidata:WikiProject_Authority_control)

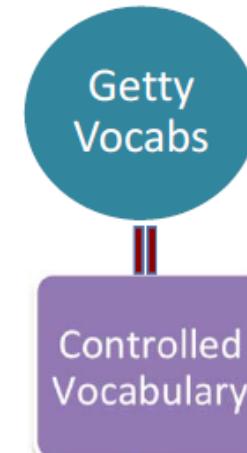
- Europeana is also connected to AAT concepts:  
<https://pro.europeana.eu/page/europeana-aat>  
 See the links from their SPARQL API: <https://pro.europeana.eu/resources/apis/sparql>
- There are other various institutions that have linked to ULAN.  
 Some examples include MoMA (ULAN IDs included in this data set):  
<https://github.com/MuseumofModernArt/collecton>  
 and the Gilcrease Museum (“About the creator” section comes from ULAN):  
<https://collectons.gilcrease.org/object/1526167>
- The Ariadne project also mapped a number of data sets to the AAT:  
<http://www.riadne-infrastructure.eu/Resources/AAT/Mappings-to-AAT>

Gregg Garcia

To be a five-star LOD dataset,  
one has to be already a five-star product

### The Getty Vocabularies -- is a **five-star vocabulary**

- High quality authority control of appellations representing things;
- Multilingual and multi-cultural; historical and contemporary;
- High specificity while comprehensive; continual and open-ended;
- One of the few selected vocabularies that are being:
  - recommended or required by many important metadata standards (e.g., DC., VRA Core, CCO, etc.)
  - used as examples at national and international standards for structured vocabularies (e.g., ISO25964-1 and ISO25964-2, NISO Z39.19)
  - adopted by cross-country and cross-domain data services, in addition to many institutions' (e.g., Europeana, DPLA (Digital Public Library of America))
  - widely studied by researchers. Google Scholar shows results when searching (exact match):
    - 2,110 entries for "Art and Architecture Thesaurus"
    - 3,570 for "Thesaurus of Geographic Names"
    - 89 for "Cultural Objects Name Authority"
    - 72 for "Union List of Artist Names"
    - 355 for "Getty Vocabularies" ... ...



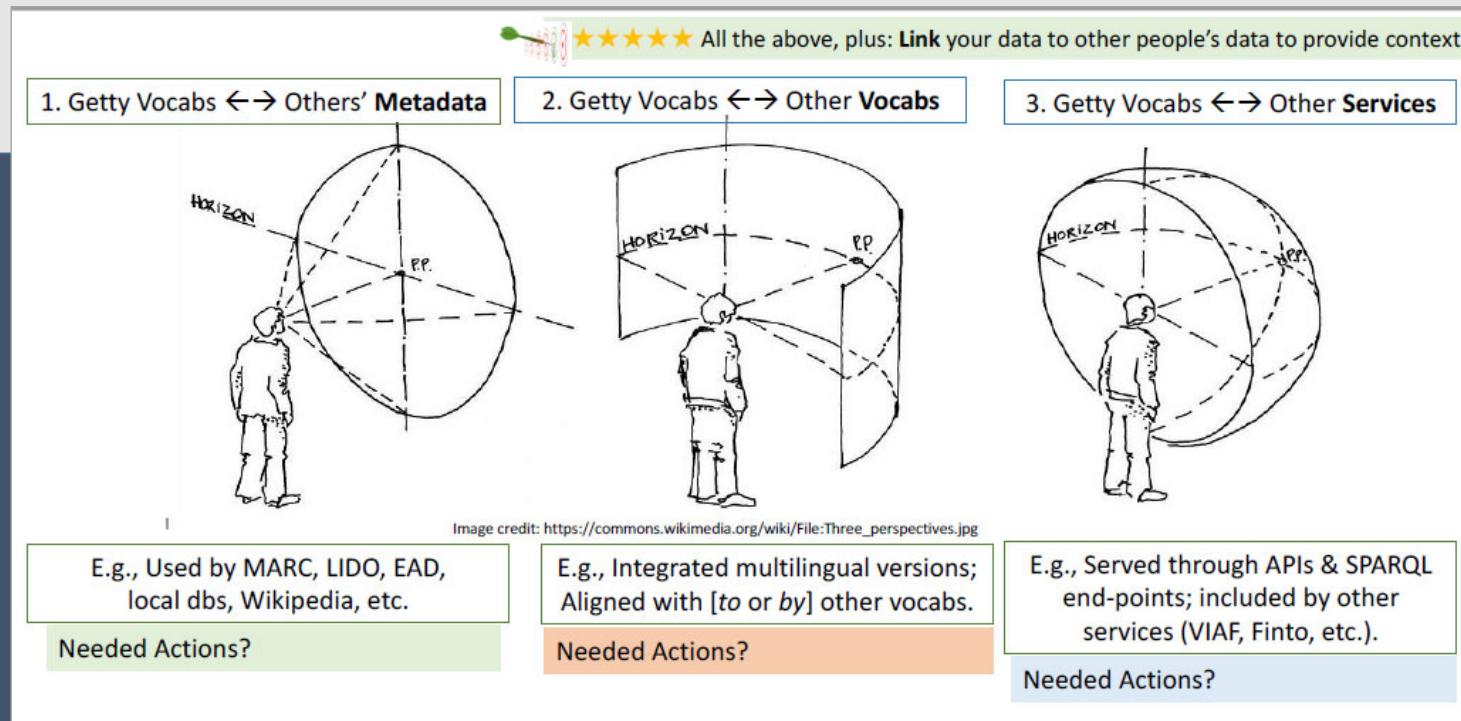
2016.07.20

In comparison:

- "Eurovoc": 2,220
- "Library of Congress Name Authority": 768

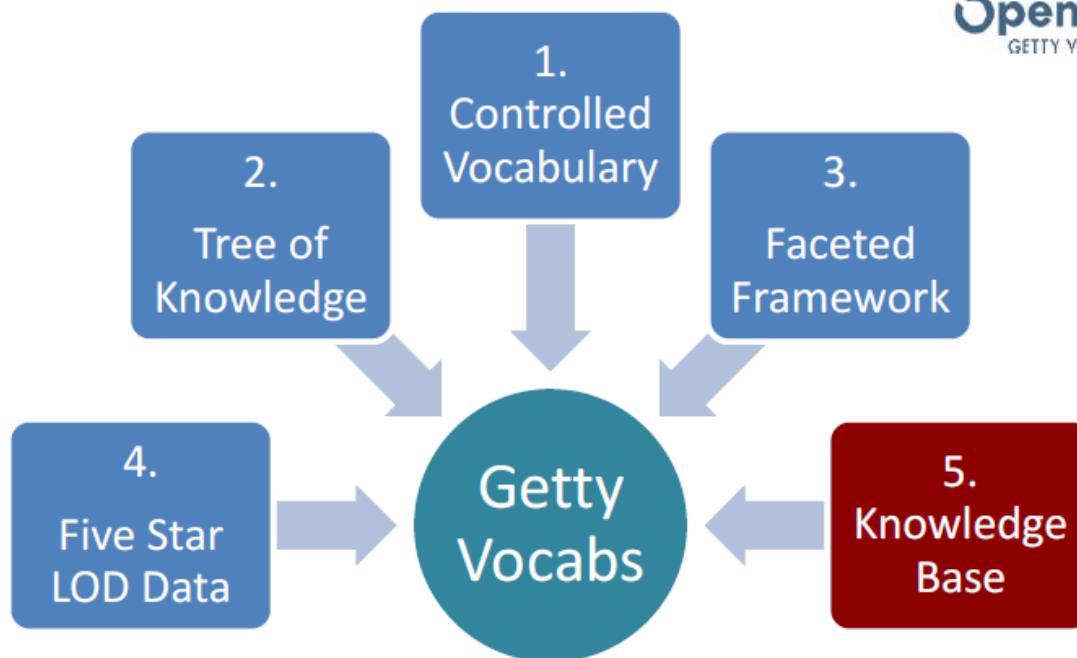
Marcia Zeng

## How to improve five-star data



Marcia Zeng

The Getty vocabularies is five-star data  
and valuable in other ways too



Revised from Marcia Zeng

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

Images may be under additional copyright

**WHO**

- Top of the AAT hierarchies
- Associated Concepts Facet
- Associated Concepts (hierarchy name)
- Physical Attributes Facet
- Attributes and Properties (hierarchy name)
- Conditions and Effects (hierarchy name)
- Design Elements (hierarchy name)
- Color (hierarchy name)
- Styles and Periods Facet
- Styles and Periods (hierarchy name)

**WHAT**

- Agents Facet
- People (hierarchy name)
- Organizations (hierarchy name)
- Living Organisms (hierarchy name)
- agents (general) [N]

**HOW**

- Activities Facet
- Disciplines (hierarchy name)
- Functions (hierarchy name)
- Events (hierarchy name)

**WHERE**

- Physical and Mental Activities (hierarchy name)
- Processes and Techniques (hierarchy name)
- activities (general context)

**WHEN**

- Materials Facet
- Materials (hierarchy name)
- Objects Facet
- Built Environment (hierarchy name)
- Components (hierarchy name)
- Furnishings and Equipment (hierarchy name)
- Object Genres (hierarchy name)
- Object Groupings and Systems (hierarchy name)
- Visual and Verbal Communication (hierarchy name)
- Brand Names Facet

**Top of the TGN hierarchy** (hierarchy root)

- World
- [ view physical features ]
- Abbasid Caliphate (historical region)
- Africa (continent)
- Alexandrian Empire (former nation/state)
- Antarctica (continent)
- Arctic (general region)
- Asia (continent)

**Top of the ULAN list / hierarchy**

- Corporate Bodies
- Persons, Artists
- Non-Artists
- Unidentified Named People and Firms
- Unknown People by Culture

**Top of the CONA Hierarchy**

- Built Works
- Movable Works
- Visual Surrogates
- Conceptual Works
- Unified Index

The Getty Iconography Authority  
Named events, religious/mythological iconography, fictional characters and places,

**Getty Vocab**

**Multi-Faceted Framework**

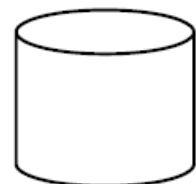
Marcia Zeng

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

Images may be under additional copyright

# Triple Extract Process

Vocabulary Coordination System  
(Oracle RDBMS)



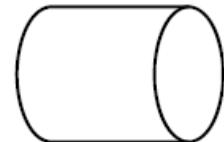
R2RML + Perl

NT Files



Sesame Console

OWLIM Triple Store



[vocab.getty.edu/sparql](http://vocab.getty.edu/sparql)

Internet



Gregg Garcia

Images may be under additional copyright

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

## Getty vocabularies LOD formats



Gregg Garcia

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev.

Images may be under additional copyright

# Using SPARQL

- Now we can begin to find materials for research and discovery online
- Getty vocabularies have been used for indexing  
Now = links are possible via LOD, links to TGN and AAT within ULAN are used
- 90 sample SPARQL queries, editable

***Find artists who worked in Italy and lived during a given time range but who are not Italian***

Select ULAN records

- Having event that took place in **tgn:1000080 Italy** or any of its descendants
- Birth date between 1250 and 1780
- Descendants of facet **ulan:500000002 "Persons, Artists"**
- Not having nationality **aat:300111198 Italian** or any of its descendants
- Then use this set of artists to search for works

**LINK**

**LINK**

**LINK**

# Using Linked Open Data

## Getty Vocabularies are **LINK-able**

Data in standard formats that allow linking

The screenshot shows the Getty Vocabularies LOD interface. On the left, there's a sidebar with a tree view of vocabulary categories. One category, '5.9 Non-Italians Who Worked in Italy', is highlighted with a blue box and has a red arrow pointing to it from the text above. On the right, a large text area contains a SPARQL query:

```

select ?x ?name ?bio ?birth {
  select distinct ?x
  ?x
  foaf:focus/bio:event/(schema:location|(schema:location/gvp:broaderExtended)) tgn:1000080-place}}
  ?x gvp:prefLabelGVP/xl:literalForm ?name;
  foaf:focus/gvp:biographyPreferred [
    schema:description ?bio;
    gvp:estStart ?birth].
  filter ("1250"^^xsd:gYear <= ?birth && ?birth <=
  "1780"^^xsd:gYear)
  filter exists {?x gvp:broaderExtended ?facet.
    filter (?facet in (ulan:500000003,
    ulan:500000002))}
  filter not exists {
    ?x
    foaf:focus/(schema:nationality|(schema:nationality/
    gvp:broaderExtended)) aat:300111198}}
  
```

**LINK – [this is coming, as of now not enough works are discoverable]**

## External ontologies

Prefix	Ontology	Used for
bibo:	Bibliography Ontology	Sources
dc:	Dublin Core Elements	common
dct:	Dublin Core Terms	common
foaf:	Friend of a Friend ontology	Contributors
iso:	ISO 25946 (latest on thesauri)	iso:ThesaurusArray, BTG/BTP/BTI
owl:	Web Ontology Language	Basic RDF representation
prov:	Provenance Ontology	Revision history
rdf:	Resource Description Framework	Basic RDF representation
rdfs:	RDF Schema	Basic RDF representation
schema:	Schema.org	common, geo (TGN)
skos:	Simple Knowledge Org System	Basic vocabulary representation
skosxl:	SKOS Extension for Labels	Rich labels
wgs:	W3C World Geodetic Survey geo	Geo (TGN)
xsd:	XML Schema Datatypes	Basic RDF representation

Vladimir Alexiev

Images may be under additional copyright

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev.

## GVP Data

### Scope includes:

- Subjects: Concepts but also non-concepts
- Obsolete subjects (and dct:isReplacedBy)
- Terms: plain (SKOS) & rich (SKOS-XL). Term characteristics
- Languages (some custom lang tags)
- Hierarchical rels: custom & standard, distinguish BTG,BTP,BTI
- Associative rels (170 subprop of skos:related)
- Historic info on rels (rdf:Statement) and terms
- Alignment (exactMatch to LCSH)
- Sources (bibo:Document, bibo:DocumentPart with locator)
- Contributors (foaf:Agent)
- Revision history (prov:Activity)
- Thesaurus-specific (TGN place types, coordinates)

Vladimir Alexiev

## Semantic resolution and content negotiation

All GVP, AAT, TGN, and ULAN URLs resolve, returning human or machine readable content through content negotiation  
(303 redirect)

<a href="http://vocab.getty.edu/ontology">http://vocab.getty.edu/ontology</a>	semantic URI, content-negotiated
<a href="http://vocab.getty.edu/ontology.html">http://vocab.getty.edu/ontology.html</a>	page (application/xhtml+xml)
<a href="http://vocab.getty.edu/ontology.rdf">http://vocab.getty.edu/ontology.rdf</a>	application/rdf+xml
<a href="http://vocab.getty.edu/ontology.ttl">http://vocab.getty.edu/ontology.ttl</a>	text/turtle

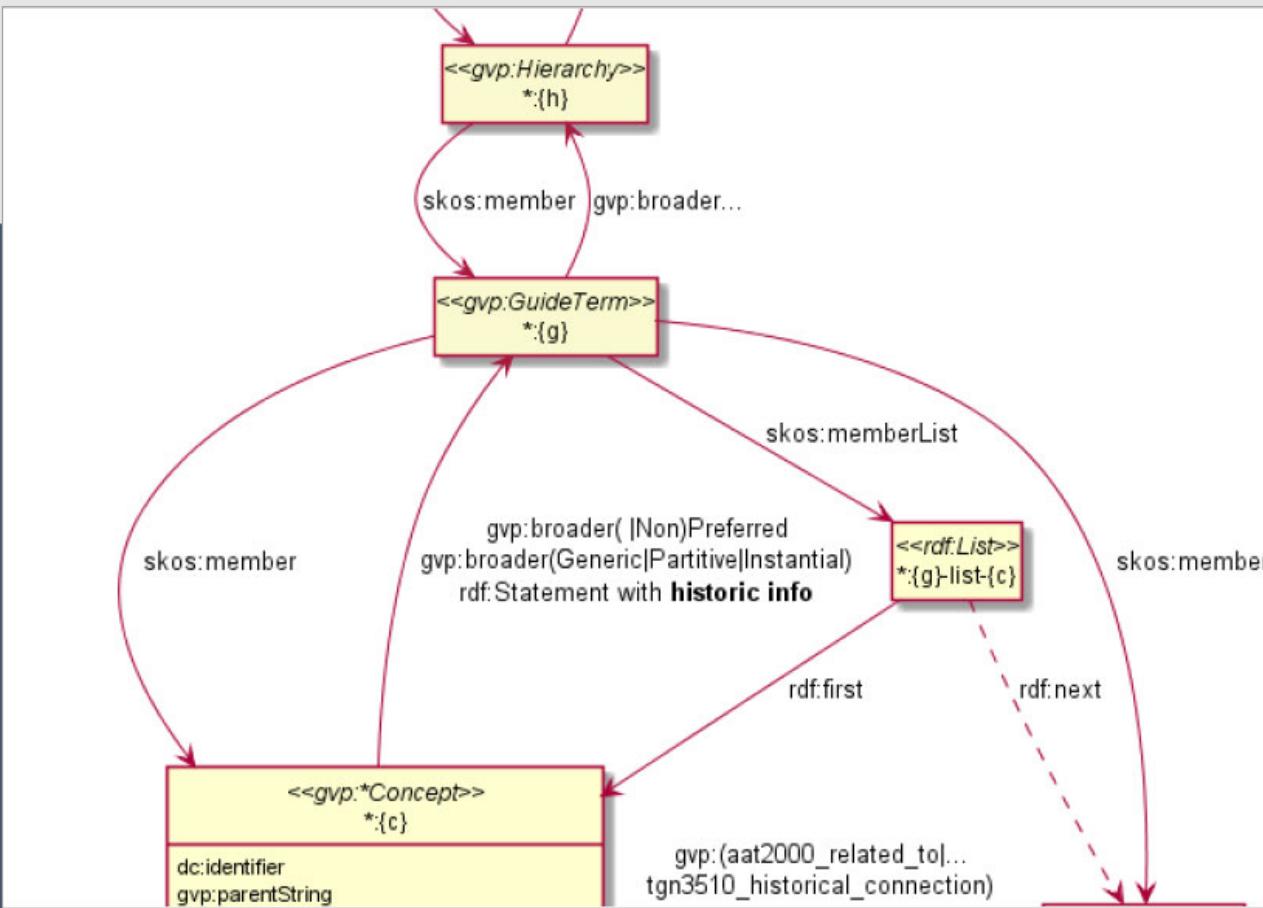
Eg about an AAT subject

<a href="http://vocab.getty.edu/aat/300011154">http://vocab.getty.edu/aat/300011154</a>	semantic URI, con-neg
<a href="http://vocab.getty.edu/aat/300011154.html">http://vocab.getty.edu/aat/300011154.html</a>	page (application/xhtml+xml)
<a href="http://vocab.getty.edu/aat/300011154.rdf">http://vocab.getty.edu/aat/300011154.rdf</a>	application/rdf+xml
<a href="http://vocab.getty.edu/aat/300011154.ttl">http://vocab.getty.edu/aat/300011154.ttl</a>	text/turtle
<a href="http://vocab.getty.edu/aat/300011154.nt">http://vocab.getty.edu/aat/300011154.nt</a>	NTriples

Vladimir Alexiev

Images may be under additional copyright

## GVP Semantic Representation



Vladimir Alexiev

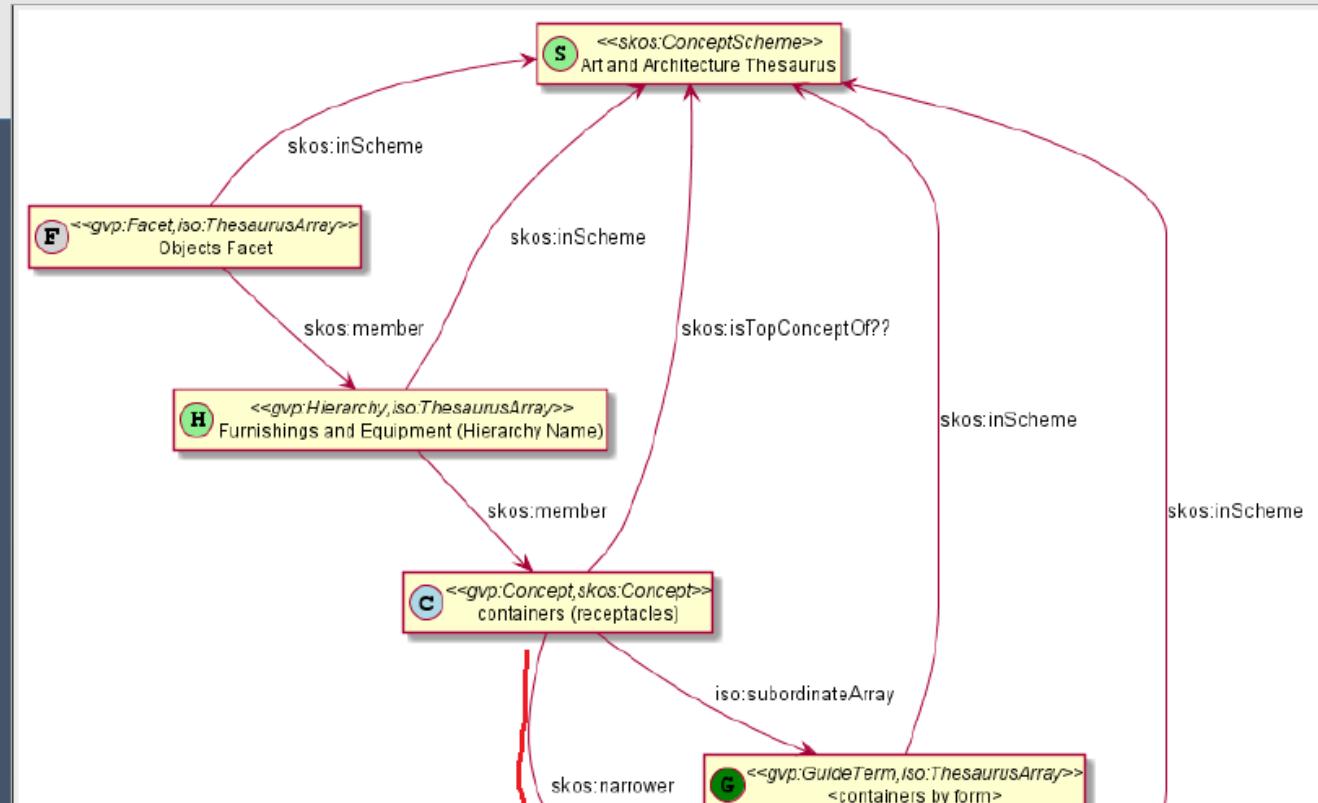
Images may be under additional copyright

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

## Hierarchical relations

Use ISO: ThesaurusArray to allow Guide Terms below Concepts.

Infer cross-threading SKOS/ISO broader relations



Vladimir Alexiev

Images may be under additional copyright

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

## Key values (“flags”) are important

voca table	field	val	ObjectProperty	Class	label	domain	range	subProperty	subClassOf	ConceptSche
	subject	F		gvp:Facet	Facet					gvp:Subject, iso:ThesaurusA
AAT	subject	H		gvp:Hierarchy	Hierarchy Name					gvp:Subject, iso:ThesaurusA
AAT	subject	G		gvp:GuideTerm	Guide Term					gvp:Subject, iso:ThesaurusA
AAT	subject	C		gvp:Concept	Concept					gvp:Subject, skos:Concept
	subject	-		gvp:ObsoleteSubject	Obsolete Subject					gvp:Subject
TGN	subject	P		gvp:PhysPlaceConcept	Physical Place Concept					gvp:Subject, skos:Concept
TGN	subject	A		gvp:AdminPlaceConcept	Administrative Place Concept					gvp:Subject, skos:Concept
TGN	subject	B		gvp:PhysAdminPlaceConcept	Physical and Administrative Place Concept					gvp:Subject, skos:Concept
subject_rels	preferred	P	gvp:broaderPreferred		Preferred Parent	gvp:Subject	gvp:Subject	gvp:broader		
subject_rels	preferred	N	gvp:broaderNonPreferred		Non-Preferred Parent	gvp:Subject	gvp:Subject	gvp:broader		
subject_rels	hier_rel_type	G	gvp:broaderGeneric		Parent (Generic)	gvp:Subject	gvp:Subject	gvp:broader		
subject_rels	hier_rel_type	P	gvp:broaderPartitive		Parent (Partitive)	gvp:Subject	gvp:Subject	gvp:broader		
subject_rels	hier_rel_type	I	gvp:broaderInstantial		Parent (Instantial)	gvp:Subject	gvp:Subject	gvp:broader		
term	preferred	P	gvp:prefLabelGVP		Preferred Label for GVP	gvp:Subject	skosxt:Label			
term	aacr2_flag	Y	gvp:prefLabelLoC		Preferred Label for LoC	gvp:Subject	skosxt:Label			
term	vernacular	V	gvp:termFlag		Term Flag	skosxt:Label	skos:Concept			term/flag/
term	other_flags	A	gvp:termKind		Term Kind	skosxt:Label	skos:Concept			term/kind/
AAT	term	C	gvp:termKind		Term Kind	skosxt:Label	skos:Concept			term/kind/
AAT	term	CN	gvp:termKind		Term Kind	skosxt:Label	skos:Concept			term/kind/
AAT	term	F	gvp:termKind		Term Kind	skosxt:Label	skos:Concept			term/kind/
AAT	term	J	gvp:termKind		Term Kind	skosxt:Label	skos:Concept			term/kind/
AAT	term	N	gvp:termKind		Term Kind	skosxt:Label	skos:Concept			term/kind/
AAT	term	S	gvp:termKind		Term Kind	skosxt:Label	skos:Concept			term/kind/

```

gvp:Facet a owl:Class ;
  rdfs:isDefinedBy <http://vocab.getty.edu/ontology> ;
  rdfs:subClassOf gvp:Subject, iso:ThesaurusArray ;
  rdfs:label "Facet" ;
  rdfs:comment "One of the major divisions of a vocabulary" ;
  skos:example "Objects Facet (ART) - David (TCW)" .
  
```

Vladimir Alexiev

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

Images may be under additional copyright

## Associative relations are important

Relations come in owl:inverseOf pairs or  
owl:symmetricProperty self-inverse

fcode	icode	domain (C1)	LOD frel	range (C2)	LOD irel	Editor frel - From C1 to C2	Editor irel - From C2 to C1	texample	texample
2000		any	related to	any		any - related to - any	same	<i>gulf red</i> is related to <i>light red (pigment)</i>	<i>light red (pigment)</i> is related to <i>gulf red</i>
2001		any	formerly referred to	any		any - formerly referred - any	same	<i>gigues</i> formerly referred to <i>fiddles</i>	<i>fiddles</i> formerly referred to <i>gigues</i>
2100		any	distinguished from	any		any - distinguished from - any	same	<i>historic farms</i> are distinguished from <i>abandoned farms</i> ; <i>naive art</i> is distinguished from <i>outsider art</i>	<i>abandoned farms</i> are distinguished from <i>historic farms</i> ; <i>outsider art</i> is distinguished from <i>naive art</i>

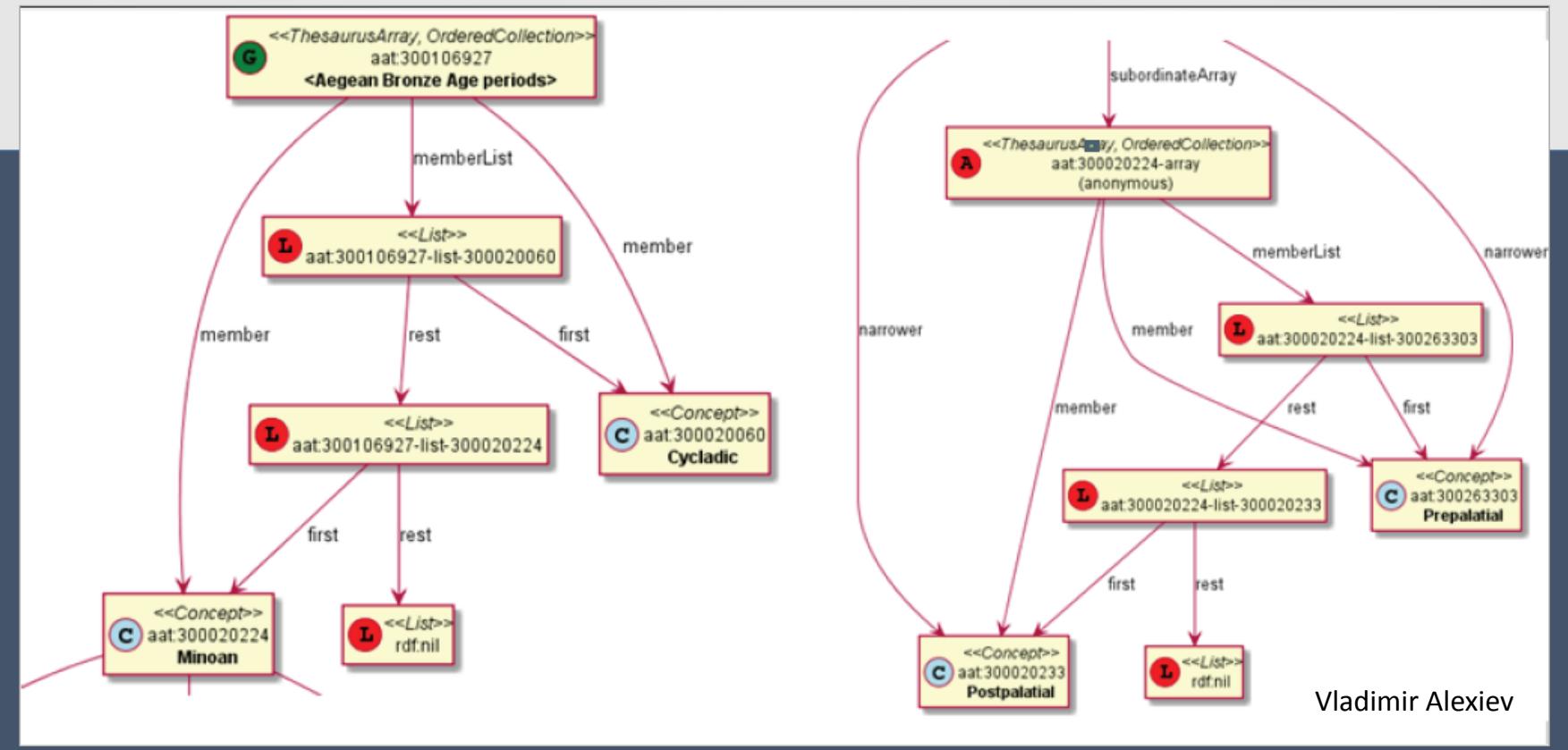
```

gvp:aat2000_related_to a owl:ObjectProperty;
  rdfs:subPropertyOf skos:related;
  rdfs:domain skos:Concept; rdfs:range skos:Concept;
  # domain "any"; range "any";
  dc:identifier "2000";
  skos:prefLabel "aat2000_related_to";
  dc:title "related to - any";
  skos:example "gulf red is related to light red (pigment)";
  skos:scopeNote "generic relationship, not explained";
  dct:description """any - related to - any; generic relationship, not explained.
Example: gulf red is related to light red (pigment)""";
  gvp:aat2000_related_to a owl:SymmetricProperty.

```

Vladimir Alexiev

## Use of ISO: ThesaurusArray in GVP



Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

Images may be under additional copyright

# CONTRIBUTION TO ISO 25946

- Contributed to ISO 25946 ontology (LOV entry)
- First industrial use of ISO 25946
- Defined appropriate combinations of BTG, BTP, BTI relations (first formally defined in ISO).

On Compositionality of ISO 25946 Hierarchical Relations  
 (BTG, BTP, BTI), V.Alexiev, J.Lindenthal, A.Isaac. [Draft paper](#),  
[Presentation at NKOS 2014](#) Workshop, London, 12 Sep 2014

	BTGx	BTPx	BTIx
BTGx	BTGE	BTPE	no
BTPx	BTPE	BTPE	no
BTIx	BTIE	no	no

- Eg: anvil components BTP <anvils and anvil accessories> BTG <forging and metal-shaping tools> => BTPE
- Mount Athos BTI Orthodox religious center BTG religious center => BTIE

Vladimir Alexiev

# TERMS

Support multilingual labels: both SKOS (plain)...

```
aat:300198841 a skos:Concept , gvp:Subject , gvp:Concept ;
  skos:prefLabel "rhyta"@el-latn , "rhyta"@en , "rhytons"@es , "rhytons"@fr ;
  skos:altLabel "rhyta"@es , "rhyton"@es , "rhyton"@en , "rhyton"@el-latn ...;
  skosxl:prefLabel aat_term:1000198841-en , aat_term:1000198841-el-Latin ...;
  skosxl:altLabel aat_term:1000198841-es , aat_term:1000297235-en ...
```

... and rich info in SKOS-XL:

```
aat_term:1000198841-en a skosxl:Label ;
  dc:identifier "1000198841" ;
  dct:language aat:300388277 , gvp_lang:en ; # owl:sameAs
  dct:contributor aat_contrib:10000000 , aat_contrib:10000131 ;
  skosxl:literalForm "rhyta"@en ;           ##### with Qualifier if applicable
  gvp:term "rhyta"@en ;                   ##### no qualifier
  gvp:displayOrder "1"^^xsd:positiveInteger ;
  gvp:termType <term/type/Descriptor> ;    ##### Descr/AltDescr/UseFor
  gvp:termPOS <term/POS/PluralNoun> ;     ##### Part of Speech
  gvp:contributorPreferred aat_contrib:10000000 , aat_contrib:10000088 ;
  gvp:contributorNonPreferred aat_contrib:10000131 ;
  gvp:sourcePreferred aat_source:2000051089-term-1000198841 ...;
  dct:source aat_source:2000024811 , aat_source:2000052946 ...;
  gvp:sourceNonPreferred aat_source:2000052946 ;
  gvp:sourceAlternatePreferred aat_source:2000048328-term-1000198841 .
```

Vladimir Alexiev

## SOME CUSTOM LANGUAGE TAGS

Despite the richness of IANA tags (9000), we had to define new tags, using several extension mechanisms:

- Private language, e.g.
  - **x-byzantin-Latn**: Byzantine Greek (transliterated)
  - **x-frisian** (IANA/ISO has codes for predecessor Old Frisian and dialects West, Saterland and North Frisian)
- Private language used in specific region, e.g.
  - **qqq-002**: African language (not specified which)
  - **qqq-ET**: Ethiopian (not specified: Boro/Borna, Karo...)
- Private modifier, e.g.
  - **grc-Latn- x-liturgic**: Liturgical Greek
  - **ber-Latn- x-dialect**: Berber Dialects (transliterated)
  - **fa-Latn- x-middle**: Persian, Middle (transliterated)
  - **zh-Latn-pinyin- x-notone**: transliterated Pinyin without tones

Vladimir Alexiev

# SOURCES

bibo:Document or bibo:DocumentPart

```
aat_source:2000051089 a bibo:Document;
dc:identifier "2000051089"
bibo:shortTitle "AATA database (2002-)";
dct:title "Getty Conservation Institute (GCI). database of AATA Online...".
aat_source:2000051089-term-1000198841 a bibo:DocumentPart;
dct:isPartOf aat_source:2000051089;
bibo:locator "128257 checked 26 January 2012".
```

Applied to subject, term, scopeNote:

```
aat:300198841 # subject (rhyta)
dct:source aat_source:2000030301-subject-300198841;
dct:source aat_source:2000052378.
aat_term:1000198841-en # term "rhyta"@en
gvp:sourceNonPreferred aat_source:2000049728;
dct:source aat_source:2000051089-term-1000198841.
aat_scopeNote:34904 # scopeNote
dct:source aat_source:2000046502.
```

Vladimir Alexiev

# CONTRIBUTORS

## foaf:Agent

```
aat_contrib:10000131 a foaf:Agent;
dc:identifier "10000131";
foaf:nick "CDBP-DIBAM";
foaf:name "Centro de Documentación de Bienes Patrimoniales...".
```

## Applied to subject, term, scopeNote:

```
aat:300198841 # subject "rhyta"
dct:contributor aat_contrib:10000131;
dct:contributor aat_contrib:10000000.
aat_term:1000198841-en # term "rhyta"@en
gvp:contributorNonPreferred aat_contrib:10000131;
gvp:contributorPreferred aat_contrib:10000000.
aat_scopeNote:34904 # scopeNote
dct:contributor aat_contrib:10000000.
```

Vladimir Alexiev

# HISTORIC INFO

Includes dates of applicability, historicFlag, comment. Applied to terms; hier & assoc rels, place types (using rdf:Statement)

```

aat_term:1000002693-en a skosxl:Label;
  skosxl:literalForm "lambruscatura"@en ;
  gvp:historicFlag <http://vocab.getty.edu/historic/historic> ;
  schema:startDate "0900"^^xsd:gYear ;
  schema:endDate "1700"^^xsd:gYear ;
  rdfs:comment "Medieval term for wainscoting".

aat_rel:300020271-aat2812_followed-300020269 a rdf:Statement;
  rdf:subject      aat:300020271;          # Second Dynasty (Egyptian)
  rdf:predicate    gvp:aat2812_followed;
  rdf:object       aat:300020269;         # First Dynasty (Egyptian)
  rdfs:comment     "Second Dynasty began ca. 2775 BCE";
  schema:startDate "-2785"^^xsd:gYear;
  schema:endDate   "-2765"^^xsd:gYear.

tgn:7011179-placeType-300008347 a rdf:Statement;
  rdf:subject      tgn:7011179;          # Siena
  rdf:predicate    gvp:placeTypePreferred;
  rdf:object       aat:300008347;        # inhabited place
  rdfs:comment     "settled by Etruscans (flourished 6th century BCE)";
  schema:startDate "-0800"^^xsd:gYear;
  gvp:displayOrder "1"^^xsd:positiveInteger.

```

Vladimir Alexiev

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute. Additional slides thanks to Joan Cobb, Gregg Garcia, Marcia Zeng, Vladimir Alexiev

Images may be under additional copyright

# REVISION HISTORY

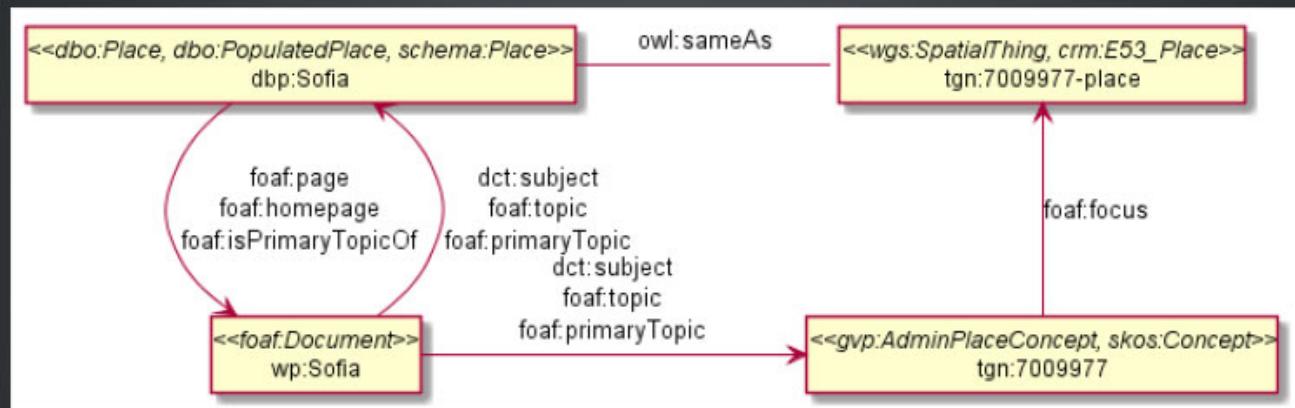
PROV is too complex, so we simplify:

```
aat:300018699
  skos:changeNote aat_rev:12345, aat_rev:12346, aat_rev:12347;
  prov:wasGeneratedBy aat_rev:12345;
  dct:created "2014-01-02T01:02:03"^^xsd:dateTime;
  dct:modified "2014-01-03T01:02:03"^^xsd:dateTime;
  dct:issued "2014-01-04T01:02:03"^^xsd:dateTime.
aat_rev:12345 a prov:Activity, prov:Create;
  dc:type "created";
  prov:startedAtTime "2014-01-02T01:02:03"^^xsd:dateTime.
aat_rev:12346 a prov:Activity, prov:Modify;
  prov:used aat:300018699;
  dc:type "term added";
  dc:description "leggings, puttee (1000248060)";
  prov:startedAtTime "2014-01-03T01:02:03"^^xsd:dateTime.
aat_rev:12347 a prov:Activity, prov:Publish;
  prov:used aat:300018699;
  dc:type "issued";
  prov:startedAtTime "2014-01-04T01:02:03"^^xsd:dateTime.
```

Vladimir Alexiev

# TGN SPECIFICS: CONCEPT-PLACE DUALITY

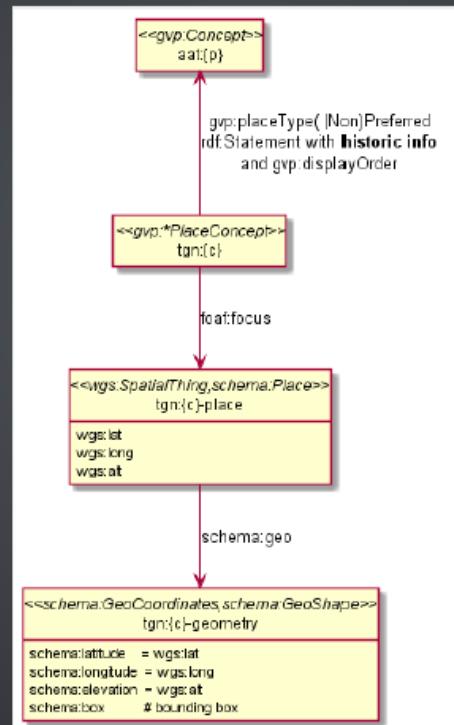
Duality between Concept and its denotation (ala VIAF, UK BL, FR BnF, SE KB...)



Vladimir Alexiev

# TGN SEMANTIC REPRESENTATION

Place types (TGN->AAT), Concept-Place duality, coordinates



Vladimir Alexiev

<http://vocab.getty.edu/aat/300198841><http://www.w3.org/1999/02/22-rdf  
<http://vocab.getty.edu/aat/300198841><http://www.w3.org/1999/02/22-rdf  
<http://vocab.getty.edu/aat/300198841><http://www.w3.org/2000/01/rdf-sci  
<http://vocab.getty.edu/aat/300198841><http://www.w3.org/2000/01/rdf-sci  
<http://vocab.getty.edu/aat/300198841><http://www.w3.org/2000/01/rdf-sci  
<http://vocab.getty.edu/aat/300198841><http://www.w3.org/2000/01/rdf-sci

See original slides by other authors in these PDFs

- Getty Vocabularies, Why LOD?, Joan Cobb  
[http://www.getty.edu/research/tools/vocabularies/cidoc\\_cobb\\_getty\\_vocab\\_lod.pdf](http://www.getty.edu/research/tools/vocabularies/cidoc_cobb_getty_vocab_lod.pdf)
  - Getty Vocabularies as LOD: Process, Discovery, Evolutions, Gregg Garcia  
[http://www.getty.edu/research/tools/vocabularies/cidoc\\_garcia\\_getty\\_vocab\\_lod.pdf](http://www.getty.edu/research/tools/vocabularies/cidoc_garcia_getty_vocab_lod.pdf)
  - GVP Ontologies and Semantic Representation, Vladimir Alexiev  
[http://www.getty.edu/research/tools/vocabularies/cidoc\\_alexiev\\_getty\\_vocab\\_lod.pdf](http://www.getty.edu/research/tools/vocabularies/cidoc_alexiev_getty_vocab_lod.pdf)
  - Present and Future of LOD, KOS, and the Getty Vocabularies, Marcia Zeng  
[http://www.getty.edu/research/tools/vocabularies/zeng\\_itwg\\_2017.pdf](http://www.getty.edu/research/tools/vocabularies/zeng_itwg_2017.pdf)
  - Getty Vocabularies and the Significance of Five-Star LOD Datasets, Marcia Zeng  
[https://www.getty.edu/research/tools/vocabularies/zeng\\_vocab\\_and\\_five\\_star\\_lod.pdf](https://www.getty.edu/research/tools/vocabularies/zeng_vocab_and_five_star_lod.pdf)

See full documentation and SPARQL endpoint here

<http://vocab.getty.edu/>



THE GETTY

Patricia Harpring  
Managing Editor  
Getty Vocabulary Program  
Getty Research Institute

1200 Getty Center Drive  
Los Angeles, CA 90049

[pharpring@getty.edu](mailto:pharpring@getty.edu)

Patricia Harpring © 2018 J. Paul Getty Trust. For educational purposes only. Do not distribute.