Introduction
Overview

- Getty Vocabularies are constructed to allow their use in linked data, focusing on the characteristics that facilitate this

- CONA is the first Getty vocabulary to actually be linked to the other three Getty vocabularies

- Issues related to CONA,
  - and to the implementation of CCO (CONA is compliant with CCO (Cataloging Cultural Objects)) and CDWA (Categories for the Description of Works of Art)

Are the Getty Vocabularies Employed in Linked Open Data (LOD)?

- Currently our limited Getty vocabulary technical resources are taken up with developing systems and publishing contributions.

- However, the Vocabulary data is well equipped to be presented in a variety of RDF formats.

- CONA, in particular, would lend itself to being presented as linked data.

- We have started to experiment with SKOS, for example. We are also investigating which format will best serve the community (i.e., where do we put our limited resources).

- We are close to identifying a persistent URN. BUT, turning that decision into vocabulary data expressed in one of the RDF formats is a much larger project.

- We are aware that this must happen soon, and we now look to the user community to provide partnership and to express their support.
THE Getty Vocabularies

- Art & Architecture Thesaurus® (AAT)
  - 34,878 ‘records’; 245,531 terms
- Getty Thesaurus of Geographic Names® (TGN)
  - 992,307 ‘records’; 1,711,115 names
- Union List of Artist Names® (ULAN)
  - 202,718 ‘records’; 638,903 names
- Cultural Objects Name Authority™ (CONA)
  - under development; contributions began in 2011

- All four focus on the visual arts and architecture
- Grow through contributions from the user community
- Compiled, maintained, distributed by the Getty Vocabulary Program, a unit of the Getty Research Institute (GRI) in Los Angeles

AAT terms = generic concepts
  - (e.g., watercolors, amphora)
TGN names = administrative, physical places
  - (e.g., Los Angeles, Ottoman Empire, Bavarian Alps)
ULAN = person, corporate body names
  - (e.g., Christopher Wren, Altobelli & Molins)
CONA = titles/names of art and architecture
  - (e.g., Mona Lisa, Empire State Building)

A critical feature that makes the vocabularies useful as authorities is that each vocabulary record is identified by a unique, persistent numeric ID
Meaning if a record changes or is merged, the original ID remains
The Getty Vocabularies

- Growth of Getty vocabularies relies upon contributions from the user community:
  - Getty vocabularies are “social” (contributors are the community) yet “authoritative”
  - Qualified contributors = repositories of art works, visual resources, art libraries, other experts

- Contributions may be made in bulk via prescribed XML format
  - or one record at a time via an online contribution form
- Released in XML and Relational Tables, as annual full releases; updated versions every two weeks via Web Services

The Getty Vocabularies were begun in the mid-1980s, to meet the needs of the art museum, visual resources, archives, and art library communities

- Are considered authoritative vocabularies to aid in the indexing and retrieval of resources related to art, architecture, and material culture
- 300 licenses (e.g., systems’ vendors for collection management systems, providers of search engines, etc.)
• Online searching 180,000 searches per month globally
• Also, AAT is accessed from Dutch, Taiwanese, and Chilean sites (not added in our statistics)

• The Getty vocabularies comply with national and international standards for thesaurus construction
• ISO and NISO

• We are active in the standards-building communities
• Standards that underpin the Getty vocabularies also include CCO and CDWA standards for art information
• Map to RDA and DACS (Library and Archives standards)

www.getty.edu/research/publications/electronic_publications/cdwa/categories.html

• CCO available from ALA, Amazon
• CDWA is a more complete set of categories, available online

• Issues and rules for Getty vocabularies and vocabularies in general are available on the Getty Web site and in this published book available online and in hard copy

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How are Getty vocabularies used?

- Used as sources of standard terminology for use in description, cataloging, and documentation
- Used as “assistants” in online search engines, creating a semantic “road map” that shows links and paths between concepts and terms

Scope Note:
Dressing rooms in ancient Greek and Roman baths and palaestrae.

How are Getty vocabularies used?

- Record Type: item
- Object Type: painting
- Title: From Line
- Creator: Lee Ufan (Korean painter and sculptor, born 1936)
- Materials and Techniques:
  - oil on canvas
  - Terms: oil paint, canvas
- Dimensions: 71 1/2 x 89 3/8” (181.6 x 227 cm)
- Date of Creation: 1974
- Location: Museum of Modern Art (New York, New York, USA) ID: 392.2010
- Subject: nonrepresentational art lines

Various fields in a work record are controlled by vocabularies.
Relationships to allow linked data

 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

rhyta \(\equiv\) rhyton
rhythms \(\equiv\) rhea
rheon
ritón
Getty Vocabularies are thesauri

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Equivalence Relationships

Hierarchical Relationships

Associative Relationships
Links in the Getty Vocabularies:
characteristics of art information
Using the semantic relationships

- Using defined relationships between vocabulary terms and other data could intelligently link data

- These are examples of the types of relationships inherent in Getty vocabularies

Elements of a ULAN record

- **names**: Shitao, Daoji, Yuanji, Tao-wei, Shih-t’ao, Zhu, Ruoji, Dadizi, Kuguaheshang, 石涛, 释道, Qingxianglaoren

- **life dates**: Birth: 1642, Death: 1707

- **roles**: artist, painter, calligrapher

- **geographic location**: Guilin (Guangxi, China), Yangzhou (Jiangsu, China)

- **nationalities**: Chinese, Qing

- **related people**: collaborated with Wang Yuanqi


**note**: Most commonly referred to as Daoji or Shitao in modern Western sources, although he himself preferred the name Yuanji. He was a descendant of the Ming dynasty (1368–1644) imperial Zhu family. In 1645, fleeing from invading Manchu troops, he fled to Buddhist monastic life in Quanzhou, Guangxi Province. Many of the sobriquets Daoji adopted sprang from his connection with Buddhism...

**note**: Most commonly referred to as Daoji or Shitao in modern Western sources, although he himself preferred the name Yuanji. He was a descendant of the Ming dynasty (1368–1644) imperial Zhu family. In 1645, fleeing from invading Manchu troops, he fled to Buddhist monastic life in Quanzhou, Guangxi Province. Many of the sobriquets Daoji adopted sprang from his connection with Buddhism...
### Equivalence relationship

**Le Corbusier** (preferred, V, display, LC, P)

- Jeanneret, Charles Édouard (V, BN)
- Jeanneret-Gris, Charles Édouard (V)
- Le Corbusier, Edgard (V)
- Le Corbusier-Saunier (V)
- Corb (V)
- Corbu (V)
- Jeanneret, Le Corbusier (V)
- Kebiyi (U)
- Korbüuyjie (U)
- Le Korbüz ‘e (U)
- Lu Kürbüzlyah (U)
- Ru Korbüuyjie (U)

**Equivalence relationships link various names and appellations referring to the person or corporate body**
- Multilingual access
- Dates associated with names

*Pseudonym adopted in 1920*

**Start date:** 1920  **End date:** 9999

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### Anonymous masters and Unknown artists

**Names:**
- Spitz Master
- Master of the Spitz Hours
- Maestro Spitz

**Names:**
- unknown Inca
- unknown Inka
- anonymous Inca
- anonymous Inka
- Inca
- Inka
- Incaic

- Appellations when name is unknown
- Access for anonymous and unknown hands
- Where oeuvre is identified but name is not known
- Where hand is identified, but culture designation used
Equivalence relationship

- Ethnological Museum (preferred, English-P)
- Ethnologisches Museum (German-P)
- Museo Etnológico (Spanish-P)
- Musée Ethnologique (French-P)
- 民族博物館 (Chinese-P)
- Ethnographische Sammlung (historical, German)
- Ethnographic Collection (historical, English)
- ... name used from 1829
- Cabinet of Art and Rarities (historical, English)
- Kunst- und Raritätenkabinett (historical, German)

- Multilingual access
- Historical names

Associative relationships

- Important relationships that are not hierarchical

- Albrecht Dürer the elder
  (German goldsmith, 1427-1502)

- Albrecht Dürer
  (German painter, printmaker, 1471-1528)

- Michael Wolgemut
  (German painter, printmaker, 1434/1437-1519)
Associative relationships

- Relationships are reciprocal
- Dates may be included

Albrecht Dürer the elder
(German goldsmith, 1427-1502)

Albrecht Dürer
(German painter, printmaker, 1471-1528)

Michael Wolgemut
(German painter, printmaker, 1434/1437-1519)

3-D model of Douglas House from Great Buildings online; photo of Atheneum, New Harmony, IN, Avery Fischer Hall, New York, from http://www.richardmeier.com/

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Associative relationships

- people may be linked to corporate bodies

Names:
Richard Meier & Partners (preferred, display, ⬤)
Richard Meier and Partners (⬤)

RELATED PERSONS:
members are
Richard Meier
Michael Palladino
James R. Crawford
Bernhard Karpf
Reynolds Logan

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Jorge Afonso (Portuguese painter and court artist, born ca. 1470-1475, died before 1540)

Master of 1515 (Portuguese painter, active 1515)

**Relationship Type:** possibly identified with

**Related Person:**
Master of 1515 (Portuguese painter, active 1515)

- Use for artists who are perhaps the same person
- If scholars are not sure, do not put the names in the same record

Image: Jorge Afonso. Jesus visiting Mary. ca. 1515, from the main altar of the Madre de Deus church in Lisbon, now in the National Museum of Ancient Art

### Relationship Types

- **1000** related to
- **1001** miscellaneous
- **1002** associated with
- **1005** possibly identified with
- **1007** distinguished from

**<person to person - teaching/learning>**

The following relationships may be used as appropriate and described in scholarly literature. These refer to relationships between two people.

- **1101** taught
- **1102** taught by
- **1105** apprenticed to
- **1106** apprentice of
- **1107** influenced
- **1108** influenced by

**<person to person / person to firm - patronage>**

Generally for relationships between artists and patrons.

- **1121** patron of
- **1122** patron was

**Relation Types are derived from a controlled list**
Hierarchical relationships, whole/part

- Dates may be associated with hierarchical relationships
- Start and End Dates index the Display Date
  - Start: 2004
  - End: 9999

Other relationships

- for Sèvres Porcelain Manufactory
- Display Biography:
  - French porcelain manufactory, active from 1756 to the present

  - NATIONALITY: French
  - ROLES: manufactory, porcelain makers
  - START DATE: 1756
  - END DATE: 9999

- Relationships beyond thesaural
- Biographical information expressed in display and also controlled
Other relationships

- Each person/corp. body has life roles
- Could be used to inform linking
- Roles are controlled vocabulary
- Based on the AAT

Events may be included

For Henri Rousseau

EVENT: exhibited
DISPLAY DATE: at the Salon des Indépendants, Paris, in 1886
START DATE: 1886  END DATE: 1886
PLACE: Paris (France)

- Events such as "active," exhibited, baptism, etc. may be indexed
12001/ miscellaneous
12002/ active
12003/ documented
12004/ flourished
12011/ baptism
12012/ burial
12015/ citizenship
12016/ naturalization
12018/ relocation
12019/ immigration

**Events types are controlled**

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**Places in ULAN could be linked to TGN**

**ULAN record for Vincent van Gogh**

**Birth and Death Places:**
- Born: Zundert (North Brabant, Netherlands) (inhabited place)
- Died: Auvers-sur-Oise (Val-d'Oise, Ile-de-France, France) (inhabited place)

**Events:**
- active: France (Europe) (nation)
- active: Paris (Ville de Paris department, Ile-de-France, France) (inhabited place)
- active: Arles (Bouches-du-Rhône, Provence-Alpes-Côte d'Azur, France) (inhabited place)

**TGN record for Arles, France**

- ULAN can be linked to TGN because the TGN ID is stored in ULAN
- E.g., Arles as place of activity
- Variant names in TGN thus can be used to retrieve ULAN data
Citations in ULAN could be linked to published sources

Library of Congress Authorities database (n.d.) n 82031996

- Linking to sources and contributors
- Including links to LOC authorities, control no.
- VIAF (Virtual International Authority File)

Elements of a TGN record

- Names
  - Munich
  - München
  - Monaco
  - Munich

- Place
  - Germany
  - Baveria
  - Oberbayern
  - Inhabited place
    - State capital

- Coordinates
  - 48 08 N, 011 35 E

- Dates
  - Founded near an older settlement in 1157

- Note
  - Capital of Bavaria and the third-largest city in Germany; is situated on both sides of the Isar River, north of the Alps. Henry the Lion, duke of Bavaria, established it in 1157 as a mint and market for Benedictine monks from Tegernsee ...

- Sources
**Equivalence relationship**

Siena (preferred, C,V,display,English-P,U,N) ........... used since 13th century start: 1200 end: 9999

Σιένα (C,V,Greek,U)
錫耶納 (C,V,Chinese,U)
Siyenah (C,V)
Сиена (C,V,Russian,U)
ںیئن (C,V,Hebrew ,U)
シエーナ (C,V,Japanese,U)
Sienese (C,O,English,U,A)
Sienna (H,O,English,U,N)
Siena Julia (H,V,Latin-P,U,N)
Sanna (H,V)
Sena (H,V,Etruscan-P,U,N)
Sene (H,V)
Sana Julia (H,V)

- multilingual access
- names may be current or historical
- names may have display dates
- years delimiting span

**Special flags characterize names**

Hierakonpolis, Egypt
Kawm Al-Ahmar (preferred)
Kom al Ahmar
Hierakonpolis (historic, site name)

... meaning "City of the Hawk"
Hieraconpolis (historic)
Nekhen (historic)
Nekhab (historic)

- Site name
  - Use when the modern name for the place is not the same name used by scholars to refer to the ancient site
Hierarchical Relationships

Polyhierarchical links

- Multiple hierarchical relationships may include historical parents
- The date of the relationship may also be included
- All Getty vocabularies are polyhierarchical

Modern world
Italy
Tuscany
Siena province

Historical world
Etruria

Siena/Sena

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

- Places linked by hierarchical and associative relationships
- Dates may be included

La Piana (deserted settlement)

Pisa (inhabited place)

World (facet) hierarchical
Europe (continent)
Italy (nation)
Tuscany (region)
Siena province

Siena
Σίένα
Sienna
Saena
Senae

Pisa

equivalence

La Piana
adjacent to

Pisa

ally of

Siena
Σίένα
Sienna
Siena
Saena Julia
Sanna
Sen
Sena
Senae

La Piana (deserted settlement)ectarated settlement

Pisa (inhabited place)
Associative Relationships

- Relationship Type: distinguished from
  Related Place: Assyria (Roman Empire) (province)
- Relationship Type: possibly identified as
  Related Place: Tel el-Far’ah (As Suwayd$01a', Syria) (deserted settlement)

Other data that could inform linking

- Place types define the roles of the place over time
- Could be used to inform linking
- are drawn from a controlled list
- Based on the AAT
**Geographic coordinates**

- Coordinates could be used to inform linking via proximity
- Not GIS

![Map of Benin, Togo, and Nigeria with geographic coordinates](image)

**Elements of an AAT record**

- **concept**: 300011329
  - **names/terms**: travertine, travertine marble, travertine stone, roachstone, lapis tiburtinus
  - **related concepts**: tufa, onyx marble
    - **scope note**: A dense, crystalline or microcrystalline limestone that was formed by the evaporation of river or spring waters. It is named after Tivoli (Tibur in Latin).

**Sources**
- AATA, Sturgis, Dictionary of Architecture and Building (1902);
- Roberts, Construction Industry Thesaurus (1976);
- Brady and Clauser, Materials Handbook (1977);
- Dictionary of Geological Terms (1984);
- Oxford English Dictionary (1986);
- Encyclopaedia Britannica online (2002-);
- MFA Cameo (2005)
<table>
<thead>
<tr>
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<td><strong>watermerk</strong> (descriptor, Dutch-P)</td>
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- All equivalence relationships in Getty Vocabularies are true synonyms = exact equivalents
- Not partial synonyms; linked as related terms

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- Translated terms are considered synonyms in AAT
- AAT is becoming increasingly multilingual
- Translations in French, Italian, Dutch, Spanish, and Chinese
Visual Works Hierarchy
...<visual works by medium or technique>
..........photographs
............<photographs by form>
.................negatives
.................possitives
.................<transparencies: photographic>
.................<photographs by form: color>
.................<photographs by form: format>
.................card photographs
.................boudoir midget mounts
.................cabinet photographs
.................cartes-de-visite
.................cameo prints
.................gem photographs
.................lantern slides
.................slides (photographs)

Containers Hierarchy
...containers
...<containers by form>
.........vessels
...............alembics
...............askoi
...............basins
...............louteria
...............beakers (vessels)
...............boilers (vessels)
...............bottles
...............<bottles by form>
...............<bottles by function>
...............bowls (vessels)
...............covered bowls
...............buckets (vessels)
...............cage-cups
...............cauldrons
...............craggans
...............crockets
...............dinoi
...............ewers
...............aquamaniles
...............face vessels

Include narrower terms if a user asks for a broader term.
Translations use the hierarchy of the existing AAT
= one-to-one correspondence

Source language: English  
Target language: German

Associative Relationships

Materials
- building materials
- coating (material)
- lacquer
- plaster
  - arriccio
  - intonaco
  - stucco
  - photographic materials
  - solvent

Visual Works
- drawings
- design drawings
- preliminary drawing
  - sinopie
- environmental art
- mosaics
- paintings
  - finger paintings
  - frescoes
  - watercolors

- There may be associative relationships between concepts
  - mural painting (fresco) and the plasters, and drawing (sinopia) underneath
Elements of a CONA record

**titles/names**
- Irises
- Les Iris
- Pianta di iris
- Die Irisse
- Irysy
- Iriissen

**creator**
Vincent van Gogh (Dutch, 1853-1890)

**work type**
painting

**subject**
botanical
nature
iris
regeneration
soil

**date**
1889

**work**
700000073

**notes**
This work was painted when the artist was recuperating from a severe attack of mental illness; it depicts the garden at the asylum at Saint Rémy...

**sources**

**materials**
oil on canvas, applied with brush and palette knife

**measurements**
71 x 93 cm (28 x 36 5/8 inches)

**current location**
Paul Getty Museum (Los Angeles, California, United States)

**creation location**
Saint Rémy de Provence (Provence Alpes Côte d’Azur, France)
Elements of a CONA record

- **titles/names**
  - Hagia Sophia
  - Holy Wisdom
  - Ayasofya
  - Agia Sofia
  - Agia Sophia
  - Hagia Sophia
  - Sancta Sophia
  - Sancta Sapientia
  - Saint Sophia
  - Αγία Σοφία

- **creators**
  - Anthemios of Tralles and Isidoros of Meletus, the Elder

- **work types**
  - church
  - mosque
  - museum

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

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

- **date**
  - present structure built 532-537 CE; rebuilt in 12th century

- **subject**
  - architecture
  - Holy Wisdom

- **notes**
  - Nothing remains of the earlier two basilicas on this site: a 4th-century church and a 5th-century one built by Constantine...

- **sources**
  - Fletcher, History of Architecture (1987)

- **current location**
  - Istanbul (Marmara region, Turkey)

- **latitude/longitude**
  - 31 meters (102 feet); height 56 meters (184 feet)

Linked to Getty Vocabularies

- ULAN
- TGN
- AAT
- Iconography Authority

- In addition to compliance with ISO and NISO for controlled vocabularies
- CONA complies with entity relationship diagram for CCO/CDWA

Work Records

Source Records
CONA is the first Getty vocabulary to be actually linked to the others (others have controlled lists based on another vocabulary, e.g., “roles” in ULAN based on AAT terms).

CONA is compliant with CCO, thus issues related to CONA as linked data also apply to implementations of CCO.

In local implementations of CCO, be sure to include the unique IDs of authorities to which you link (e.g., ULAN or LOC).
Equivalence relationship

**Titles/Names:**

- Eiffel Tower  
  **Preference:** preferred
- Tour Eiffel  
  **Preference:** alternate
- Torre Eiffel  
  **Preference:** alternate
- Eiffelturm  
  **Preference:** alternate
- Three-Hundred-Meter Tower  
  **Preference:** alternate  
  **Title Type:** former

Relationships making CONA compliant with standards for controlled vocabularies

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**Equivalence relationship**

- Great Pyramid of Giza (English)
- Pyramid of Khufu (English)
- Pyramid of Cheops (English)
- Cheops-Pyramide (German)
- Chufuova pyramida (Czech)
- Pyramide de Khéops (French)
- Piramide di Cheope (Italian)
- Keops Piramidi (Turkish)
- خانق پیرامیدی (Arabic)
- أهرام الأكبر (Arabic)
- ギザの大ピラミッド (Japanese)
- কিৎফে ইন বাংলা ফিওয়াড (Bangla)

- **Title/names and Descriptive Notes in CONA may be flagged in various languages**
**Whole/Part Records for a series and a part (conceptual)**

- Christ Presented to the People
  - State 1
  - State 2
  - State 3
  - State 4
  - State 5
  - State 6
  - State 7
  - State 8

- **Whole/Part Records for multiples**
**Eiffel Tower: State of the Construction**

*Work Type*: albumen print  
*Title/Name*: Eiffel Tower: State of the Construction  
*Creator Display*: photographer: Louis-Emile Durandelle (French, 1832-1923)

*Work Type [link]*: observation tower  
*Title/Name*: Eiffel Tower  
*Alternate Title/Name*: Tour Eiffel  
*Former Title/Name*: Three-Hundred-Metre Tower

*Creator Display*: architect: Gustave Eiffel (French, 1832-1923)

*Creation Date*: photographed 23 November 1888

*Current Location*: J. Paul Getty Museum (Los Angeles, California, USA); 87.XM.121.16

*Measurements*: 17 x 13 3/4 inches

*Materials and Techniques*: albumin print  
*Style*: Belle Époque

*Description*: This view was made about four months short of the tower’s completion. Louis-Émile Durandelle photographed the tower from a low vantage point to emphasize its monumentality. The massive building barely visible in the far distance is dwarfed under the tower’s arches...

*Related Works [link to work record]*: Relationship Type: depicts

*Current Location*: Paris (France)

*Measurements*: height: 300 m (984 feet)

*Materials and Techniques* [link to Concept Authority]: wrought iron, exposed iron construction

*Style*: Belle Époque

*Description*: Commission was awarded by competition; the competition sought a plan for a monument for the International Exposition of 1889, celebrating the centenary of the French Revolution. The tower is built almost entirely of open-lattice wrought iron. It was the entrance gateway to the exposition.

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**Jean-Auguste-Dominique Ingres; Study for the Dress and the Hands of Madame Moitessier; 1851; graphite on tracing paper, squared in black chalk; 13 15/16 x 6 5/8 inches; J. Paul Getty Museum (Los Angeles, California); 91.GG.79**

**Jean-Auguste-Dominique Ingres; Madame Moitessier; 1851; Samuel H. Kress Collection, National Gallery of Art (Washington, DC); 1946.7.18**

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**Associative relationship**

- Works may be related to other works
- Depicted in, study for, etc.

**Associative relationship**

- Relationships are reciprocal
- (Works may be located in different museums)
Fields in CONA are controlled by links to other vocabularies.
Thus providing multilingual access via AAT, TGN, and ULAN within CONA.

- TGN controls location and other place names
- ULAN controls architect and other people and corporate bodies
CONA Iconography Authority (CONA IA)

- Hierarchical
- Linked to the other vocabularies

CONA IA record

<table>
<thead>
<tr>
<th>#</th>
<th>P</th>
<th>Type</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1P</td>
<td>D</td>
<td>Shiva</td>
<td></td>
</tr>
<tr>
<td>2V</td>
<td>UF</td>
<td>Siva</td>
<td></td>
</tr>
<tr>
<td>3V</td>
<td>UF</td>
<td>Siva</td>
<td></td>
</tr>
<tr>
<td>4V</td>
<td>D</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>5V</td>
<td>D</td>
<td>Shivá</td>
<td></td>
</tr>
<tr>
<td>6V</td>
<td>D</td>
<td>Xiva</td>
<td></td>
</tr>
</tbody>
</table>

CONA work record

Name:
Chidambaram Temple
Chidambaram சிதம்பரம்

Location:
Tamil Nadu

Date:
before 6th century

Subject:
arquitectura
Shiva

CONA Iconography Authority may provide multilingual access for architecture occasionally. E.g., dedications of temples and churches are recorded using the CONA IA.

Literature, religion/mythology, events, literary themes, fictional characters and places – iconography not covered by AAT, TGN, ULAN per CCO/CDWA.
Issues related to Linked Data

Addressing issues in linked data

Observations re. linked data include the following: (various authors)

- In any discipline, LOD (Linked Open Data) is not one cloud, but many, each with dense internal connections and typically with only sparse connections between them.

- Two fundamental concepts in record linkage: error rate and discriminating power
  - Together they influence the number of incorrect decisions in a linking procedure.

- Impact of linkage error is underestimated by developers
  - Accurate probability estimates are lacking for estimating record linkage error rates.
  - Approaches to analyze: manual reviews, cumulative weight curves, and simulation approaches to provide estimates of linkage errors.
Addressing issues in linked data

Observations re. linked data include the following: (various authors)

- The reason why it is hard to avoid linkage error is that humans are needed to manually create linkage or to proof auto links.

- Homogeneity is required to make accurate links, but such homogeneity does not occur.
  - E.g., if names and other information does not standardize, then it is unlikely that a high percentage of true matches having nonstandardized names and other information can be identified.

- Even when terminology is standardized, differences in values between corresponding variables can have many underlying causes: errors created during collection of the data, during the data entry, or true changes of a value.

Addressing issues in linked data

Lessons learned in linking vocabulary data:

- CONA not presented as LOD, but you can extrapolate via our local example of linking vocabularies within our own data world.

- We link automatically where possible.

- But for uncertain matches, we link by hand.

- Even then, mistakes may be made when the incoming data has incorrect references or links.
- Reduce redundancy:
- Merging records: for multiple records contributed for the same person; automated if possible in the load

<table>
<thead>
<tr>
<th>Preferred Name</th>
<th>Matched Name</th>
<th>Biography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palamedesz, Anthonie</td>
<td>Palamedesz, Anthonie</td>
<td>Dutch painter, 1601-1673</td>
</tr>
<tr>
<td></td>
<td>Anthonie Palamedesz.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palamedesz, Anthony</td>
<td></td>
</tr>
<tr>
<td>Pallemedes, Anthonie</td>
<td>Anthonie, Palamedez</td>
<td>Netherlandish artist, 1601-1673</td>
</tr>
<tr>
<td></td>
<td>Palamedesz, Anthonie</td>
<td></td>
</tr>
</tbody>
</table>

- Tables relate roles and nationalities that should be considered equivalents for the purposes of matching -- are not synonyms

<table>
<thead>
<tr>
<th>ID</th>
<th>Nationality</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>210905010</td>
<td>Netherlandish</td>
<td>painter</td>
</tr>
<tr>
<td>210905011</td>
<td>North Netherland</td>
<td>tempera painter</td>
</tr>
<tr>
<td>210905020</td>
<td>Dutch</td>
<td>panel painter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>watercolorist</td>
</tr>
</tbody>
</table>
Dom: Álvarez Algeciras, German
(Spanish painter, exhibited 1871-1878) 500035166
birth: 1831 death: 1878

Rec: Álvarez de Algeciras y Jiménez, German
(Spanish artist, 1848-1878) 500298289
birth: 1848 death: 1878

- This report gives editors lists of near-matches
- You are seeing display data, but match was done on controlled, indexing fields not shown in this report
- Require vetting by humans
- Usually problem with inexact dates, etc.

Linking data in CONA

- Since CONA is linked to the other vocabularies, it is necessary to match incoming values to the AAT, ULAN, TGN, and CONA Iconography Authority when CONA records are processed for loading
• Editor may search other vocabs in CONA processor
• CONA processor presents editor with choices for linking
• New stub records for AAT, ULAN, TGN, or IA, may be added and linked on the spot, filled in later by editors
• For links with a pattern, editor may write a ‘rule’ for processor

- Amsterdam (7006952) [Amsterdam, Noord-Holland, Nederland, Europe, World, Top of the ULAN Hierarchy]
- Amsterdam (7259865) [Gemeente Amsterdam, temp, Mediterranean Region, Europe, World, Top of the ULAN Hierarchy]
- Dutch language (6529254) [Benelux (37), Mediterranean, Europe, World, Top of the ULAN Hierarchy]
Linking data in CONA

- Errors in linking that is in the incoming data may be caught, but in general must rely upon contributors’ accuracy
- To which person should the link be made in ULAN?

<table>
<thead>
<tr>
<th>Status Mark</th>
<th>Preferred Name</th>
<th>ULAN record</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Lazowski, Claude François</td>
<td>Biography</td>
</tr>
<tr>
<td>AC</td>
<td>Lazowski</td>
<td>French administrator and revolutionary, 17th century</td>
</tr>
<tr>
<td>AC</td>
<td>Lazowski, Maximilien de</td>
<td>French travel writer, 18th century</td>
</tr>
<tr>
<td>AC</td>
<td>Lazowski, Maximilien de</td>
<td>French travel writer, 18th century</td>
</tr>
</tbody>
</table>

LC control no.: n 90699430
LCCN permalink: http://lccn.loc.gov/n90699430

HEADING: Lazowski, Maximilien de

- Subject was linked to LOC record for travel writer “Lazowski”
- But should be the French revolutionary

Inscribed title: Inauguration du buste de Marat au tombeau qui été élevé pour sa gloire et celle de Lazowski, place de la Réunion a Paris, l’an 2 de la Rep. Franc. une et indivisible / 

Conclusion
Getty Vocabularies and Linked Data

• Getty Vocabularies are constructed to allow their use in linked data, focusing on the characteristics that facilitate this

• CONA is the first vocabulary to actually be linked to the other three vocabularies

• CONA has the potential of creating a critical mass of supervised initial links among multiple institutions upon which the much larger endeavor can be built (linked)

• CCO: When implementing CCO locally, be careful to include the unique IDs of related data so unambiguous links may be made

One of the most powerful potentials offered by Web technology is the ability to electronically link related resources. One element of the so-called “Semantic Web” is “linked open data,” a method by which computers can automatically link related resources in a meaningful way.

The GRI recently initiated a collaborative project with the Institute for Information Sciences (ISI), a unit of the Viterbi School of Engineering at the University of Southern California (USC), to transform the data from our vocabulary databases into linked open data.

The potential future uses for this type of technology, united with the scholarly, authoritative data compiled in our research databases, hold great promise for Web users worldwide.