THE GETTY VOCABULARIES

A Brief Overview & Linked Open Data

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PREFACE

• This presentation is a brief overview of the Getty vocabularies, AAT, TGN, ULAN, and the resources in development, CONA and IA.

• For full discussions of the Getty vocabularies, see the vocabulary Web pages, Editorial Manuals, and other presentations on the vocabulary training page.

• http://www.getty.edu/research/tools/vocabularies/index.html
PREFACE

- This presentation is a brief overview of the Getty vocabularies, AAT, TGN, ULAN, and the resources in development, CONA and IA.

- For full discussions of the Getty vocabularies, see the vocabulary Web pages, Editorial Manuals, and other presentations on the vocabulary training page.

☐ For basic information on vocabularies, see *Introduction to Controlled Vocabularies* (Harpring, Baca editor, revised 2013) and its bibliography
What Are the Getty Vocabularies?

AAT  TGN  ULAN  CONA  IA
 Getty Vocabularies in Context

Enabling digital art history

- **Art & Architecture Thesaurus ®**
  - AAT = terms for generic concepts, relationships, other data
    - (e.g., watercolors, 玉器, amphora, asa-no-ha-toji)

- **Getty Thesaurus of Geographic Names ®**
  - TGN = names for administrative, physical places, relationships, historical information, coordinates, other data
    - (e.g., Diospolis, Acalán, Ottoman Empire, Ganges River)

- **Union List of Artist Names ®**
  - ULAN = names for people, corporate bodies, biography, relationships, other data
    - (e.g., Christopher Wren, Altobelli & Molins, Anp’yŏng Taegun)

- **Cultural Objects Name Authority ®**
  - CONA = not only titles/names of art and architecture
    - (e.g., Mona Lisa, Livre de la Chasse, Chayasomesvara Temple)
  - In development: CONA links rich metadata for works to allow a conduit for research and discovery in the broader, ever expanding arena of digital art history

- **Getty Iconography Authority**
  - (e.g., Adoration of the Magi, Zeus, French Revolution, Der Ring des Nibelungen, Reclining Buddha)
  - In development: Now a module of CONA, includes names for iconographical narratives, religious or fictional characters, historical events, names of literary works and performing arts

What are the Getty vocabularies?

- Catherine wheel or rose window? Thebes or Diospolis? Giovanni da Bologna or Giambologna? Mona Lisa or La Gioconda? Reclining Buddha or Bouddha couché or 涅槃仏?

- The AAT, TGN, and ULAN contain multilingual terminology and other related data to describe
  - visual art, architecture, other cultural heritage works, art history, conservation, archaeology, archival materials, visual surrogates, and related bibliographic materials
What are the Getty vocabularies?

- *Catherine wheel* or *rose window*? *Thebes* or *Diospolis*? *Giovanni da Bologna* or *Giambologna*? *Mona Lisa* or *La Gioconda*? *Reclining Buddha* or *Bouddha couché* or 涅槃仏?

- **In development**: CONA is linked to AAT, TGN, and ULAN
- CONA is a resource that compiles titles, attributions, depicted subjects, and other metadata about works of art, architecture, and cultural heritage, both extant and historical. Metadata is gathered or linked from museum collections, special collections, archives, libraries, scholarly research, and other sources
- Through rich metadata and links, it is hoped that CONA will provide a powerful conduit for research and discovery for digital art history and related disciplines
What are the Getty vocabularies?

- *Catherine wheel* or *rose window*? *Thebes* or *Diospolis*? *Giovanni da Bologna* or *Giambologna*? *Mona Lisa* or *La Gioconda*? *Reclining Buddha* or *Bouddha couché* or 涅槃仏?

- **In development**: Getty Iconography Authority (IA)
  - The IA is a thesaurus that compiles names and other information for subjects of works of art that are not covered by the other Getty vocabularies
  - It includes proper names of iconographical themes or narratives, fictional or legendary people and places, named historical and legendary events, and named literary works or themes
  - It links to AAT, TGN, ULAN, and CONA
  - It links to Iconclass, LOC authorities, and other existing resources for subject matter
History of the Getty Vocabularies

- The AAT, ULAN, and TGN were begun in the mid-1980s
- To meet the needs of the art museum, visual resources, archives, and art library communities
- Authoritative vocabularies to aid in the indexing and retrieval of art information
- CONA development began in 2004; IA development was part of CONA
- The vocabularies are compiled through contributions from qualified and trained contributors (museums, art libraries, bibliographic indexing projects, national and international translation projects)
- AAT, ULAN, TGN, CONA, and IA have same core data structure and editorial rules
- We (Vocabulary Program and technical team) provide instruction for use of and contribution to the Getty vocabularies at conferences and in online training materials
The Getty Vocabularies

Discover, link, access, retrieve, research, catalogue, index
Explore art, architecture, cultural heritage, conservation, archaeology, and beyond

- Getty vocabularies are valued as authoritative
  - Grow through contributions from experts
  - Contributors and published sources are cited

- Compiled, merged, edited, and published by the Getty Vocabulary Program and our technical team; refreshed every two weeks

- **Data is made available in various ways:** via online searching; Web services APIs; licensed relational tables and XML format annual releases [will be discontinued]
  - **Now as Linked Open Data:** structured and published to make it openly accessible and shareable on the Semantic Web
    - Open Data Commons Attribution License (ODC-By) v1.0
    - More open license, allows sharing, creation, adaptation of data with attribution

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The Getty Vocabularies

Discover, link, access, retrieve, research, catalogue, index
Explore art, architecture, cultural heritage, conservation, archaeology, and beyond

Search Tools & Databases
- Primo Search
- Getty Research Portal
- Collection Inventories & Finding Aids
- Photo Archive
- Research Guides & Bibliographies
- Digital Collections
- Article & Research Databases
- Collecting & Provenance Research
- DMA & RILA
- Getty Vocabularies
- Art & Architecture Thesaurus (AAT)®
- Cultural Objects Name Authority (CONA)®
- Getty Thesaurus of Geographic Names (TGN)®
- Union List of Artist Names (ULAN)®
- Contribute
- Editorial Guidelines
- Getty Vocabularies as Linked Open Data
- Frequently Asked Questions
- Obtain the Getty Vocabularies

Gettys Vocabularies as Linked Open Data

The Getty vocabularies are constructed to allow their use in linked data. A project to publish them to the LOD (Linked Open Data) cloud is underway. The documents on this page contain news and presentations about releasing the Getty vocabularies as LOD. These materials are subject to frequent modification and addition.

- News and Status of the Project
- What is LOD?
- Introduction to Getty Vocabularies as LOD (PDF, 3.8 MB, 45pp)
- List of External Advisors (PDF, 88KB, 7pp)

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

Attention developers and programmers:
Technical documentation to assist in exploring the AAT, TGN, and ULAN data is available at the SPARQL endpoint at vocab.getty.edu

News and Status of the Project

Releasing the Getty vocabularies as Linked Open Data is part of the Getty’s ongoing effort to make our knowledge resources freely available to all, Making the Getty

Patricia Harpring

Getty Vocabularies Overview
 Getty vocabularies are thesauri compliant with national (NISO) and international (ISO) standards for thesaurus construction.

They are compliant with / map to other standards:
- CDWA (Categories for the Description of Works of Art)
- CCO (Cataloging Cultural Objects)
- VRA Core (Visual Resources Association core categories)
- LIDO (Lightweight Information Describing Objects)
- etc.
Features that allow the Getty vocabularies to be used in cataloging, retrieval, and linking

- Each Getty vocabulary record, each term, and other data are identified by **unique numeric IDs** (rather than relying solely on test matching)
- Many other fields are controlled by lookup lists
- The vocabularies are **linked to each other**
- The vocabularies share a **core data structure**
Context for the Getty Vocabularies

AAT  TGN  ULAN  CONA  IA
What Are Controlled Vocabularies?

- A controlled vocabulary is an organized arrangement of words and phrases.
- Typically includes preferred and variant terms.
- Has a defined scope or describes a specific domain.

Purpose of Controlled Vocabularies

- To provide terminology to catalog and retrieve information.
  - To capture the richness of variant terms.
  - For some users, to promote consistency in assignment of the same terms to similar content.
  - In retrieval, to utilize variants and broader/narrower contexts.
**Controlled Vocabularies vs. Controlled Format**

- **Controlled vocabularies** are organized sets of controlled terminology values (often with other information as well)

- **Controlled format** refers to rules concerning the allowable data types and formatting of information

- Fields may have controlled format in addition to being linked to controlled vocabulary

- Or the controlled format may exist in the absence of any finite controlled list of acceptable values
Controlled Vocabularies vs. Controlled Format

**Controlled format**

- May govern the expression of Unicode or other characters in either a free-text field or in a field that is linked to a controlled vocabulary

- Also for fields where numbers or codes are used
- E.g., recording measurements, geographic coordinates
- May regulate the number of digits allowed, the expression of decimals and negative numbers, etc.,
- *Ideally in compliance with ISO, NISO, or another appropriate standard*
Controlled Vocabularies vs. Controlled Format

Which fields here are controlled format, which use controlled vocabulary?

<table>
<thead>
<tr>
<th>Display</th>
<th>Materials/Techniques Description: egg-tempera paint with tooled gold-leaf halos on panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role</td>
<td>medium</td>
</tr>
<tr>
<td>Role</td>
<td>support</td>
</tr>
<tr>
<td>Technique Name: painting</td>
<td>gold tooling</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display</th>
<th>Dimensions Description: comprises 10 panels; overall: 280 x 215 x 17 cm (110 1/4 x 84 5/8 x 6 3/4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent</td>
<td>components</td>
</tr>
<tr>
<td>Value</td>
<td>280</td>
</tr>
<tr>
<td>Value</td>
<td>215</td>
</tr>
<tr>
<td>Value</td>
<td>17</td>
</tr>
</tbody>
</table>
Types of Controlled Vocabularies

• Most controlled vocabularies in art indexing are structured vocabularies

• Structured vocabulary = emphasizes relationships

Relationships in General

• Connections between terms and between concepts
  Are a rose window and a Catherine wheel the same thing? How is pot-metal glass related to the more general term stained glass?

• Between equivalents (synonyms)

• Other relationships = hierarchical and associative (links that organize concepts and provide context)
The most common types of controlled vocabularies used for art and architecture information

- subject heading lists
- simple controlled lists
- synonym ring lists
- taxonomies
- thesauri
Subject Heading Lists

Uniform words or phrases intended to be assigned to books, articles, or other documents in order to describe the subject or topic of the texts and to group them with texts having similar subjects

**Examples:**

**Library of Congress Subject Headings (LCSH)**

- Bicycle racing--United States
- Medical Subject Headings (MeSH)

- Embryonic and Fetal Development

- Typically arranged in alphabetical order, with cross-references between the preferred and other nonpreferred headings
- Differ from other vocabularies = precoordination of terminology = combine several unique concepts together in a string
Other Headings

- Other types of headings or labels may be used to uniquely identify or disambiguate one vocabulary entry from another.

  - E.g., name of a creator may be listed with a short biographical string to form a heading or label for display in a work record.

  **Pierre Koenig (American architect, 1925-2004)**

  - [name]
  - [display biography]
Label: Case Study House No. 21 (house; architect: Pierre Koenig (American architect, 1925-2004); 1956-1958; renovated 1998)

Examples of headings in object record
Controlled Lists

A controlled list is a simple list of terms used to control terminology.

A well-constructed controlled list, the following is true:

- each term is unique
- terms are not overlapping in meaning
- terms are all members of the same class (i.e., having the same level of rank in a classification system)
- terms are equal in granularity or specificity
- terms are arranged alphabetically or in another logical order

- Should be derived from larger published standard vocabularies if appropriate

- They are best employed in certain fields of a database where a short list of values is appropriate and where terms are unlikely to have synonyms or ancillary information
Controlled Lists

**Pick Lists**

Lead users to a small set of choices of terms for a given field

 Often implemented as drop-down or other types of lists

• From the end-user perspective, such short lists may be easier to navigate than more complex lists, particularly for nonspecialist users
Controlled Lists

*Pick Lists*

In cataloging systems, advantage of such lists = cataloger or indexer has only short list of terms from which to choose

Thus ensuring more consistency and reducing the likelihood of error

Example of a pick list from The Museum System (TMS) application for the J. Paul Getty Museum

- architecture
- armor
- books
- coins
- decorative arts
- drawings
- implements
- jewelry
- manuscripts
- miscellaneous
- paintings
- photographs
- sculpture
- site installation
- texts
- vessels

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Controlled Lists

**Pick Lists**

In cataloging systems, advantage of such lists = cataloger or indexer has only short list of terms from which to choose

Thus ensuring more consistency and reducing the likelihood of error

- Dozens of areas of a work record may be better suited for a short controlled list rather than a more complex controlled vocabulary

  Classification field, Title Type (e.g., artist’s, descriptive, inscribed, etc.), Title Language (e.g., English, French, German, Italian, Spanish, etc.), or Title Preference (e.g., preferred, alternate)

- **Disadvantage** is that it limits choices to cataloger or end-user; if used in retrieval would not allow retrieval by synonyms and related terms
**Synonym Ring Lists**

- Simple sets of terms considered equivalent for the purpose of retrieval

- Catalogers do not use synonym rings for indexing; used behind the scenes of an electronic information system

- Used to broaden retrieval (query expansion): may contain near-synonyms that have similar or related meanings rather than only terms with true synonymy

- Used with texts, not generally with fielded data

- Best when constructed by an expert in the content and for a specific text
Authority Files

Sets of established names or headings and cross-references to the preferred form from variant or alternate forms

- Authority control refers as much to the methodology of application as to a particular controlled vocabulary

- Any listing of terms, names, or headings that distinguishes between a preferred and variant names or headings may be used as an authority

- Getty vocabularies are non-authoritarian authorities; preferred term is flagged (term used most often in scholarly literature in language of the record) but users may use any term in the record if they wish
**Taxonomies**

A taxonomy = orderly classification for a defined domain
Comprises controlled vocabulary terms organized into a hierarchical structure

- A taxonomy may differ from a **thesaurus** in that it generally has shallower hierarchies and a less complicated structure
- For example, it often has no equivalent (synonyms or variant terms) or related terms (associative relationships)
- Scientific classifications of animals and plants are well-known examples of taxonomies

*Flavobacterium* LinkOut Click on organism name to get

- *Flavobacterium algicola* LinkOut
- *Flavobacterium anhuicense* LinkOut
- *Flavobacterium antarcticum* LinkOut
- *Flavobacterium aquatile* LinkOut
- *Flavobacterium aqudaricense* LinkOut
- *Flavobacterium arcticum*
- *Flavobacterium banpakuense*
- *Flavobacterium branchiophilum* LinkOut
  - *Flavobacterium branchiophilum FL-15*
- *Flavobacterium celti* LinkOut
- *Flavobacterium cheni*
- *Flavobacterium chungangense* LinkOut
- *Flavobacterium columnare* LinkOut
- *Flavobacterium croceum* LinkOut
- *Flavobacterium cucumis* LinkOut
- *Flavobacterium daejeonense* LinkOut
- *Flavobacterium defluvi* LinkOut
- *Flavobacterium degerlachei*
- *Flavobacterium enloeae*
- *Flavobacterium fischeria*
- *Flavobacterium gealceanum*
- *Flavobacterium grahamii*
- *Flavobacterium heimii*
- *Flavobacterium hongkongense*
- *Flavobacterium kocandense*
- *Flavobacterium koreense*
- *Flavobacterium lanceae*
- *Flavobacterium larawaiense*
- *Flavobacterium levis*
- *Flavobacterium limosum*
- *Flavobacterium longeae*
- *Flavobacterium manzoni*
- *Flavobacterium manzoni*
- *Flavobacterium maris*
- *Flavobacterium maris*
- *Flavobacterium nankinense*
- *Flavobacterium novomexicanum*
- *Flavobacterium odontophorum*
- *Flavobacterium otispum*
- *Flavobacterium pacificum*
- *Flavobacterium peptonicum*
- *Flavobacterium pelagicum*
- *Flavobacterium perfidum*
- *Flavobacterium phenotypicum*
- *Flavobacterium phaffii*
- *Flavobacterium plumbali*
- *Flavobacterium potosi*
- *Flavobacterium raymondii*
- *Flavobacterium renale*
- *Flavobacterium roseum*
- *Flavobacterium ruvido*
- *Flavobacterium russeae*
- *Flavobacterium salpetri*
- *Flavobacterium sauberei*
- *Flavobacterium salvisolae*
- *Flavobacterium sanguis*
- *Flavobacterium sanguinis*
- *Flavobacterium sanguinis*
- *Flavobacterium saundersii*
- *Flavobacterium saxonicum*
- *Flavobacterium septicum*
- *Flavobacterium shinii>*
Alphanumeric Classification Schemes

Controlled codes (letters or numbers, or both letters and numbers) that represent concepts or headings

- Generally have an implied taxonomy that can be surmised from the codes

### Dewey Decimal Classification and Library of Congress Classification systems

<table>
<thead>
<tr>
<th>Dewey</th>
<th>LC</th>
<th>General Subject</th>
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<tbody>
<tr>
<td>000, 040, 080</td>
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<td>010, 020, 090</td>
<td>Z</td>
<td>Library Science</td>
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<tr>
<td>030</td>
<td>AE</td>
<td>Encyclopedias</td>
</tr>
<tr>
<td>050</td>
<td>AP</td>
<td>Periodicals</td>
</tr>
<tr>
<td>060</td>
<td>AS</td>
<td>Academies, Societies</td>
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<tr>
<td>070</td>
<td>PN</td>
<td>Literature (Gen.)</td>
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<td>Philosophy (Gen.)</td>
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<td>BD</td>
<td>Speculative Philosophy</td>
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<td>130, 150</td>
<td>BF</td>
<td>Psychology</td>
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<td>140, 180, 190</td>
<td>B</td>
<td>Philosophy (Gen.)</td>
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<tr>
<td>160</td>
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<td>Logic</td>
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<td>170</td>
<td>BJ</td>
<td>Ethics</td>
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<td>200, 210, 290</td>
<td>BL</td>
<td>Religion, Mythology</td>
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<td>220</td>
<td>BS</td>
<td>The Bible</td>
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<td>230</td>
<td>BT</td>
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<td>240, 250</td>
<td>BV</td>
<td>Practical Theology</td>
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<td>250, 270</td>
<td>BR</td>
<td>Christianity</td>
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<td>280</td>
<td>BX</td>
<td>Christian Denominations</td>
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<tr>
<td>300</td>
<td>H</td>
<td>Soc. Sci. (General)</td>
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<tr>
<td>720</td>
<td>Architecture</td>
<td></td>
</tr>
<tr>
<td>723</td>
<td>Architecture from ca. 300 to 1399</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dewey</th>
<th>LC</th>
<th>General Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>570</td>
<td>GN, QH</td>
<td>Anthropology, Nat. Hist.</td>
</tr>
<tr>
<td>580</td>
<td>QX</td>
<td>Botany</td>
</tr>
<tr>
<td>590</td>
<td>QL</td>
<td>Zoology</td>
</tr>
<tr>
<td>600</td>
<td>T-TX</td>
<td>Technology</td>
</tr>
<tr>
<td>610</td>
<td>R</td>
<td>Medicine (General)</td>
</tr>
<tr>
<td>620</td>
<td>TA</td>
<td>Engineering</td>
</tr>
<tr>
<td>630</td>
<td>S, HD</td>
<td>Agriculture, Land Use</td>
</tr>
<tr>
<td>640</td>
<td>TX</td>
<td>Home Economics</td>
</tr>
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<td>650</td>
<td>HF</td>
<td>Commerce</td>
</tr>
<tr>
<td>660</td>
<td>TP</td>
<td>Chemical Technology</td>
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<td>670, 680</td>
<td>TS, HD</td>
<td>Manufactures</td>
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<tr>
<td>690</td>
<td>TH</td>
<td>Building Construction</td>
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<tr>
<td>700</td>
<td>N</td>
<td>Visual arts</td>
</tr>
<tr>
<td>710</td>
<td>SB</td>
<td>Plant culture</td>
</tr>
<tr>
<td>720</td>
<td>NA</td>
<td>Architecture</td>
</tr>
<tr>
<td>730</td>
<td>NB</td>
<td>Sculpture</td>
</tr>
<tr>
<td>740</td>
<td>NC</td>
<td>Drawing, Design</td>
</tr>
<tr>
<td>750</td>
<td>ND</td>
<td>Painting</td>
</tr>
</tbody>
</table>
Ontologies

Formal, machine-readable specifications of a conceptual model

Not a controlled vocabulary, but use one or more controlled vocabularies and expresses the vocabulary in a representative language to express relationships

- Ontologies generally divide the realm of knowledge that they represent into the following areas: **individuals, classes, attributes, relations, and events**
- Ontologies used in the Semantic Web, artificial intelligence, software engineering, and information architecture

A detail of a sample ontology for Vincent van Gogh’s *Iris*es and Henri Matisse’s *Still Life*, illustrating how the works are part of a subset of oil paintings under the category paintings
Folksonomies

Assemblages of concepts represented by terms and names (called tags) that are compiled through social tagging; became prominent ca. 2004

Do not typically have hierarchical structure or preferred terms for concepts, and they may not even cluster synonyms

Not considered authoritative because they are typically not compiled by experts

- Can be useful in situations where controlled tagging is not possible
- Potential for enhanced retrieval = by linking folksonomies to more rigorously structured controlled vocabularies
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
Using Multiple Vocabularies

Catalogers of art information require multiple vocabularies because no single vocabulary provides the full set of terminology needed to catalog or index a given set of cultural heritage data.

• A combination of vocabularies is necessary for indexing
• A separate combination may be necessary for retrieval (or at minimum the cataloging vocabularies may be used differently in retrieval)
Scope and Content of the Getty Vocabularies

AAT  TGN  ULAN  CONA  IA
AAT, the Art & Architecture Thesaurus®

Generic terms for describing art and architecture (fine art, built works, decorative arts, other material culture, visual surrogates, archival materials, archaeology, and conservation)

(e.g., oil paintings, Baroque, lithographers, sintering)

Current totals: 41,855 records; 355,000 terms
Thousands of new records every year; translations

- AAT is multilingual; large translation projects are underway
- Conceptually organized from terms to describe abstract concepts to generic terms for concrete, physical artifacts
- Facets are the upper levels of the AAT structure
- AAT is not organized by subject matter or discipline
<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>amphorae</td>
<td>Roman amphorae are rectangular containers used for transporting and storing goods.</td>
</tr>
<tr>
<td>arc-boutant</td>
<td>Arc-boutant was a type of architectural element used in the construction of arches.</td>
</tr>
<tr>
<td>brittleness</td>
<td>Brittle refers to the property of materials that break easily under stress.</td>
</tr>
<tr>
<td>Buddhism</td>
<td>Buddhism is a religion that originated in ancient India.</td>
</tr>
<tr>
<td>calligraphy</td>
<td>Calligraphy involves the art of writing with a pen or brush.</td>
</tr>
<tr>
<td>emulsifier</td>
<td>An emulsifier is a substance that stabilizes emulsions.</td>
</tr>
<tr>
<td>façades</td>
<td>Façades are the outer walls of a building.</td>
</tr>
<tr>
<td>flying buttress</td>
<td>A flying buttress is a structural component used in Gothic architecture.</td>
</tr>
<tr>
<td>lithographer</td>
<td>A lithographer is a professional who produces lithographs.</td>
</tr>
<tr>
<td>litógrafos</td>
<td>Litógrafos are Spanish for lithographers.</td>
</tr>
<tr>
<td>luchtbogen</td>
<td>Luchtbogen refers to a type of architectural element in Dutch.</td>
</tr>
<tr>
<td>orthogonal plan</td>
<td>An orthogonal plan is a plan where the axes are perpendicular.</td>
</tr>
<tr>
<td>Macedonian</td>
<td>Macedonian refers to a region and its people in southeastern Europe.</td>
</tr>
<tr>
<td>millwork</td>
<td>Millwork involves the production of wooden objects for carpentry.</td>
</tr>
<tr>
<td>Rinascimento</td>
<td>Rinascimento refers to the Renaissance period in Italian art.</td>
</tr>
<tr>
<td>stupa</td>
<td>A stupa is a small mound-like structure used in Buddhist and Hinduism.</td>
</tr>
<tr>
<td>Sturzbecher</td>
<td>Sturzbecher is a type of earthenware jug.</td>
</tr>
<tr>
<td>travertine</td>
<td>Travertine is a sedimentary rock formed by the mineral travertine.</td>
</tr>
<tr>
<td>weft wrapping</td>
<td>Weft wrapping involves the process of wrapping weft threads around a warp.</td>
</tr>
<tr>
<td>yastiks</td>
<td>Yastiks are slender, flexible cords used in architecture.</td>
</tr>
<tr>
<td>zeppelin</td>
<td>A zeppelin is a type of non-rigid airship.</td>
</tr>
<tr>
<td>Zigula</td>
<td>Zigula is a type of ornamentation in architecture.</td>
</tr>
<tr>
<td>zinc oxide</td>
<td>Zinc oxide is a compound used in various industries.</td>
</tr>
</tbody>
</table>
AAT, the Art & Architecture Thesaurus®

- equivalence relationship
- hierarchical relationship
- associative relationship

**Thesaural relationships**

- **hierarchical**
  - Objects Facet
  - Furnishings and Equipment
  - Containers
  - culinary containers
  - <vessels for serving / consuming food>
  - drinking vessels

- **associative**
  - stirrup cups
  - coaching glasses
  - hunting glasses
  - sturzbechers
  - Sturzbecher
  - stortebokers

- **equivalence**
  - rhyta
  - rhyton
  - rhytons
  - rhea
  - rheon
  - rheons
  - ritón
  - 莱坦酒杯
**Sample record**

<table>
<thead>
<tr>
<th>ID: 300132869</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Terms:</strong> bobbin lace (pref, en)  bone lace (en)  cushion lace (en)  梭心蕾絲 (zh)  線軸編織花邊 (zh)  kloskant (nl)  dentelle aux fuseaux (fr)  encaje de bolillos (es)  encaje de bolillo (es)  Klöppelspitze (de)  Klöppelspitzen (de)</td>
</tr>
</tbody>
</table>

| **Associative Relationships** requires ... lace pillows (<textile fabricating tools and equipment>...Objects Facet) [300132869] |

| **Hierarchical Relationships (poly)** | Objects Facet  ... Visual & Verbal Communication  ..... Visual Works  ....... visual works (works)  ........... <visual works by material >  ............ needlework (visual works)  ............ bobbin lace |

| **Note:** With "needle lace," one of two primary types of handmade lace. It is characterized by being made by ... |

**Chinese (traditional) ..... 與「針織蕾絲（needle lace）」同為主要的手工蕾絲，其特色是以纏繞於線軸或梭心...**

**Dutch ..... Een van de twee belangrijkste soorten met de hand vervaardigde kant; ‘naaldkant’ is ...**

**German ..... Zusammen mit der “Nadelspitze” eine der wichtigsten...**

**Spanish ..... Junto a "encaje a aguja", uno de los dos tipos principales de ...**

**Contributors:** VP, CHIN, AS, RKD, IFM-SMB-PK, CDPB-DIBAM  
**Sources:** Earnshaw, Clabburn, Needleworker's Dictionary (1976); Identification of Lace, 2d ed. (1984); Ginsburg, Illustrated History of Textiles (1991)
bobbin lace (preferred, C, U, LC, English-P, D, U, PN)
bone lace (C, U, English, UF, U, N)
cushion lace (C, U, English, UF, U, N)
lace, bobbin (C, U, English, UF, U, N)

pillar lace (C, U, English, UF, U, N)

梭心蕾絲 (C, U, Chinese (traditional)-P, D, U, U)
線軸編織花邊 (C, U, Chinese (traditional)-UF, U, U)
骨架花邊 (C, U, Chinese (traditional)-UF, U, U)
枕墊花邊 (C, U, Chinese (traditional)-UF, U, U)

suō xīn léi sī (C, U, Chinese (transliterated Hanyu)
suo xīn léi sī (C, U, Chinese (transliterated Pinyin)
suó xīn léi sì (C, U, Chinese (transliterated Wade)
klokkant (C, U, Dutch-P, D, U, U)
dentelle aux fuseaux (C, U, French-P, D, U, PN)
merletto a tombolo (C, U, Italian-P, D, U, PN)
encaje de bolillos (C, U, Spanish-P, D, U, PN)
encaje de bolillo (C, U, Spanish-AD, U, SN)
Klöppelspitze (C, U, German-AD, U, SN)
Klöppelspitzen (C, U, German-P, D, U, PN)
TGN, the Getty Thesaurus of Geographic Names®

Names, other information for current & historical administrative places (cities, nations, empires) and physical features
(e.g., Acalán, Argissa Magoula, Firenze, Roman Empire, Ganges River)
Current totals: 1,475,816; 2,150,000 names
Grows by thousands every year

- It includes formerly inhabited places, archaeological sites, and historical places with unknown exact locations (i.e., “lost settlements”)
- It focuses on places important to study of art, architecture, and related disciplines; powerful as thesaurus and historical information. Not GIS, but may be linked to GIS and maps.
- It grows through contributions from the expert user community, archaeology projects, conservation experts, scholars, large national geographic databases, etc.
## Sample record

**TGN, the Getty Thesaurus of Geographic Names®**

**ID:** 7011179

**Names:**
- Siena (it, en, es, fr, nl, de)
- Σίένα (el)
- Siyenah (zh)
- シェーナ (ja)
- Sienese (en-adj)
- Sienna (h-en)
- Sena Julia (h-la)
- Sanna (h)
- Saena (h)

**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

**Place Types**
- Inhabited place, settled by Etruscans (founded by 5th century BCE)
  - City
  - Archdiocese
  - Commune (administrative) since 1125
  - Cultural center
  - University center
  - World heritage site

**Place:**
- 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 a medieval self-governing commune...

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

**Contributors:** BHA, FDA, GRL, PSC, VP

**Sources:**
- Annuario Generale (1980)
- Canby, Historic Places (2007) 2/661
- Dizionario Corografico Toscana (1977) 1008
- Milanesi, Storia dell’Arte Senese (1968) passim
- UNESCO World Heritage Centre [online] (1992) accessed 20 July 2010
- Webster’s Geographical Dictionary (2007) 1114

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ULAN, the Union List of Artist Names®

Names, other information for people (artists, patrons, sitters) and corporate bodies (repositories, studios) related to the design, creation, patronage, collection, conservation, etc. of art, architecture, and other cultural materials
(e.g., Bartolo di Fredi, Xueshi Bai, 白雪石, Santa Eufemia Master, National Palace Museum (Taipei))

Current totals: 234,825 records; 645,000 names
Grows by thousands every year

- Scope also includes “Non-Artists” (e.g., sitters and patrons)
  “Unknown People by Culture” (e.g., unknown Aztec)
  “Unidentified Named People” (e.g., known from archival documents)
- ULAN includes current and historical associative relationships
  (e.g., students to teachers; firm and studios to members)
- Contributions to ULAN are from experts (museums, art libraries, cataloging projects, etc.)
ULAN, the Union List of Artist Names®

Sample record

**ID:** 500060426
**Names:**
- Hokusai, Katsushika (pref, en, ja-trans, de)
- Katsushika Hokusai (en, ja-trans)
- Hokusai (en, ja-trans)
- 葛飾 北斎 (ja)
- Shunrō (en, ja-trans)
- Tawaraya Sōri (en, ja-trans)
- Kakō (en, ja-trans)
- Tatsumasa (en, ja-trans)
- Gakyōjin (en, ja-trans)
- Taito (en, ja-trans)
- lichi (en, ja-trans)
- Manji (en, ja-trans)
- Tokitarō (en, ja-trans)
- 時太郎 (ja)
- 葛飾北斎 (ja)

**Nationalities:**
Japanese (pref)

**Roles:**
- artist
- printmaker
- painter
- designer
- calligrapher
- draftsman
- landscapist
- marine artist
- figure artist
- ukiyo-e artist

**Gender:** male

**Birth and Death Places:**
- Born: Tokyo (Kanto, Japan) (inhab place)
- Died: Tokyo (Kanto, Japan) (inhab place)

**Events:**
- active: Tokyo (Kanto, Japan) (inhab place)
- ....... in Edo, modern-day Tokyo

**Associative Relationships:**
- teacher of Taito, Katsushika, II
- .......... (Japanese printmaker, active ca. 1820-1850)
- child of Nakajima Ise
- .......... (Japanese mirror maker, 18th century)
- possibly identified with ... Tōshūsai Sharaku
- .......... (Japanese printmaker, active 1794-1795)

**Contributors:**
- VP, Avery, GRL, BHA, CCA

**Sources:**
- Bowie, Drawings of Hokusai (1964);
- Grove Dictionary of Art online (1999-2002);
- Library of Congress Authorities database (n.d.);
- Metropolitan Museum of Art [online] (2003-);
- Bouquillard, Hokusai: First Manga Master (2007)
ULAN, the Union List of Artist Names®

Sample record

**ID:** 500115493

**Names:**
- Dürrer, Albrecht (pref,de,en)
- Albrecht Dürrer
- Duerer, Albrecht (en)
- Durer, Albrecht (en)
- Dürrero, Alberto (it)
- Durerus, Albertus (la)
- Dîrer, Albreht
- Djurer, Albrecht
- Dyürə, Albrecht
- Dîrers, Abrehnts
- Alberto Duro Tedesco
- デューラー, アルブレヒト (ja)
- 阿尔布雷希特·丢勒 (zh)

**Nationalities:**
- German (pref)
- Bavarian

**Roles:**
- artist (preferred)
- painter
- printmaker
- engraver (printmaker)
- woodcutter
- draftsman
- illustrator
- designer
- mathematician
- theorist
- portraitist
- religious artist

**Gender:** male

**Birth and Death Places:**
- Born: Nuremberg (Bavaria, Germany) (inhab place)
- Died: Nuremberg (Bavaria, Germany) (inhab place)

**Events:**
- active: Nuremberg (Bavaria, Germany) (inhab pl)
- active: Venice (Veneto, Italy) (inhabited place)

**Associative Relationships:**
- apprentice of Wolgemut, Michael; 1486 to 1489
- child of Dürer, Albrecht, the elder
- founder of ...Albrecht Dürrer Workshop
- patron was ...Maximilian I, Holy Roman Emperor

**Contributors:**
- VP, JPGM, Avery, WCI, Prov, GRLPSC, BHA, CCA
- Sources: Bartrum, Albrecht Dürrer and his Legacy (2002); Bénézit, Dictionnaire des Peintres (1976; Bartsch, Le peintre graveur.

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Processing records

- Contributors’ data is loaded and processed by the Getty ITS team and the Vocabulary Program
- Data is merged, normalized, and published
- Exported data is refreshed for users every two weeks
- Releases: Online search, Web services APIs, LOD, [annual XML and relational tables]

Batch loading of data
- From various systems or from online forms
- In our prescribed format

VCS: Processing Data
- Searching, Merging
- Editing/adding info
- Moving/adding links

Exporting Data
- Reports for quality control
- Reports for work flow
- Release formats: Web, APIs, LOD

At any time, could be 100s of thousands of candidate records, contributed but still in process
Editors have monthly quotas for work done
- to allow anticipation of time frame for publications
- to ensure not too much time is spent on unsolvable tasks
What do we do?

Publishing data

• Mapping incoming contributor data to correct fields and controlled lists etc.
• Editorial work requires normalizing data
• Merging duplicate records
• Dozens of other data issues to correct and normalized to allow efficient use in cataloging and retrieval

Merging records
Finding matches
Manual or automated merge, vetted by VP editors

Names

Palamedesz., Anthonie
Palamedes, Anthonie
Palamedesz., Anthonie

Biography

Dutch painter, active mid-17th century
birth: 1620 death: 1699

Netherlandish artist, 1601-1673
birth: 1601 death: 1673

Publishing data

• Mapping incoming contributor data to correct fields and controlled lists etc.
• Editorial work requires normalizing data
• Merging duplicate records
• Dozens of other data issues to correct and normalized to allow efficient use in cataloging and retrieval

What do we do?

Publishing data

• Mapping incoming contributor data to correct fields and controlled lists etc.
• Editorial work requires normalizing data
• Merging duplicate records
• Dozens of other data issues to correct and normalized to allow efficient use in cataloging and retrieval
Using data

- Online Web searches
- Access to training materials and editorial guidelines
- Highest number of pages accessed at GRI every month (200,000 queries)
- Among the highest at Getty overall
- Now working on ways to determine how many using LOD
- Demonstrating usefulness is important to proving the value of the project, re. budgets, etc.
Using data

- Vocabulary data is licensed and used by hundreds of institutions and vendors
- Collections management systems (e.g., TMS)
- We contribute to VIAF
- Now linking vocabulary data in LOD in hundreds or thousands of new ways

GRI (with ULAN and TGN) contributes to VIAF, the Virtual International Authority File.

Link to other sources in Linked Open Data

http://viaf.org/
The Getty Iconography Authority
Named events, religious/mythological iconography, fictional characters and places, themes from literature

- Includes the proper names of subjects not covered by other Getty vocabularies
- The Getty Iconography Authority (IA) is a module within CONA; over time, it could become a stand-alone authority through contributions
- Includes links to other sources, such as Iconclass and the US Library of Congress subject authorities
**Getty Iconography Authority**

**Sample record**

**ID:** 1000085

**Names:**
Avalokiteshvara
Avalokiteśvara
अवलोकितेश्वर
Spyan ras gzigs

**AAT links**
role/characteristic is … bodhisattva
symbolic attribute is … lotus
culture/religion is … Mahayana (Buddhism)
culture/religion is … Theravada (Buddhism)

**Associative Relationships**
associated with …. Krishna (Hindu iconography)
counterpart is …. Guanyin (Buddhist iconography)

**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] Encyclopedia Britannica Online (2002-); Bowker, Oxford Dictionary of World Religions (1997); Huntington, Art of Ancient India (1985); LC: LC control no.: sh 85010492
In development: [CONA, the Cultural Objects Name Authority®]

Titles, other information for moveable works (paintings, sculpture, prints, drawings, photographs, ceramics, etc.) and architecture (buildings, bridges, etc.)
(e.g., Hagia Sophia, Mona Lisa, Fantastic Landscape with a Pavilion, Thirty-six Views of Mount Fuji, 富嶽三十六景)

- Currently in development, CONA compiles titles, attributions, depicted subjects, and other metadata about works of art, architecture, and cultural heritage, both extant works and historical works
- Metadata is gathered and linked from museum collections, special collections, archives, libraries, scholarly research, and many other sources
- CONA is multicultural and multilingual
- CONA is linked to images
- CONA is linked to the AAT, TGN, and ULAN
- Through this rich metadata and links, CONA may provide a powerful conduit for research and discovery for digital art history

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The simplified entity-relationship diagram for CONA is the same as CDWA / CCO
What is a minimum record for contribution?

<table>
<thead>
<tr>
<th>Core elements</th>
<th>Core elements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Catalog Level</strong></td>
<td>item</td>
</tr>
<tr>
<td><strong>Classification</strong></td>
<td>paintings</td>
</tr>
<tr>
<td><strong>Work Type</strong></td>
<td>painting (visual work)</td>
</tr>
<tr>
<td></td>
<td>scroll (information artifact)</td>
</tr>
<tr>
<td><strong>Title</strong></td>
<td>Scene of Early Spring</td>
</tr>
<tr>
<td></td>
<td>宋郭熙早春圖 軸</td>
</tr>
<tr>
<td><strong>Creator</strong></td>
<td>Guo Xi (Chinese painter, 1023 - ca.1085 CE)</td>
</tr>
<tr>
<td><strong>Creation Date</strong></td>
<td>1072 CE</td>
</tr>
<tr>
<td><strong>Subject</strong></td>
<td>(general) landscape</td>
</tr>
<tr>
<td></td>
<td>(specific)</td>
</tr>
<tr>
<td><strong>Current Location</strong></td>
<td>National Palace Museum (Taipei, Taiwan)</td>
</tr>
<tr>
<td></td>
<td>ID: 000053N0000000000</td>
</tr>
<tr>
<td><strong>Measurements</strong></td>
<td>158.3 x 108.1 cm</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td>painted scroll</td>
</tr>
</tbody>
</table>
CONA, the Cultural Objects Name Authority®

- CONA contains links to artists and patrons, style, dates, locations, studies and other related works, bibliography, and the subjects depicted in the works.
- CONA can merge information from various sources and contributors about a given architectural or movable work, and provide a unique ID for that work in LOD.
  - Information from the repository of a work will be preferred (e.g., attribution), but other opinions and additional information of scholars could be included.
- CONA provides unique, persistent numeric identifiers for the work and all of its associated information, allowing disambiguation between similar works and authoritative identification of the work in a linked environment.
- CONA can facilitate linking between works, including works held in different repositories but having historical relationships (e.g., studies, disassembled manuscripts, etc.).
- CONA can provide a record for lost and destroyed works.
- CONA contains links to images of the works.
CONA merges metadata from multiple sources in one record

<table>
<thead>
<tr>
<th>CONA ID: <strong>700000178</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalog Level: item</td>
</tr>
<tr>
<td>Classification: paintings</td>
</tr>
<tr>
<td>Work Type: panel painting</td>
</tr>
<tr>
<td>Title: Adoration of the Magi</td>
</tr>
<tr>
<td>Creator: Bartolo di Fredi (Sienese painter, active by 1353, died 1410)</td>
</tr>
<tr>
<td>Creation Date: ca. 1385; some scholars date it after 1395</td>
</tr>
<tr>
<td>General Subject: religion and mythology</td>
</tr>
<tr>
<td>Specific: Adoration of the Magi</td>
</tr>
<tr>
<td>Journey of the Magi</td>
</tr>
<tr>
<td>Holy Family</td>
</tr>
<tr>
<td>horses</td>
</tr>
<tr>
<td>gold</td>
</tr>
<tr>
<td>frankincense</td>
</tr>
<tr>
<td>myrrh</td>
</tr>
<tr>
<td>Current Location: Pinacoteca Nazionale di Siena (Siena, Italy); Repository No: no. 104</td>
</tr>
<tr>
<td>Dimensions: 195 x 158 cm (76 x 61 5/8 inches)</td>
</tr>
<tr>
<td>Mat &amp; Tech: tempera on panel</td>
</tr>
<tr>
<td>Contributors: BHA VP CD PNS GRI-PA</td>
</tr>
<tr>
<td>Sources: Pinacoteca Nazionale di Siena (2002-); Boucher and Fiorini, Magi Reconstructed (2012); Cole, Sienese Painting (1985); Freuler, Bartolo di Fredi (1994); Harpring, Bartolo di Fredi (1992)</td>
</tr>
</tbody>
</table>

• CONA ID uniquely identifies the work in LOD world
• Repository title is flagged, others included
• Date of execution is in dispute: The display of the CONA record prefers the date espoused by the Repository, but other scholarly opinions are included

• CONA ID uniquely identifies the work in LOD world
• Repository title is flagged, others included
• Date of execution is in dispute: The display of the CONA record prefers the date espoused by the Repository, but other scholarly opinions are included
CONA, the Cultural Objects Name Authority®

CONA could link work records to Getty vocabularies

Catalog Level: item
Classification: vessels
Work Type: vase
Title: Blue and White Glazed Globular Vase
Creator: unknown Chinese
Creation Date: 1403/1424 CE
Subject (general): object (utilitarian)
(subject) | animal | dragon
Current Location: National Palace Museum (Taipei, Taiwan) ID: 012547N000000000
Measurements: 42.9 cm high and 9.7 cm diameter; foot diameter 15.8 cm
Materials: blue and white porcelain | porcelain (material) | blue-and-white (ceramic glaze)

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Linking to the AAT and other Getty vocabularies allows the variant terms and other links and information in the AAT, ULAN, or TGN record to be used in retrieval of the work.
Sample record

**CONA links work records to Getty vocabularies**

**ID:** 700001950

**Titles:**
Shiva met de maan in het haar (nl)
Shiva with the Moon in his Hair (en)

**Catalog Level:** item

**Work Types:**
sculpture (visual work)

**Classifications:**
sculpture (preferred)

**Creation Date:** 1000/1200

**Creator Display:**
anoniem
sculptor: unknown Chola

**Locations:**
Current: Rijksmuseum (Amsterdam, North Holland, Netherlands) AK-MAK-1291; RM001.collect.910; Bruikleen van de Vereniging van Vrienden der Aziatische Kunst
Creation: Tamil Nādu (India)

**Materials:**
bronze founding

**Dimensions:**
40 cm (height) x 24cm (width) x 10.5 (depth)

**Events:**
exhibition: Metamorfoze/Geheugenproject Willem Witsen

**Cultures:**
Indian
Chola

**General Subject:**
human figure(s) (preferred )
religion and mythology

**Specific Subjects:**
Shivā (Hindu iconography)
mudrā (pose, <visual and representational concepts>)

**Contributors & Sources:**
[Rijksmuseum;VP]; Rijksmuseum XML file

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CONA, the Cultural Objects
Name Authority®

**Sample record**

<table>
<thead>
<tr>
<th>ID: 700000141</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Titles/Names:</strong> Hagia Sophia (en, de, nl) Ayasofya (tr) Αγία Σοφία (el) Agia Sophia Haghia Sophia Sainte-Sophie (fr) Santa Sofia (es) Santa Sofia (it) Sancta Sophia (la) Sancta Sapientia (la) Holy Wisdom (en) Saint Sophia (en) 聖索非亞大教堂 (zh)</td>
</tr>
<tr>
<td><strong>Work Types:</strong> church; mosque; museum</td>
</tr>
<tr>
<td><strong>Date:</strong> original structure dated from 4th century CE; present structure built 532-537 CE; rebuilt in 12th century</td>
</tr>
<tr>
<td><strong>Creators:</strong> Anthemios of Tralles (Byzantine architect, ca. 474-ca. 534) and Isidore of Miletus, the Elder (Byzantine architect, active mid-6th century); Patron: Justinian I (Byzantine emperor, ca. 482-565)</td>
</tr>
<tr>
<td><strong>Built Work</strong> Homage to Hagia Sophia Associated Relationship depicted in View of the Hagia Sophia in Constantinople: Eduard Hildebrandt: watercolor; ca. 1852; Hermitage Museum (Saint Petersburg, Russia) [700008345]</td>
</tr>
<tr>
<td><strong>Location:</strong> Istanbul (Marmara, Turkey) Address Note: 41.005748°N; 28.979938°E</td>
</tr>
<tr>
<td><strong>Materials:</strong> system bearing masonry, centralized plan; interior surfaces are sheathed with polychrome marble, porphyry, and mosaics</td>
</tr>
<tr>
<td><strong>Dimensions:</strong> central dome: diameter 31 m (102 feet); height 56 m (184 feet)</td>
</tr>
<tr>
<td><strong>General Subject:</strong> architecture Specific Subject: Holy Wisdom Religion/Mythology</td>
</tr>
<tr>
<td><strong>Note:</strong> Domed basilica was consecrated by the Emperor Justinian; built in Constantinople in 6th century...</td>
</tr>
<tr>
<td><strong>Contributors:</strong> Avery, BHA, FDA, VP Sources: Fleming, Penguin Dictionary of Architecture (1999); Herrin, Judith, Byzantium (2007); Maidstone, Hagia Sophia (2002); Theoharis, Architecture of Hagia Sophia (1988); Xydias, Chancel Barrier of Hagia Sophia (1947)</td>
</tr>
</tbody>
</table>
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 loaded.

The CVA/Processor was developed in-house for editors to use where auto-links are not possible.

Such a tool for contributors should be investigated.

**CONA record, creator**

Koenig, Pierre (American architect, 1925-2004)  500086520

**link to ULAN**
CONA, the Cultural Objects Name Authority®

- CONA links depicted subjects

  - Whereas libraries have a tradition of cataloging the subjects of works
  - Many art museums typically do not index subject matter depicted in / represented by works
    - [sitters, places, events, iconographical themes, dedication of certain buildings, etc.]
    - In a survey conducted of American art museums’ data, of the core fields (agreed by consensus in CDWA, CCO, etc.), all museums included all core fields except the subject [by OCLC (Online Computer Library Center, a nonprofit computer library service and research organization); core fields per CCO and CDWA (Categories for the Description of Works of Art)]
CONA, the Cultural Objects Name Authority®

- Three levels of analysis ("indexing type" in CONA)
  - Objective description
  - Identification of named subject
  - Interpretation of the meaning or theme

Analyzing the subject

another way of considering subject, according to what the subject is of, what it is about, or what it is

- **ofness** = what a work depicts
- **aboutness** = what a work conveys
- **isness** = what a work is, what class it belongs to

For aboutness, ofness, isness, see
### Terms for General Subjects (partial list)

Extensible list of General Subjects: for full list see CONA editorial guidelines

<table>
<thead>
<tr>
<th>Advertising and Commercial</th>
<th>Allegory</th>
<th>Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparel</td>
<td>Architecture</td>
<td>Botanical</td>
</tr>
<tr>
<td>Cartographic</td>
<td>Ceremonial Object</td>
<td>Cityscapes</td>
</tr>
<tr>
<td>Didactic and Propaganda</td>
<td>Funerary Art</td>
<td>Genre</td>
</tr>
<tr>
<td>History and Legend</td>
<td>Human Figures</td>
<td>Interior Architecture</td>
</tr>
<tr>
<td>Landscapes</td>
<td>Literary Theme</td>
<td>Machines and Equipment</td>
</tr>
<tr>
<td>Military</td>
<td>Mixed Motifs</td>
<td>Nonrepresentational Art</td>
</tr>
<tr>
<td>Utilitarian Objects</td>
<td>Performance Art</td>
<td>Portraits</td>
</tr>
<tr>
<td>Religion and Mythology</td>
<td>Seascapes</td>
<td>Still Lifes</td>
</tr>
</tbody>
</table>

- General subject is an extensible controlled list, originally derived from CDWA and CCO
- One term for general subject is the minimum required
- Additional terms to describe the specific subject are strongly encouraged
- How to supply values when missing in large data sets? Title and notes could be mined, parsed, mapped to this list and the vocabularies, checked by editors as necessary
CONA, the Cultural Objects Name Authority®

Depicted subjects

**General**
- portraits
- history and legend

**Specific**
- Antietam National Battlefield (Sharpsburg, Maryland, United States)
- American Civil War (event)
- Abraham Lincoln (American president, 1809-1865)
- John McClernand (American Union General, 1812-1900)
- Allan Pinkerton (American Secret Service agent, detective, 1819-1884)
- army camp
- tents (portable buildings)

*Lincoln on the Battlefield of Antietam*; albumen print; Alexander Gardner (American photographer, 1821-1882); 1862; 8 5/8 x 7 3/4 inches; J. Paul Getty Museum (Los Angeles, CA); 84.xm.482.1

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CONA, the Cultural Objects Name Authority®

Depicted subjects

General
architecture

Specific
San Lorenzo (built work, Florence, Italy) .......... CONA
church ................. AAT
façade ................. AAT
elevation ............. AAT
plan .................... AAT

Plan and Elevation of the façade of San Lorenzo; drawing; Aristotile da Sangallo after Michelangelo; late 15th century; 32.0 x 21.5 cm (12 1/2 x 8 3/8 inches); pen and sepia ink; Staatliche Graphische Sammlung (Munich, Germany) #33258.
<table>
<thead>
<tr>
<th>Depicted subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
</tr>
<tr>
<td>religion and mythology</td>
</tr>
<tr>
<td>human figure(s)</td>
</tr>
<tr>
<td><strong>Specific</strong></td>
</tr>
<tr>
<td>bodhisattva</td>
</tr>
<tr>
<td>IA</td>
</tr>
<tr>
<td>Avalokiteshvara.</td>
</tr>
<tr>
<td>IA</td>
</tr>
<tr>
<td>Maitreya</td>
</tr>
<tr>
<td>AAT</td>
</tr>
<tr>
<td>compassion</td>
</tr>
<tr>
<td>AAT</td>
</tr>
</tbody>
</table>
RELATIONSHIPS
Includes basic thesaural relationships
As well as many other links

CONA ID 700008433
Stanza della Segnatura (built work, room, Stanze di Raffaello, Palazzo Apostolico (Vatican City, Italy))

CONA ID 700008512
School of Athens (Raphael; chalk on paper; 1508; Biblioteca Ambrosiana, Milan, Italy)

• Thesaurus: A semantic network of unique concepts
• In compliance with ISO, NISO
• Thesauri may be multilingual
• Thesauri are characterized by the following three relationships:
  - Equivalence (synonyms)
  - Hierarchical (broader/narrower)
  - Associative (other important, direct relationships)

Linking to architectural context in this case should be done at level of the cycle, if possible

Top of CONA
.... Movable Works
.......... Stanza della Segnatura cycle
............... School of Athens (Raphael; fresco; 1508-1511; Vatican)

School of Athens
Schule von Athen
Scuola di Atene
École d’Athènes
School van Athene
Σχολή Αθηνών
雅典学校

CONA ID 700008513
School of Athens (Raphael, fresco, Vatican)
Names are linked to a work equivalence relationship

• Titles and alternate titles must all refer to the same work
• Multilingual access
• (Titles / names are discussed later in this presentation as a data element)
Works are linked to each other
Hierarchical relationships

- Whole/Part Relationships
- E.g., for a set

Traveling Tea Service
  Teapot
  Tea Caddy
  Japanese Imari Sugar Bowl and Cover
  Chinese Famille-Verte Tea Bowl and Saucer
  Silver-mounted Scent Flask
  Two Spoons
  Wooden Box

Create separate records when each part of a work contains enough unique information so that it would be difficult to clearly delineate the information in a single record.
Repositories will also consider when separate records may be necessary to manage the works (materials, conservation, etc.).
Hierarchical relationships

Works are linked to each other

• Whole/Part Relationships
• May have associated Dates: display, earliest, latest for the relationship
• Record relationship numbers (e.g., 98 v) in Hierarchy Qualifier field
• May also be a Title for the page

CONA ID 700008515  Catalog Level: volume  Class: manuscript
Work Type: codex
Title: Códice Tudela   Title: Codex Tudela
Creator: unknown Aztec  Creation Date: ca. 1553
Current Location: Museo de América in Madrid (Madrid, Spain); N  Inv.: 70.400; España Siglo XVI
Dimensions: 21 x 15.5 cm; 125 leaves
Creator: illuminator: unknown Tenochtitlán; text in Catalan by a Franciscan friar
Culture: Tenochtitlán
Subject: religion & mythology
Aztec calendar: lords of the night, day signs, birds of the day, genre scenes
Descriptive: consta de 125 páginas con pinturas realizadas por un tlacuilo indígena y textos escritos en castellano por un misionero.. Folios 98 verso and 99 recto, showing aspects of the Aztec calendar: the birds of the day, the lords of the night, and the day signs. The Codex Tudela, based on the same prototype as the Codex Magliabechiano, is a 16th century pictorial Aztec codex. It is based on the same prototype as the Codex Magliabechiano, the Codex Ixtlilxochitl, and other documents of the Magliabechiano Group. Little is known about the codex’s history. The Spanish government bought the manuscript when it was rediscovered in 1940, and it is now held by the Museo de América in Madrid.

CONA ID 700008516  Catalog Level: component  Class: manuscript
Work Type: illumination
Title: 98 Verso in Códice Tudela
Creator: unknown Aztec  Creation Date: ca. 1553
Dimensions: 21 x 15.5 cm; 125 leaves
Creator: illuminations: unknown Tenochtitlán; text in Catalan by a Franciscan friar
Culture: Tenochtitlán
Subject: religion & mythology
Aztec calendar: lords of the night, day signs, birds of the day, genre scenes
Descriptive: consta de 125 páginas con pinturas realizadas por un tlacuilo indígena y textos escritos en castellano por un misionero.. Folios 98 verso and 99 recto, showing aspects of the Aztec calendar: the birds of the day, the lords of the night, and the day signs. The Codex Tudela, named after José Tudela de la Orden, is a 16th century pictorial Aztec codex. It is based on the same prototype as the Codex Magliabechiano, the Codex Ixtlilxochitl, and other documents of the Magliabechiano Group. Little is known about the codex’s history. The Spanish government bought the manuscript when it was rediscovered in 1940, and it is now held by the Museo de América in Madrid.

Broader Context: Códice Tudela
Relationship Type: Whole/part
Qualifier: 98 verso
Possible links in CONA
Hierarchical relationships

• Whole/part relationships for groups, subgroups, items
• CONA can accommodate links that a repository would maintain

CONA ID 700008517 Classification: prints and drawings
Work Type: etching
Title: The Dissipation
Creator: Jacques Callot (French, 1592-1635)
Mat & Tech: etching
Source: Lieure, no. 1407
State 2 of 3
Current Location: National Gallery of Art (Washington, DC); R.L. Baumfeld Collection; 1969.15.833.

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Historical whole/part relationships

- E.g., set of 40 panels from Ryōanji, Kyoto, were dispersed and sold to private collectors in the early twentieth century
- Now in New York, Seattle, and Japan
- Set may be virtually reconstructed for research

Works linked to each other

Hierarchical relationships

Dispersed set: Panels depicting Confucian and Daoist figures from Ryōanji, Zen temple in Kyoto, Kano studio, ca. 1606

Classification: Asian art; Work Type: screens, fusama

Dimensions: Overall: 6 ft. x 24 ft. (182.9 x 731.5 cm)

Original location: Ryōanji (Zen temple) (Kyoto, Japan)

Possible links in CONA

Hierarchical relationships

- Non-preferred Whole/Part for a series and items belonging to conceptual series
- Conceptual relationship

Unique physical item is linked to conceptual record for the print as a concept, which in turn is linked to a series.
Great Wave off Kanagawa (woodcuts (prints); Hokusai, Katsushika; ca. 1829/1832)

Note: Woodblock print by the Japanese ukiyo-e artist Hokusai, published in the late Edo period as the first print in Hokusai’s series Thirty-Six Views of Mount Fuji. It depicts an enormous wave threatening boats off the coast of the prefecture of Kanagawa, either a tsunami or rogue wave. As in all the prints in the series, it depicts an area from which Mount Fuji is in view. Printing continued until the woodblocks showed wear; there may have been around 3,000 impressions. In later prints from worn blocks, the impression is less crisp and lines are not continuous behind the right-side of the boat and on the left side of the signature box.

Titles:
- Great Wave off Kanagawa (preferred, C, U, English, U, U) Qualifier: multiples
- The Great Wave (C, U, PO, English, U, U) Qualifier: multiples
- In the Hollow of a Wave off the Coast at Kanagawa (C, U, English, U, U) Qualifier: multiples
- Under the Wave off Kanagawa (C, U, English, U, U) Qualifier: multiples
- Kanagawa oki nami-ura (C, U, Japanese (transliterated), U, U) Qualifier: multiples
- 神奈川沖浪裏 (C, U, Japanese, U, U) Qualifier: multiples
- 「富嶽三十六景 神奈川沖浪裏」(C, U, Japanese, U, U) Qualifier: multiples
- series number: 01 (C, U, undetermined, U, U) Qualifier: multiples
- L’arc de la vague au large de Kanagawa (C, U, French, U, U) Qualifier: multiples
- La Vague (C, U, French, U, U) Qualifier: multiples
- Die große Welle (C, U, German, U, U) Qualifier: multiples
- La gran ola de Kanagawa (C, U, undetermined, U, U) Qualifier: multiples

Catalog Level: multiples

Work Types:
- woodcuts (prints) [300041405] (preferred)
- .....

- Conceptual record for Great Wave; unique physical examples are linked to it as non-preferred parent with Hier Rel Type “Instance” not “Whole/Part”
- Qualifier = multiples
- Cat Level = multiples
Possible links in CONA
Hierarchical relationships

CONA ID 700008519
Catalog Level: multiples
Classification: prints and drawings
Work Type: drypoints
Title: Christ Presented to the People
Creator: Rembrandt van Rijn (Dutch, 1606–1669)
Description: Rembrandt treated this large drypoint almost as a painting, making marked changes to the composition as he reconceived …

• Multiples: For example, prints made from the same plate
• Each print is described as a unique item; then linked to a record for the multiples
• (conceptual relationship)

• Multiples, existing in various states
• Conceptual relationship
Possible links in CONA
Hierarchical relationships

CONA ID 700008519
Catalog Level: multiples
Classification: prints and drawings
Work Type: drypoints
Title: Christ Presented to the People
Creator: Rembrandt van Rijn (Dutch, 1606–1669)
Description: Rembrandt treated this large drypoint almost as a painting, making marked changes to the composition as he reconceived …

State: 1
State: 2
State: 3
State: 4
State: 5
State: 6
State: 7
State: 8

• Combine relationships with inferred relationships in other fields to expand research
• E.g., to compare different items representing various states of this print

• Note that each item, in various repositories, is cataloged as a unique work
• Then linked (non-preferred hierarchical) to the state
associative relationship
Works linked to each other

CONA ID 700008536 Class: prints
Work Type: woodcut Title: Rhinoceros
Creator: Albrecht Dürer
Mat & tech: woodcut on paper;
Dimensions: 24.8 x 31.7 cm

CONA ID 700008537 Class: drawings
Work Type: drawing Title: Rhinoceros in profile to left
Creator: Albrecht Dürer
Mat & Tech: pen and brown ink on paper
Dimensions: 27.4 x 42.0 cm
Current Location: British Museum (London, England); SL 5218.161

• Non-hierarchically related records
• pendant of, copy of, study for, etc.
• Only clear, directly related works should be linked to each other

study is

study for
associate relationship

J. Paul Getty Museum

CONA ID: 70000620 Class: drawings Work Type: drawing
Title: Study for the Dress and the Hands of Madame Moitessier
Creator: Jean-Auguste-Dominique Ingres
Date: 1851
Mat & Tech: graphite on tracing paper, squared in black chalk
Dimensions: 13 15/16 x 6 5/8 inches
General Subject: human figures Specific: Inès Moitessier (French, 1821–1897); hands; dress
Location: J. Paul Getty Museum (Los Angeles, California); 91.GG.79

CONA ID: 700006538 Class: paintings Work Type: painting
Title: Madame Moitessier
Creator: Jean-Auguste-Dominique Ingres
Date: 1851
Mat & Tech: oil on canvas Dimensions: overall: 147 x 100 cm (57 7/8 x 39 3/8 in.)
General Subject portraits Specific: Inès Moitessier (French, 1821–1897)
Location: National Gallery of Art (Washington, DC); Samuel H. Kress Collection; 1946.7.18

National Gallery of Art

• CONA allows links between works in different repositories
associative relationship

- Movable works may be linked to built works

**drawing**

CONA ID 700000120
Work Type: architectural drawing
Title: Case Study House No. 21
Creator: Pierre Koenig
Current Location: GRI Special Collections, Getty Center (Los Angeles, California) 2006.M.30-

**photograph**

CONA ID 70000090 Work Type: house
Title: Case Study House No. 21
Creator: Pierre Koenig
Creation Date: 1956-1958; renovated 1998
Dimensions: 1 story, 1320 square feet, 4 rooms and 2 baths, on a 110 x 160 foot lot
Mat & Tech: and Techniques: steel frame and flat roof deck
Current Location: Los Angeles (California, USA) Address: 1635 Woods Drive

CONA ID 70008539 Work Type: photograph
Title: Case Study House No. 21
Creator: Julius Shulman
Current Location: GRI Special Collections, Getty Center (Los Angeles, California); 2004.R.10-26622-32-LF
associative relationship

- Context for which a work was originally designed

CONA ID 70000005 Class.: paintings   Work Type: stained glass
Title: Theodosius Arrives at Ephesus
Creator: unknown French   Date: ca. 1200–1205
Culture: French Medium: Pot-metal glass, vitreous paint
Dimensions: Overall: 25 x 28 1/8in. (63.5 x 71.5cm)
Classification: Glass-Stained
Location: Metropolitan Museum (New York, New York);
Credit Line: The Cloisters Collection, 1980 Accession Number: 1980.263.4
Creation Location: Rouen (France)

CONA ID 70000005 Class.: architecture   Work Type: cathedral
Title: Cathedral of Notre-Dame Creator: unknown
Date: current structure begun 1202, completed 1880
Mat & Tech: masonry
Culture: Roman Catholic   Style: Gothic
Location: Rouen (France); Coordinates: 49.4402 1.0950
RELATIONSHIPS BETWEEN WORKS

may be rich and complex

• St. Peter’s in Rome

and its dome
RELATIONSHIPS BETWEEN WORKS
CONA could virtually reunite disassembled or lost works, or works conceived but not executed

- CONA could virtually reconstruct disassembled works
- Held in different repositories or locations
- Common with manuscripts, paintings, sculpture, architecture, etc.

RELATIONSHIPS BETWEEN WORKS
CONA could virtually reunite disassembled or lost works, or describe works conceived but not executed

- Example of a destroyed work, surviving only in ruins
- Scholarly reconstructions, early post-conquest depictions could be linked to the record for the original temple (as Depicted Subjects)
- Artifacts that originated here could be linked (as architectural context)

CONA ID 700008555  Class: architecture
Work Type: temple  Work Type: ruins
Title: Templo Mayor  Creator: unknown Aztec
Dimensions: original ca. 100 x 80 m (328 x 262 feet) at base
Current Location: Mexico City (Mexico)  19 26 06 N, 99 07 53 W
Location: Sacred Precinct (Tenochtitlan, Mexico) Type: former
Date: first temple after 1325, rebuilt 6 times; destroyed by the Spanish in 1521
General Subject: architecture  Type: isness
Specific: Huiztilopochtli (Aztec mythology) | Tlaloc (Aztec deity)
Getty Vocabularies in LOD

AAT      TGN      ULAN      CONA      IA
How are vocabularies used?

- Traditional use of vocabularies for retrieval focuses on the names
- If a user asks for one name/term, all of the synonyms can be used for retrieval
- For example, if a user searches on “Giovanni da Bologna”...

From ULAN

Giambologna
Giovanni da Bologna
Giovanni Bologna
Jean Boulogne
Jean de Boulogne
Bologna, Giovanni da

“giambologna” OR “giovanni da bologna” OR “giovanni bologna” OR “jean boulogne” OR “bologna, giovanni da”
How are vocabularies used?

New methods and LOD can incorporate hierarchical and associative relationships, and other links or inferred relationships to answer more complex questions and aid serendipitous discovery.

**Associative relationships**

- **Giambologna** *(Flemish sculptor and architect, 1529-1608, active in Italy)*

- **Marie de Medici** *(French queen, patron, 1573-1642)*

- **Tacca, Pietro** *(Italian sculptor and architect, 1577-1640)*

**Display Date:** from 1592  
**Start Date:** 1592  
**End Date:** 1608
What is Linked Open Data (LOD)?

- 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, so that it can be both interlinked and made openly accessible and shareable on the Semantic Web. The goal of linked open data is to allow data from different resources to be interconnected and queried.
- In order for data to be understood and processed automatically by computers, data in records or about resources must be expressed in a standard format. Each thing (for example, a museum object, a place, or a person) must be represented by a persistent identifier (known as a Uniform Resource Identifier (URI)). A Resource Description Framework (RDF) is a language or format for describing things as well as the relationships between things as simple properties and values (known as 'triples'), while things are represented using URIs.
Getty vocabularies are linked to each other

- Vocabulary Program projects to make the links in legacy data, with IT team to realize it technically
- Was a huge endeavor, using input from the technical user community and experts
 Getty vocabularies providing conduits to links in the cloud
What are CDWA and CCO?

CONA is compliant with CDWA and CCO
What is CDWA?

- **Categories for the Description of Works of Art**

  - CDWA includes both a *conceptual framework* of elements and relationships, and cataloging *rules* for describing, documenting, and cataloging cultural works and related images.
  - Includes 540 elements.
  - Agreed upon best practice based on consensus of expert group who met for years.
  - **Primary focus** is art and architecture, including but not limited to prints, manuscripts, paintings, sculpture, photographs, built works, and other visual media.
  - **Also covers** many other types of cultural objects, including artifacts and functional objects from the realm of material culture.

CONA is based on CDWA.
For the Work
For Images of the Work
Authorities
Comprehensive set of 540 elements
9 core elements

http://www.getty.edu/research/publications/electronic_publications/cdwa/
What is CCO?

- **Cataloging Cultural Objects**
  - Subset of CDWA
  - Manual for describing, documenting, and cataloging cultural works and their visual surrogates
  - **Primary focus** is art and architecture, including but not limited to prints, manuscripts, paintings, sculpture, photographs, built works, and other visual media
  - **Also covers** many other types of cultural objects, including artifacts and functional objects from the realm of material culture

Published by the American Library Association
Available at the ALA site, Amazon.com, etc.
## What is CCO?

- **For the Work**
  - Chapter 1: Object Naming
    - Work Type / Title
  - Chapter 2: Creator Information
    - Creator / Creator Role
  - Chapter 3: Physical Characteristics
    - Dimensions / Materials and Techniques / State and Edition/ Additional Physical Characteristics
  - Chapter 4: Stylistic and Chronological Information
    - Style / Culture / Date
  - Chapter 5: Location and Geography
    - Current Location / Creation Location / Discovery Location/ Former Location
- **For Images of the Work**
- **Authorities**
  - Authority 1: Personal and Corporate Names
  - Authority 2: Geographic Places
  - Authority 3: Concept Authority
  - Authority 4: Subject Authority

- **116 elements total**
- **9 core elements**

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CDWA and CCO are mapped to 13 other standards.

Your should be able to express your data in multiple formats and multiple standards.
http://www.getty.edu/research/publications/electronic_publications/intrometadata/crosswalks.html

- CDWA: The Categories for the Description of Works of Art
- CCO: Cataloging Cultural Objects
- CONA: Cultural Objects Name Authority
- CIDOC CRM: The International Committee for Documentation, Conceptual Reference Model (CRM)
- LIDO: Lightweight Information Describing Objects
- CDWA Lite: CDWA Lite XML schema
- VRA Core: The Visual Resources Association Core categories 4.0
- MODS: Metadata Object Description Schema
- Dublin Core: Dublin Core Metadata Initiative
- DACS: Describing Archives Content Standard
- EAD: Encoded Archival Description Document Type Definition (DTD)
- Object ID: Object ID international standard for police and customs agencies
- CIMI: Consortium for the Computer Interchange of Museum Information attribute set, Z39.50 Profile
- FDA Guide: Guide to the Description of Architectural Drawings

CDWA and CCO are mapped to 13 other standards

A project should be able to express data in multiple formats and multiple standards
Common practice and Best practice

- **CCO/CDWA are based on best practice**
- **Both CCO and CWDA are the result of consensus** reached by groups representing a broad spectrum of prominent professionals in the museum, art library, visual resources, special collection, and archives communities
- Both CCO and CDWA committees agreed on sets of elements and rules for cataloging based on existing common practice in their professions
- But going further, to advise best practice for documenting cultural heritage works
- To both **uniquely identify the works** for maintenance by the responsible institution and to researchers
- And to provide enough additional information to **allow scholarly research and retrieval**
Key principles of good cataloging

- **What is the focus?** Establish the logical focus of each Record:
  - a single item
  - a work made up of several parts
  - a physical group or collection of works
  - an image of a work

- **Core elements:** Include all of the core required CCO/CDWA elements

- **Cataloging rules:** Follow the CCO/CDWA rules; make and enforce additional local rules to allow effective retrieval, re-purposing, exchange, and linking of information

- **Terminology:** Use published controlled vocabularies, such as the Getty vocabularies. Use local controlled lists as necessary

- **Consistency:** Be consistent in all aspects of entering data and in establishing relationships between entities

- **Metadata standards:** Ensure that your underlying data structure, including relationships, is compliant with (or mappable to) established metadata standards

- **Your system:** As far as is possible, do not allow limitations of a cataloging system to cause distortion of the data
  - E.g., do not put two values into one field due to system limitations. Your system will change in the future; your data should survive migration