

OXLOD Pilot Oxford Linked Data

4 October 2018 - OeRC

Background

- What did we set out to achieve and why is this important?
- What have we delivered?
- Purpose of today's session
 - Pilot findings (Gabriel Hanganu)
 - Introduction to Linked Data (Kevin Page)
 - Integration principles (Athanasios Velios)
 - OXLOD workflow (Athanasios Velios, Andrew Morrison, Sarah Joomun and Chris Powell)
 - OXLOD demo (Athanasios Velios)

OXLOD Pilot findings

OXLOD pilot

- Limited in scope, time, resources
- Aim: explore if Linked Data can bring significant benefits to GLAM

Delivered

- Workflow
- Server and software
- Processed datasets
- User interface
- Use cases
- Evaluation framework
- Metrics
- Community

OXLOD in numbers

- **13,280,376** records (triples)
- 40,869 words of documentation text
- 325 minutes of workshop videos
- 63 workshop participants
- 26 datasets
- 10 workshops

GLAM benefits

- Better data
 - Structured data
 - Enriched data
- Better research
 - Cross-search
 - Discovery
- More effective collection data management
- Stronger GLAM community
 - Open workshops, knowledge base
 - Knowledge transfer, capacity building



Representing knowledge on the Web using Linked Data a 10 minute introduction

(The Semantic Web and Why You Should Care)

Kevin Page University of Oxford e-Research Centre

OXLOD final workshop, October 2018

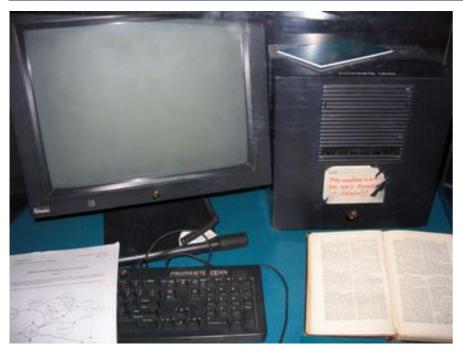
Why we should care

When knowledge has been generated, we should capitalise on its value by

- capturing it
- publishing it
- using it
- linking it
- re-using and building upon it ("unintentionally"?)



What is the Semantic Web?



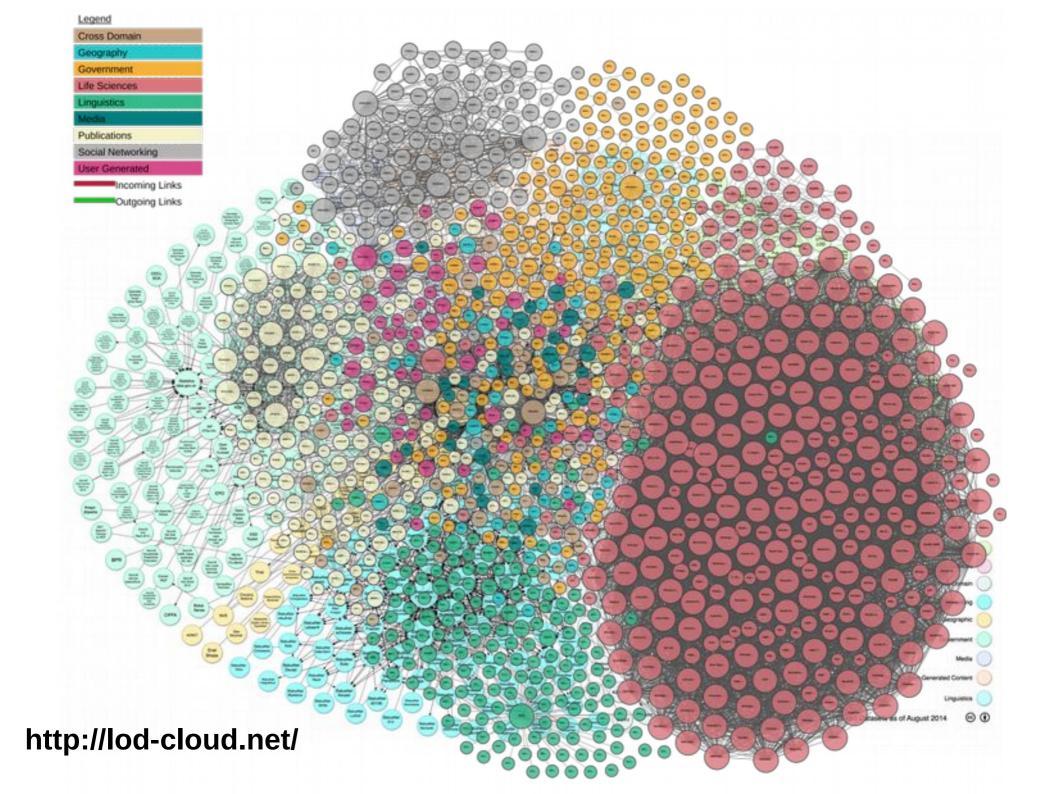
"This machine is a server - DO NOT POWER IT DOWN!!"

- The web is the largest and most successful distributed system ever constructed
- But it is a Web of Documents

The Semantic Web is the effort to create the equivalent Web of Data



 Semantic Web activities User interface and applications have been baking since the late 1990s Trust Proof • The infamous layer cake has evolved Unifying logic Linked Data is a more Ontologies: Rules: • OWL **RIF/SWRL** Cryptography recent movement... Querying: SPARQL Taxonomies: RDFS There are two Data interchange: RDF words in Syntax: XML Semantic Web Identifiers: URI Character set: UNICODE Both are important!



- The World Wide Web Consortium (W3C) **Semantic Web** activities and *standards* define underlying technologies
- Data can be Open, without being Linked Open Data
- Data can be Linked, without being Open Linked Data
- Data can be both Open and Linked Linked Open Data
- Underlying technologies can support any combination which combination is a matter of policy



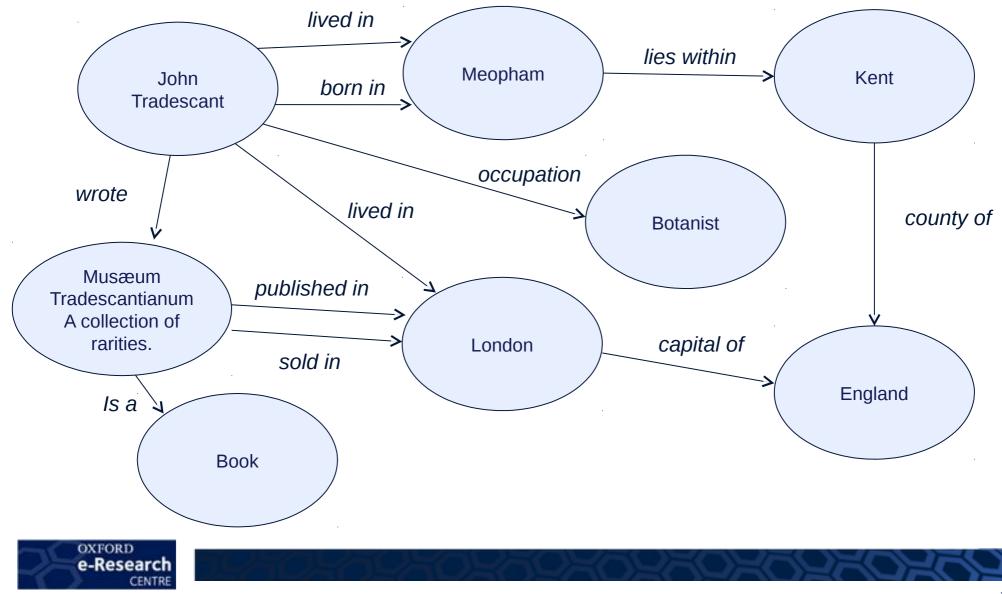
The fundamental building block of Linked Data is RDF

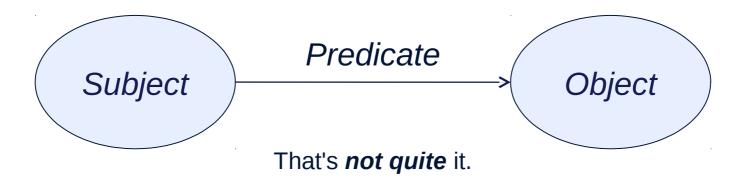


(RDF is the Resource Description Framework)



"Triples" of information, linked and expanding to the scale of the Web





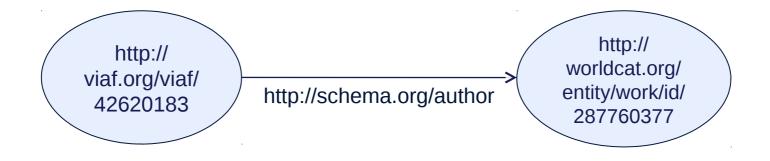












That's *really* it.



Linked Data considerations

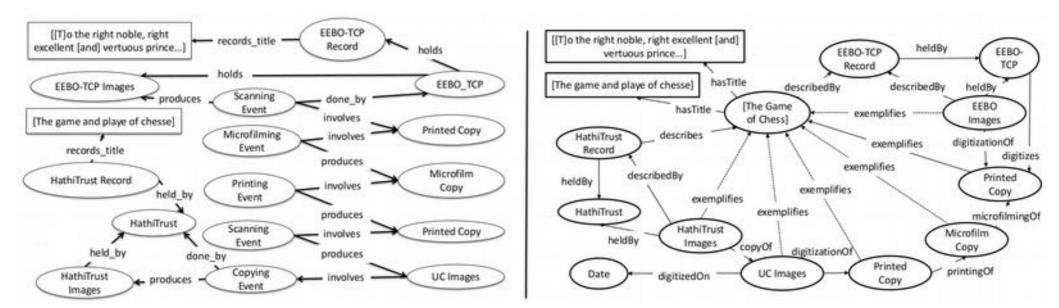
- The previous example was very simplistic
 - -The *combination* of many specialised fields of knowledge will form a large and complex web
- Linked Data is about making associations between **information with common meaning** (semantics) where that is agreed upon
 - Not (necessarily) about forcing common meanings across information
- Linked Data is a framework for scalable semantic interoperability of digital information. **It does not mandate use of specific semantics**, only standardises the technical medium through which to link



Ontologies and simultaneous contexts

We encode and share our specialised meanings through *ontologies*.

RDF, as a standard, is adaptable, and *can accommodate multiple simultaneous contexts* (perspectives, specialisms, community practices)



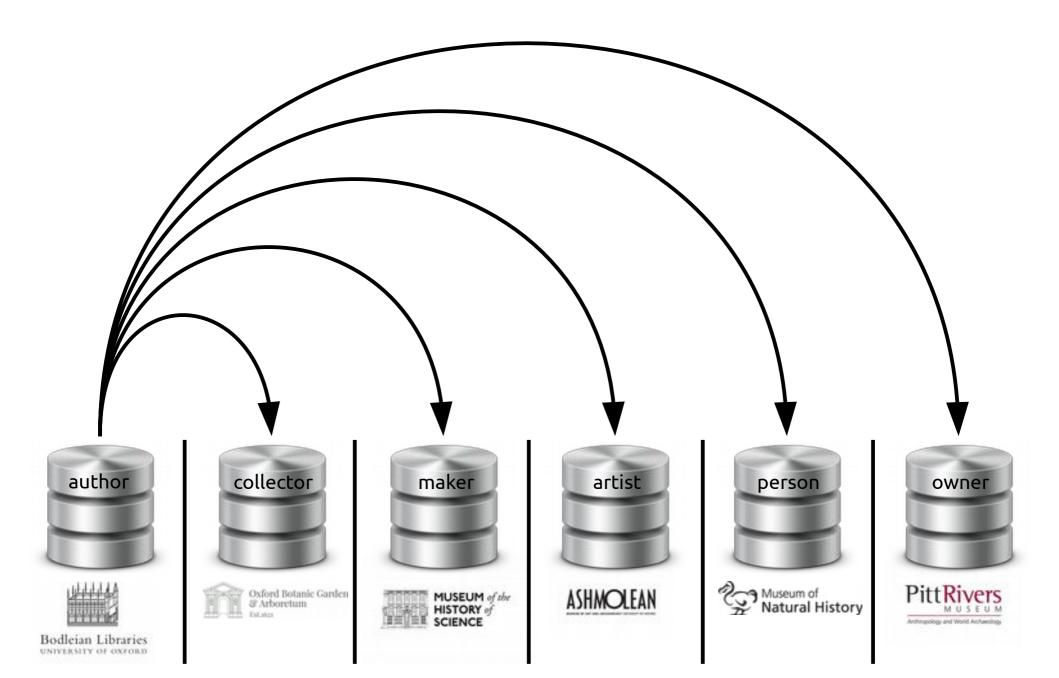
Nurmikko-Fuller, T., Page, K. et al. "Building Complex Research Collections in Digital Libraries: A Survey of Ontology Implications" ACM/IEEE Joint Conference on Digital Libraries (2015)

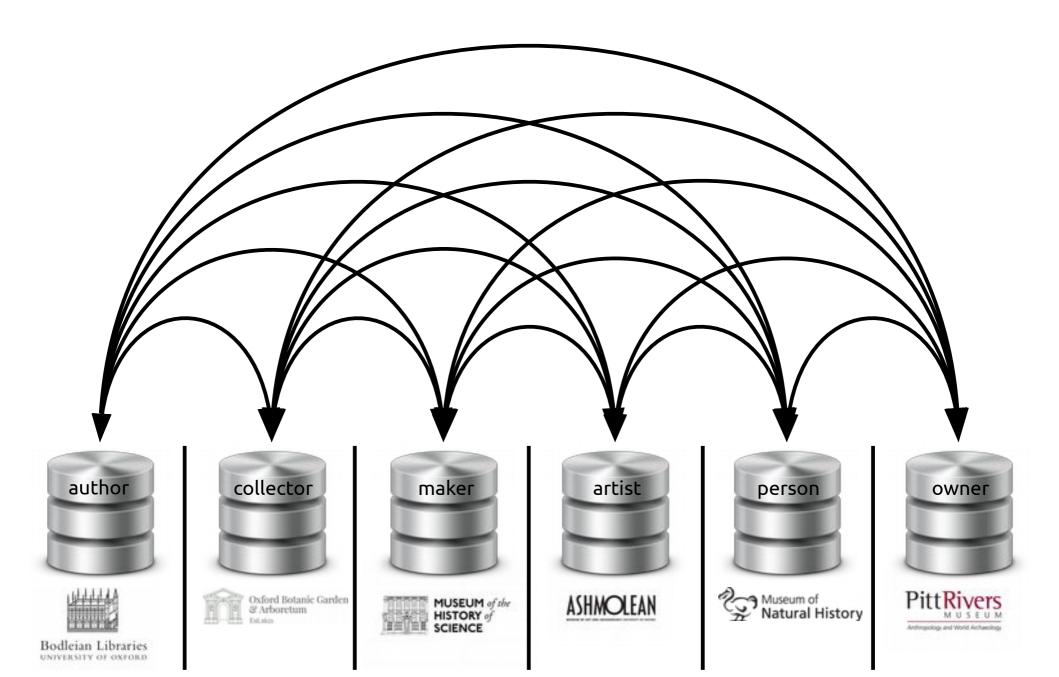


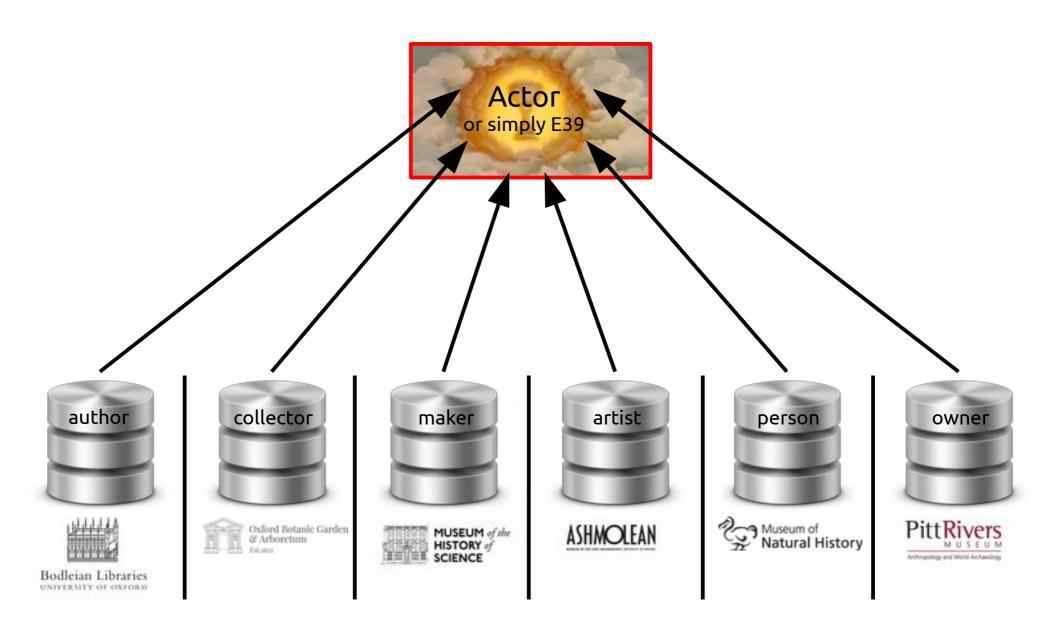
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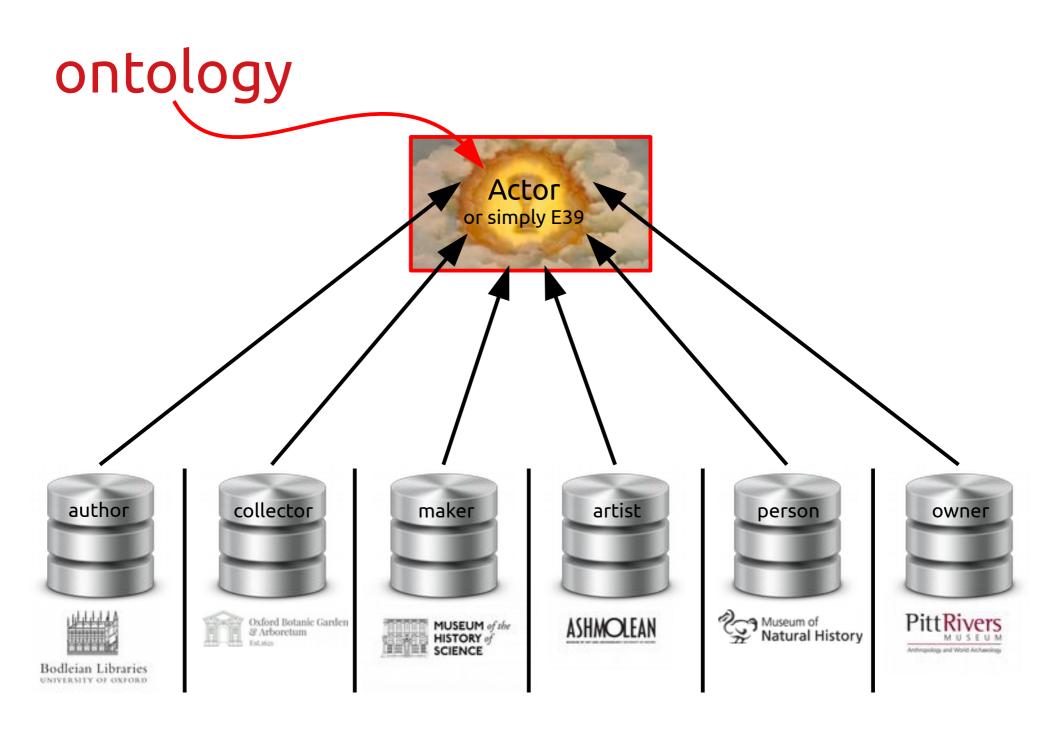
Larger sample → Better conclusions

Data integration







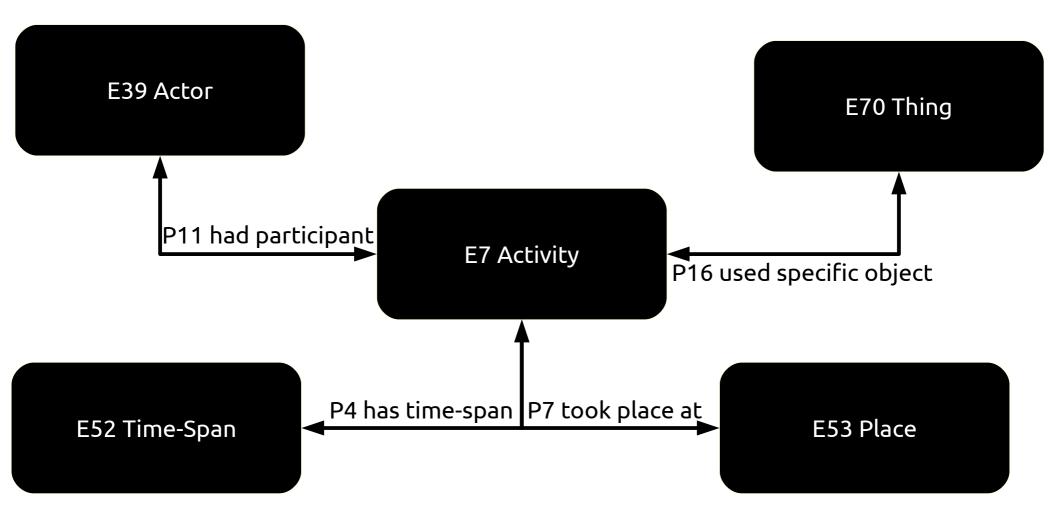


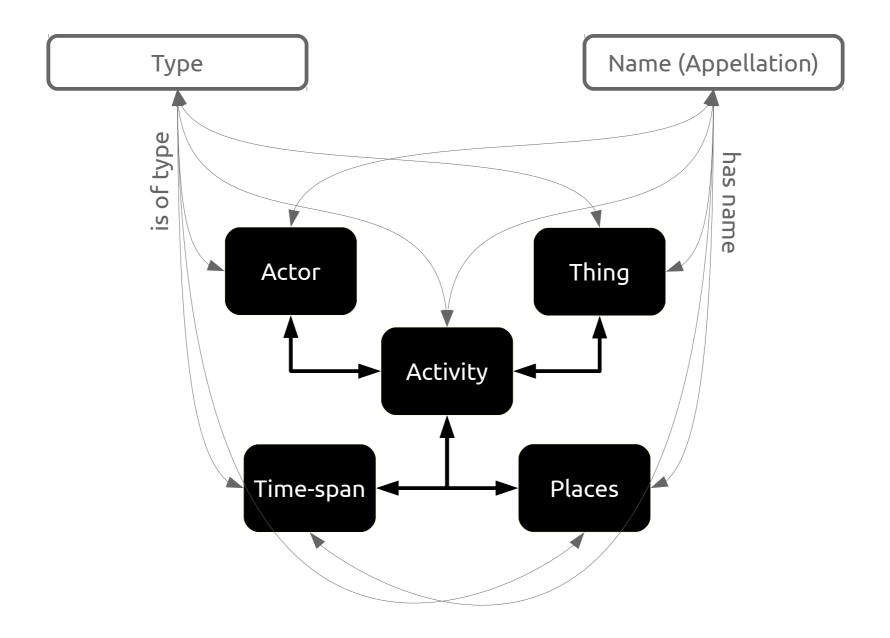
Ontology



- Provides properties to link entities
 - CIDOC-CRM
 - heritage ontology

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International Journal on Digital	What is the CIDOC CRM?		o we are	
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Choose a shortcut: Last official release Current version CIDOC CRM Tutorial CIDOC CRM Web site design related documents	The CIDOC CRM is intended to promote a shared understanding of cultural heritage information by providing a common and extensible semantic flamework that any cultural heritage information can be mapped to. It is intended to be a common language for domain experts and implementers to formulate requirements for information systems and to serve as a guide for good practice of conceptual modeling. In this way, it can provide the "semantic glue" needed to mediate between different sources of cultural heritage information.	product of these activities in Data Model: In the interior ner DSWG decided to engage is order to benefit from its expo dealing with the necessary structures in the domain. This complete edition of the CDBO (CRR), a product of the inter- contributors, in order to explo	reding in March 1996 i in an object-oriented a essive power and ext diversity and comple a ettor resulted in 199 OC Conceptual Prefere take voluntary work of at fully the potential of	in Crete, the approach in ensibility for rolly of data 10 in the first more Moder" I a variety of the CRM as
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OXLOD cross-searching demo



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Jade in Oxford

An exhibition about the history and properties of Jade with exhibits from the Oxford University Museums

Pre OXLOD system



Bodleian Libraries





















Pre-OXLOD system



Specialist librarian





Researcher / curator

GLAM contributors

Pre-OXLOD system



Specialist librarian



Collection data manager



Researcher / curator

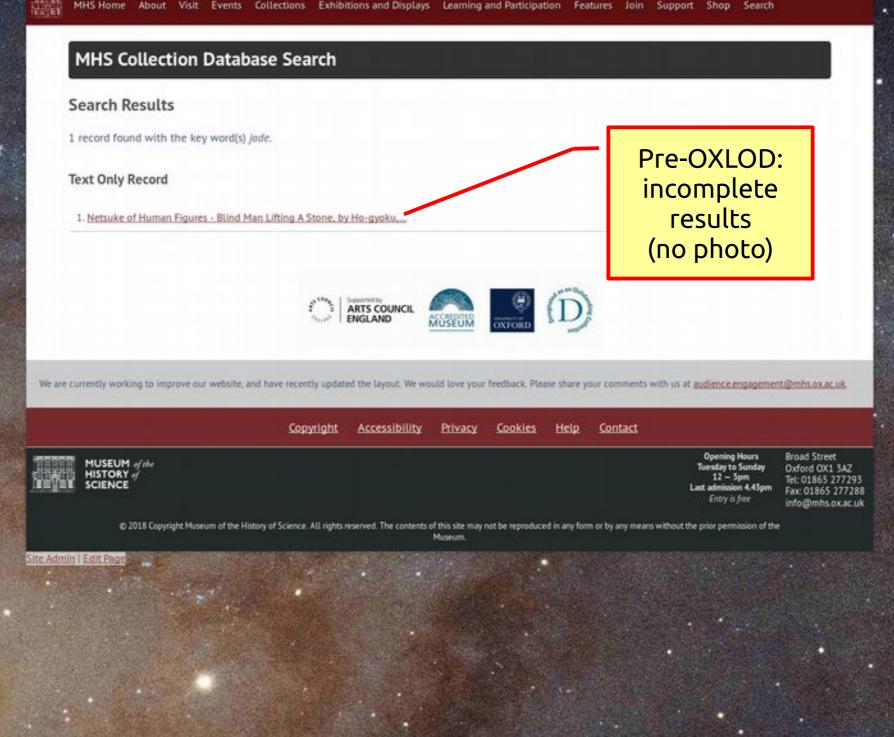
GLAM contributors

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MHS Collection Database Search

-Basic Search of over 20,000 records

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Show thumbnails

Contains multimedia (including images, audio files, PDFs etc.)

Or simply click on an image below.



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Pre-OXLOD:

keyword

search

Search Clear

MHS Collection Database Search Search Results Search for all terms: Material: jade Pre-OXLOD: 2 records found. **Records with Images** more results (Followed by: text only record) 1. Hsüan-chi, Formerly Identified as Early Chinese Astronomical...

Text Only Record

(Preceded by: records with image previews)

2. Netsuke of Human Figures - Blind Man Lifting A Stone, by Ho-gyoku....





MHS Collection Database Search

Record Details

Hsüan-chi, Formerly Identified as Early Chinese Astronomical Instrument



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 Inventory Number:
 77193

 Object Type:
 Place Created;

 Place Created;
 China Asia

 Accession Number:
 1959-33

 Brief Description:
 Primary Inscriptions:

 Provenance:
 Purchased from the Eastgate Galleries, Oxford, in 1959.

 Collection Group:
 Jade

Narratives

Inv. 77193 - rejection of astronomical significance

Inventory no. 77193 - Former Display Label



Record Details

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MHS Collection Database Search

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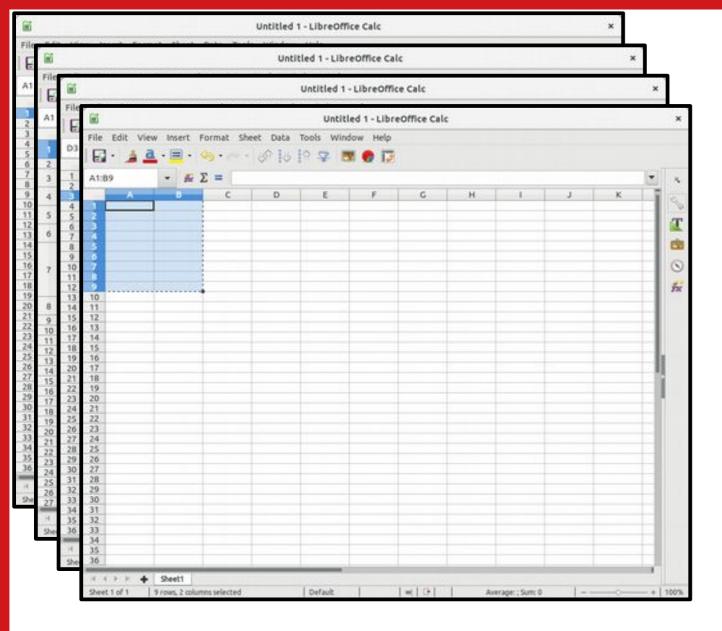


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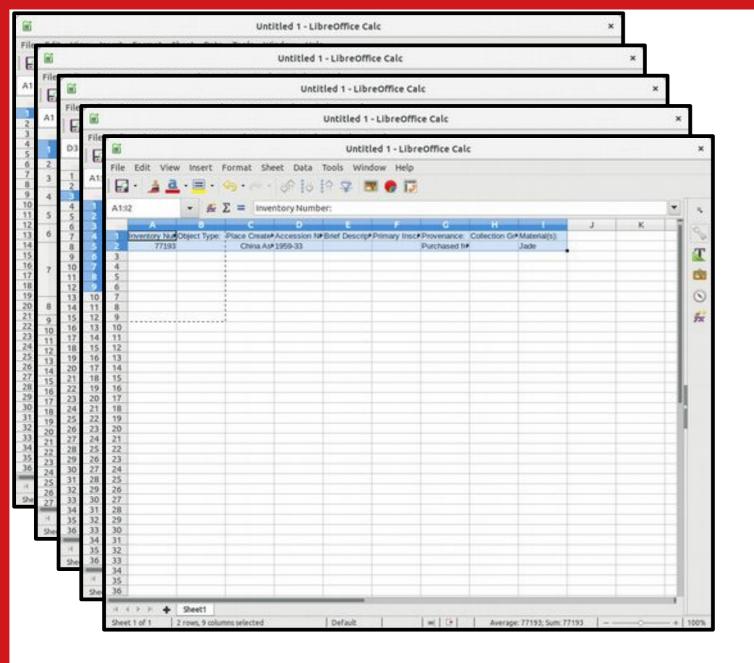
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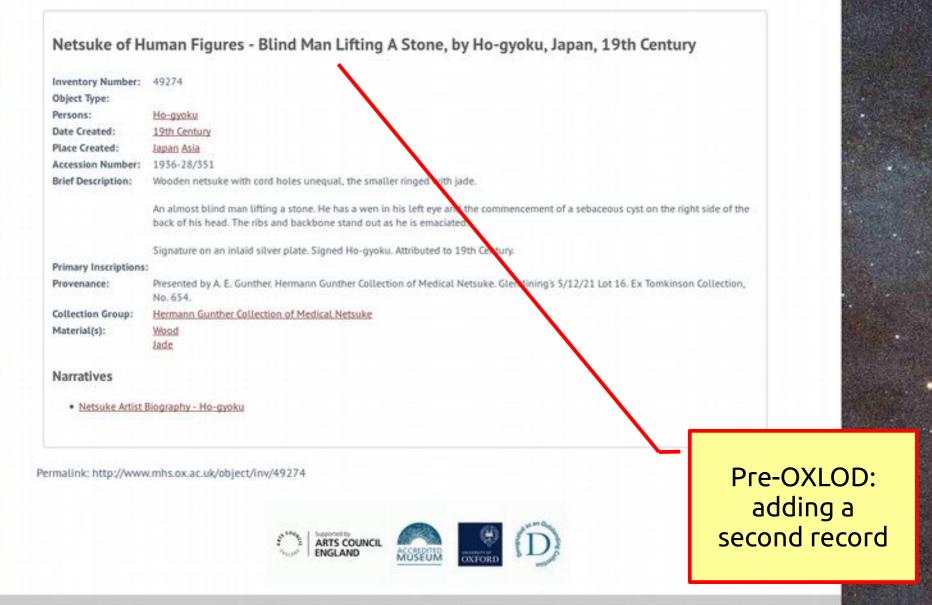


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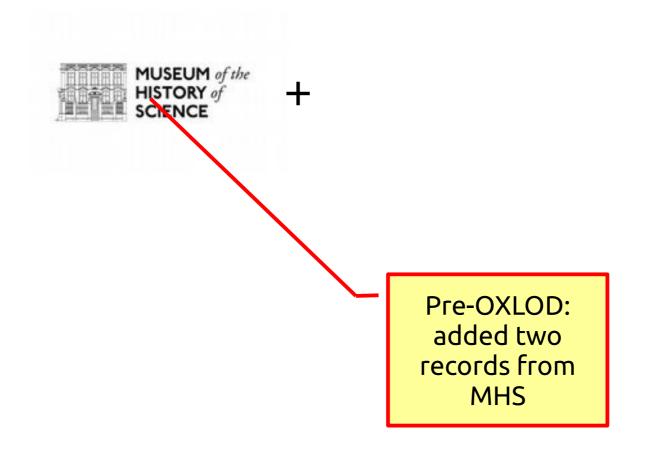
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BROWSE

COLLECTION OVERVIEW



jade

Pre-OXLOD: to search across collections each step needs to be repeated

Shop

ABOUT

SEARCH

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COLLECTION ONLINE

The Ashmolean has embarked on a major project to digitise its collections with an initial target of making 250,000 objects available online by 2020. We will be adding and updating records every month. For more information on the project see **About**.

< > Fragment of a bowl with riders

There are currently over 55500 object records available to browse or search in the online collection

DISCOVER OBJECTS

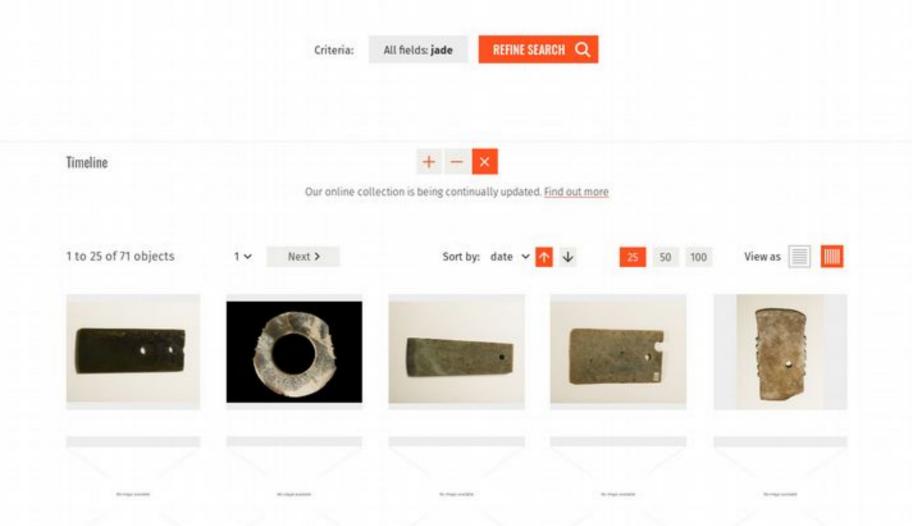
COLLECTION OVERVIEW BROWSE

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ABOUT

SEARCH RESULTS





COLLECTION OVERVIEW BROWSE SEARCH

CH ABOUT

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Notched disc axe, or xuanji

REFINE SEARCH Q

Criteria: All

All fields: jade



Ashmolean Museum, University of Oxford (image)



ABOUT

BROWSE



Details +

Title	Notched disc axe, or xuanji
Associated place	China (place of creation)
Date	2000 - 1500 BC Neolithic Period (China) (c. 10,000 - c. 2000 BC) Erlitou Period (c. 1900 - c. 1500 BC)
Material and technique	jade
Material index	jade
Technique index	carved
Object type	funerary equipment; xuanji; ritual jade
Dimensions	9.2 x 9 x 0.5 cm max. (height x width x depth)
No. of items	1
Credit line	Presented by Sir Herbert Ingram, 1956.
Museum location	not on display
Museum department	Eastern Art
Accession no.	EA1956.1578

COLLECTION OVERVIEW

SEARCH

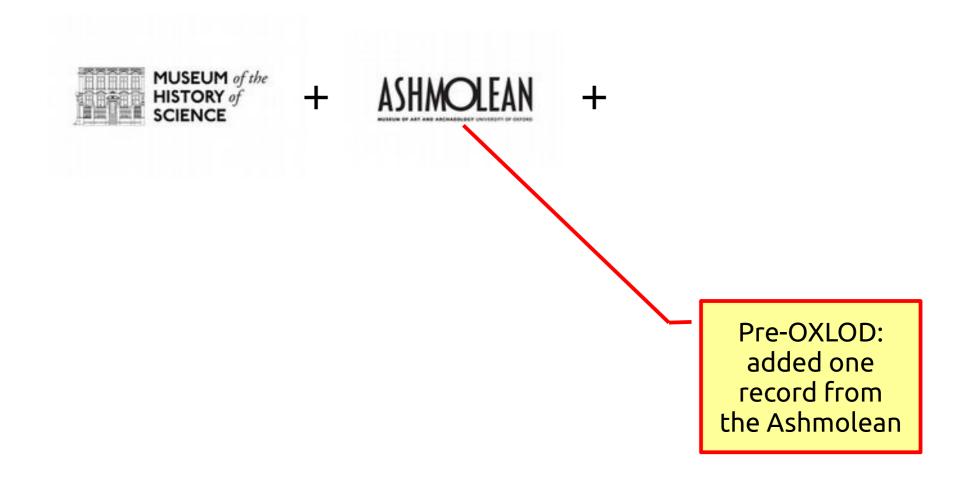
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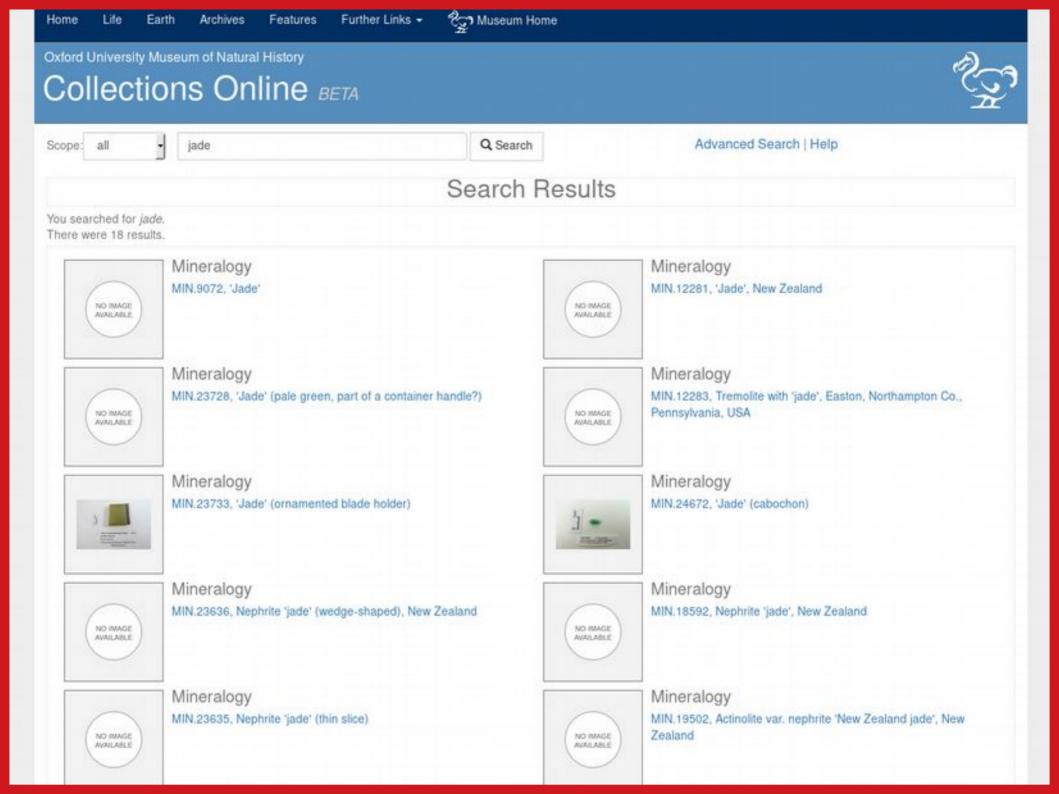
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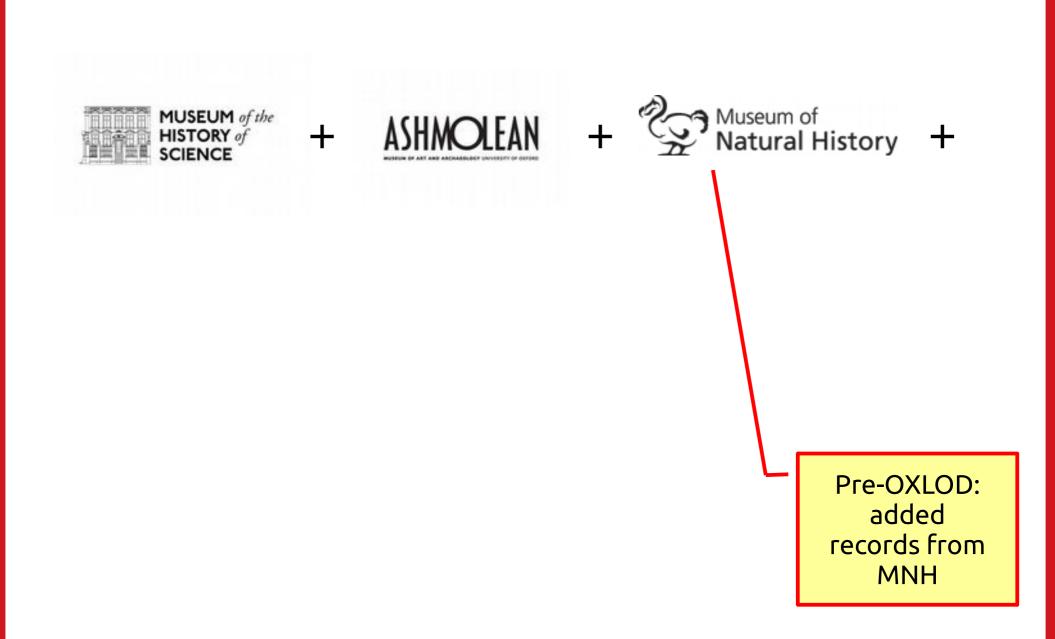


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Credit line	Presented by Sir Herbert Ingram, 1956
Museum location	not on display
Museum department	Eastern Art
Accession no.	EA1956.1578

Our online collection is being continually updated. Find out more

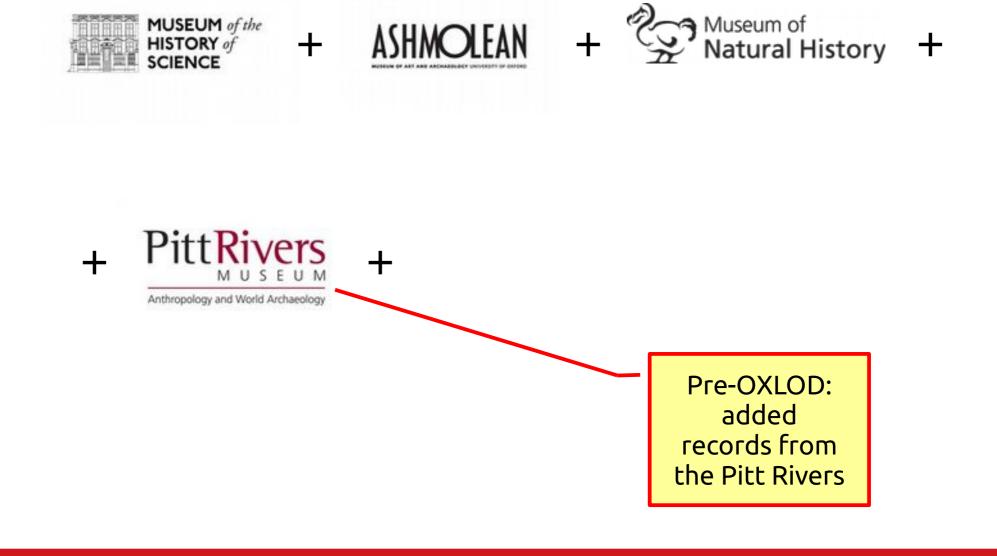






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 1943.10.66 B		On Disp	lay? Yes	2
Unquantified assemblage of 750 stone beads,	strung together on a necklace			
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 1897.38.1		On Disp	lay? Yes	3
Polished jade axe, ground curved blade. [MJD	(Verve) 30/3/2016]			
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1933.85.104		On Disp	lay? Yes	4
Stone bead or pendant				
M America	Costa Rica			
 1936.3.1 .1 1936.3.1 .2		On Disp	lay? Yes	5
Curved bone handle with bone socket [.1], with	h ground stone blade [.2].			
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Pre-OXLOD system



Specialist librarian



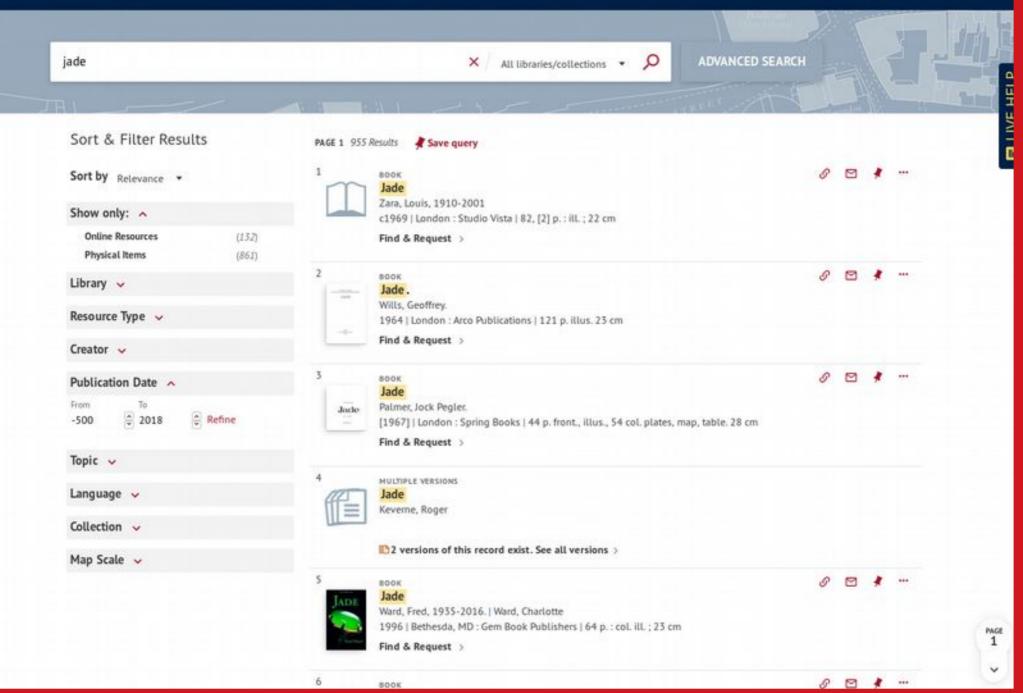
Collection data manager



Researcher / curator

GLAM contributors





jade

Jade Ward, ADI 19

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Title	Jade
Further information	text and photographs, Fred Ward ; editing, Charlotte Ward.
Author	Ward, Fred, 1935-2016. >
	Ward, Charlotte >
Publisher Details	Bethesda, MD : Gem Book Publishers
Publication Date	1996
Format	64 p. : col. ill. ; 23 cm
Language	English
Identifier	ISBN: 0963372343
	ISBN: 9780963372345
Subjects	Jade >
	Precious stone industry >
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Pre-OXLOD:

jade (mineral)

not featured

here

Pre-OXLOD system



Specialist librarian



Collection data manager



Researcher / curator

GLAM contributors

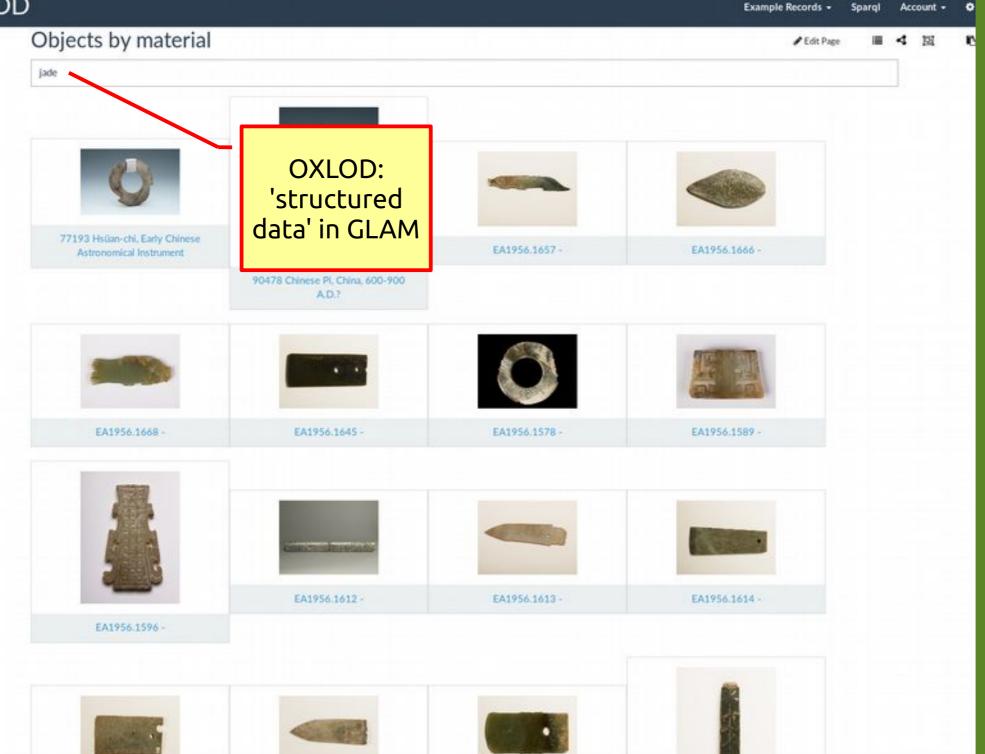
Pre-OXLOD summary

- No means of searching across GLAM datasets
- Results from different collections are difficult to compare
- Data manager's effort will need to be repeated for future exhibitions/projects

OXLOD taster replay of GLAM jade exhibition

OXLOD Search			
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Objects by title			
Search for objects e.g. type "Hsüan-chi" or "EA20	012.185°		
Objects by type			
Search for types of objects e.g. type "xuanji"			
Objects by material			
Search for materials e.g. type "Jade"			
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Current system



Specialist librarian



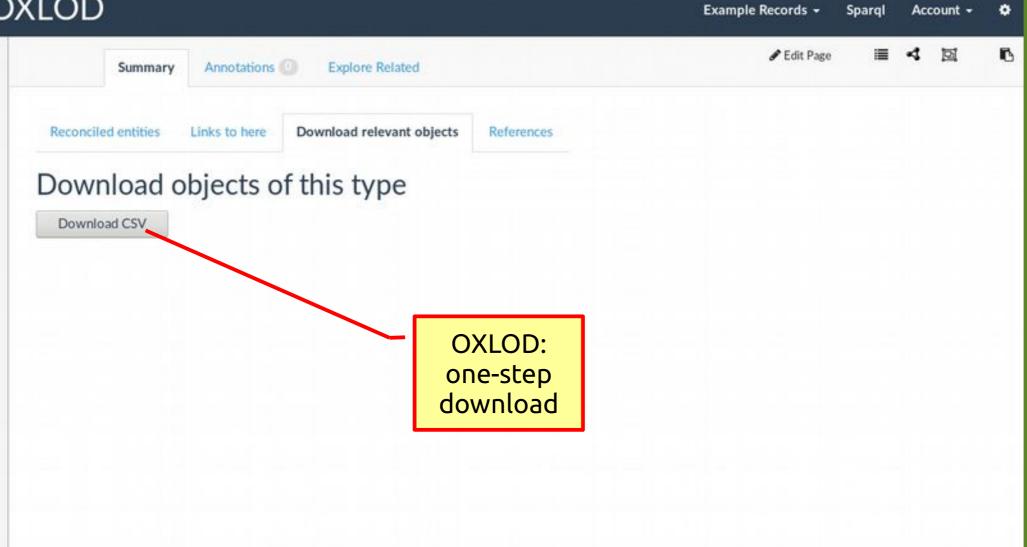
Collection data manager



Researcher / curator

GLAM contributors

OXLOD



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Acknowledgements

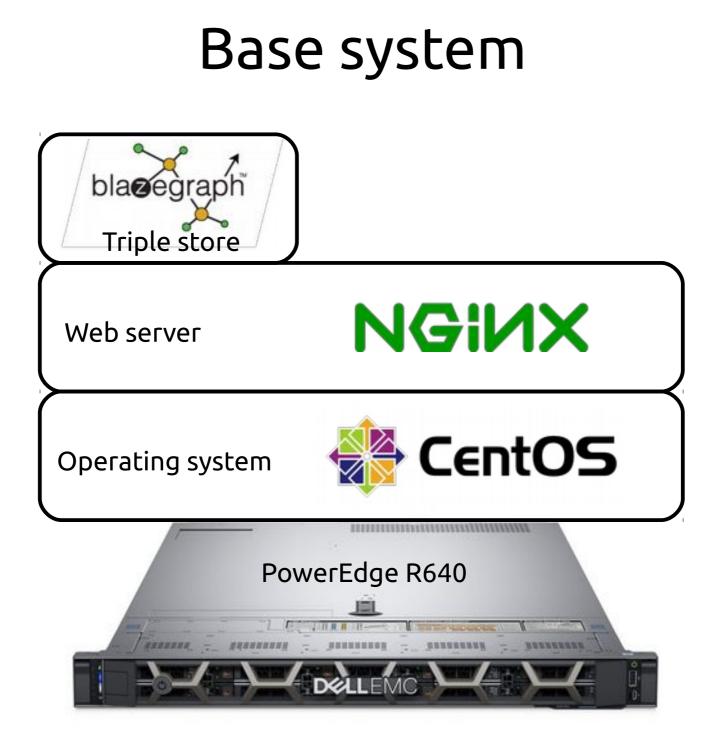
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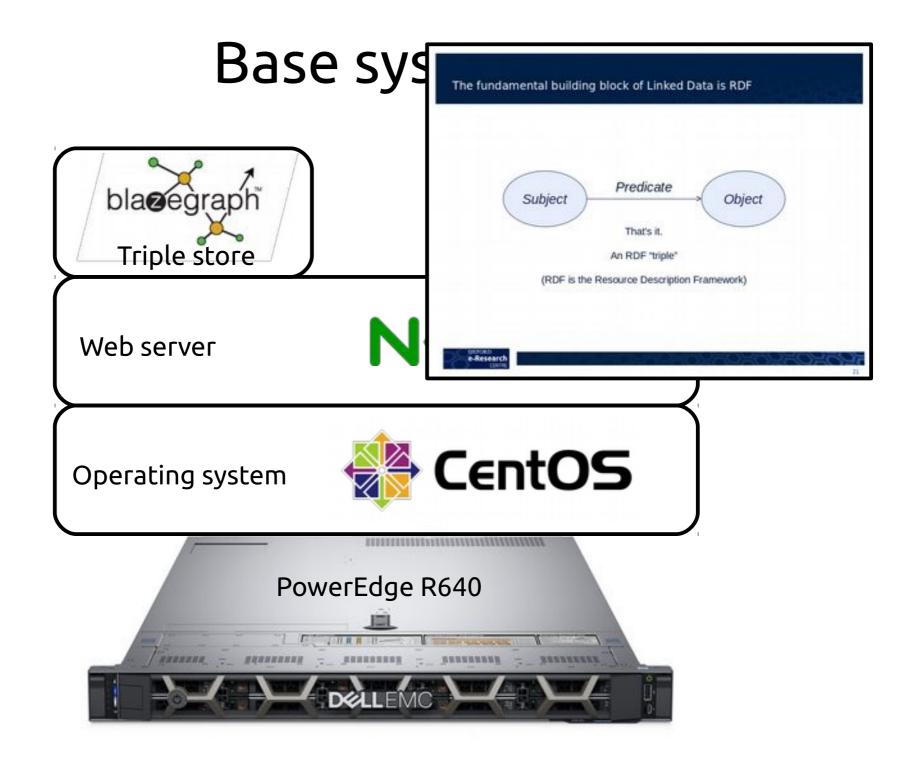
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	http://www.oum.ox.ac.uk/collections/im/476273	992		in orth	00	Decorative Rocks	http://www.oum.ox.ac.uk/jade-petrology/			
	http://www.oum.ox.ac.uk/collections/im/476273	175.1		-		Decorative Rocks	http://www.oum.ox.ac.uk/jade-petrology/			
e se properte de	http://www.oum.ox.ac.uk/collections/im/33193	Misc Rocks 951/18		-		Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
100	http://www.oum.ox.ac.uk/collections/im/36087	Mallard coll. 957		-		Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
	http://www.ashmus.ox.ac.uk/collections/362497		China	1601	1800	EA China	http://www.ashmus.ox.ac.uk/			
	http://www.ashmus.ox.ac.uk/collections/386811				2000	EA China	http://www.ashmus.cx.ac.uk/			
_	http://www.oum.ox.ac.uk/collections/im/8383	MIN.19346				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			10
2.27	http://www.oum.ox.ac.uk/collections/im/8609	MIN.23728				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
	http://www.oum.ox.ac.uk/collections/im/8614	MIN.23733				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
	http://www.oum.ox.ac.uk/collections/im/8711	MIN.24672				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
	http://www.mhs.ox.ac.uk/object/inv/77193	77193		-	-		http://www.mhs.ox.ac.uk/			
	http://www.mhs.ox.ac.uk/object/inv/90478	90478	ê.)				http://www.mhs.ox.ac.uk/			
_	http://www.oum.ox.ac.uk/collections/im/476273	DR.0707				Decorative Rocks	http://www.oum.ox.ac.uk/jade-petrology/		1.1	
5	http://www.oum.ox.ac.uk/collections/im/11763	MIN.3010				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
5	http://www.ourn.ox.ac.uk/collections/im/12662	MIN.3913				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
1	http://www.oum.ox.ac.uk/collections/im/12665	MIN.3916				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			Ц.
3	http://www.oum.ox.ac.uk/collections/im/17792	MIN.9072				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
9	http://www.oum.ox.ac.uk/collections/im/20981	MIN.12281				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			8.
	http://www.oum.ox.ac.uk/collections/im/20982	MIN.12283				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
1	http://www.oum.ox.ac.uk/collections/im/27274	MIN.18592				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
2	http://www.oum.ox.ac.uk/collections/im/28031	MIN.19502				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
3	http://www.oum.ox.ac.uk/collections/im/32436	MIN.23634				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
4	http://www.oum.ox.ac.uk/collections/im/32437	MIN.23635				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
5	http://www.oum.ox.ac.uk/collections/im/32438	MIN.23636				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
5	http://www.oum.ox.ac.uk/collections/im/33193	MIN.24549				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
7	http://www.oum.ox.ac.uk/collections/im/33472	MIN.24874				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
8	http://www.oum.ox.ac.uk/collections/im/36087	MIN.27515				Mineralogy	http://www.oum.ox.ac.uk/jade-minerals/			
2	http://www.ashmus.cx.ac.uk/collections/358871	EA1956.1657	China	-1200	-801	EA China	http://www.ashmus.cx.ac.uk/			
)	http://www.ashmus.ox.ac.uk/collections/358876	EA1956.1661	China	-1200	-801	EA China	http://www.ashmus.cx.ac.uk/			
	http://www.ashmus.cx.ac.uk/collections/358880	EA1956.1665	China	-400	-101	EA China	http://www.ashmus.cx.ac.uk/			
2	http://www.ashmus.cx.ac.uk/collections/358881	EA1956.1666	China	-400	-101	EA China	http://www.ashmus.cx.ac.uk/			
3	http://www.ashmus.ox.ac.uk/collections/358882	EA1956.1667	China	-1200	-801	EA China	http://www.ashmus.cx.ac.uk/			
\$	http://www.ashmus.ox.ac.uk/collections/358883	EA1956.1668	China	-1200	-801	EA China	http://www.ashmus.cx.ac.uk/			
5	http://www.ashmus.ox.ac.uk/collections/361493	EA1956.1637	China	-400	-101	EA China	http://www.ashmus.cx.ac.uk/			
5	http://www.ashmus.cx.ac.uk/collections/361495	EA1956.1639	China	-400	-101	EA China	http://www.ashmus.cx.ac.uk/			
7	http://www.ashmus.cx.ac.uk/collections/361502	EA1956.1645	China	-3000	-2000	EA China	http://www.ashmus.cx.ac.uk/			
3	http://www.ashmus.cx.ac.uk/collections/361987	EA1956.1578	China	-2000	-1500	EA China	http://www.ashmus.cx.ac.uk/			
2	http://www.ashmus.cx.ac.uk/collections/362216	EA1956.1589	China	-300	-201	EA China	http://www.ashmus.cx.ac.uk/			
-	b b objects-of-this-type-1		10000						1	

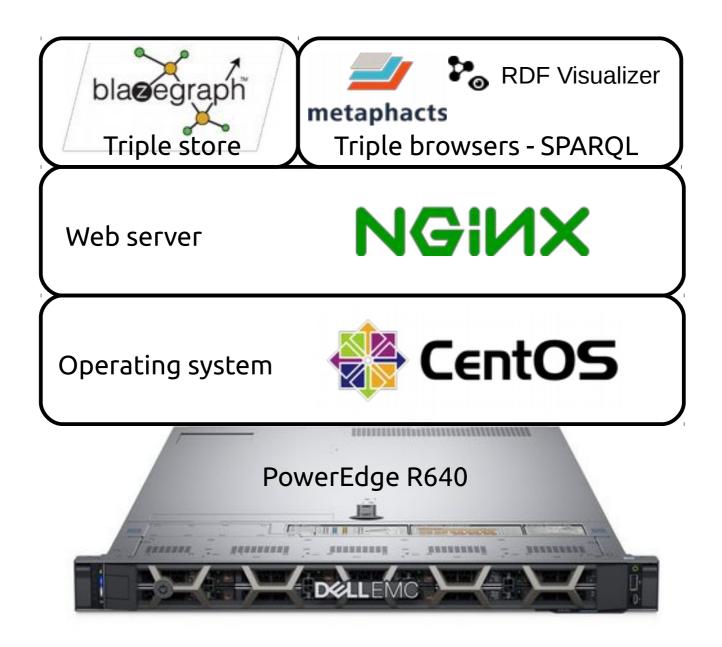
Pre-OXLOD: 8 steps per result. OXLOD: 1 step for all.

OXLOD architecture





Base system



Workflow



Bodleian Libraries











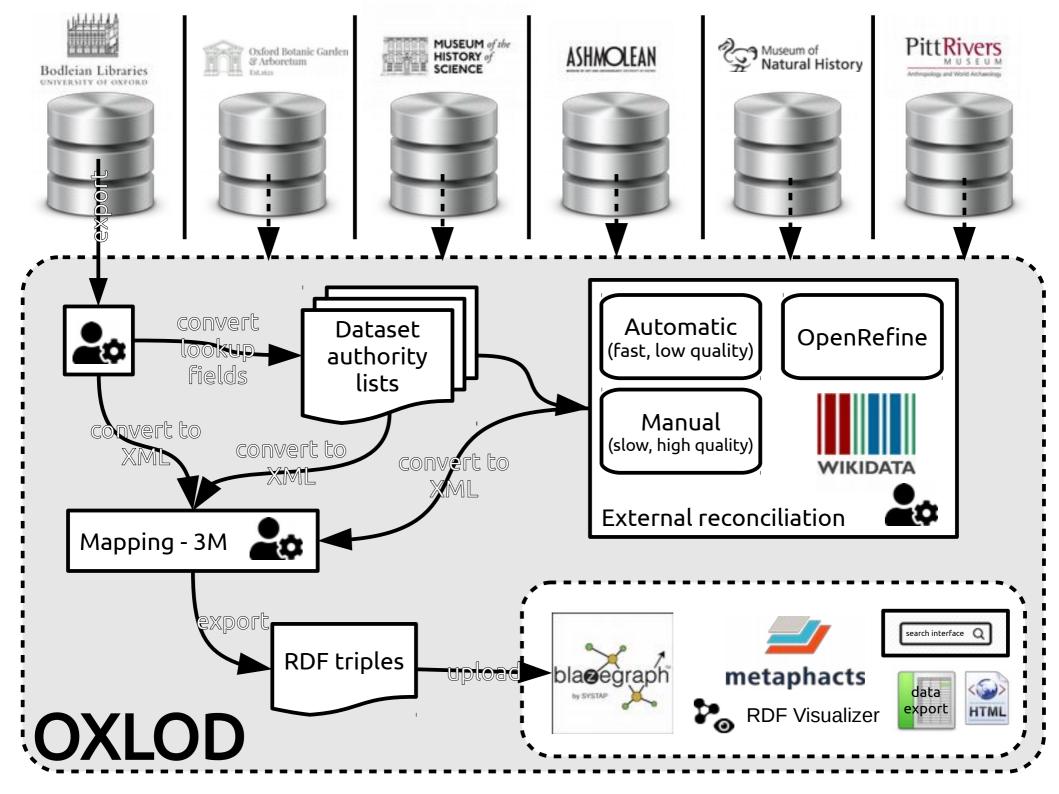


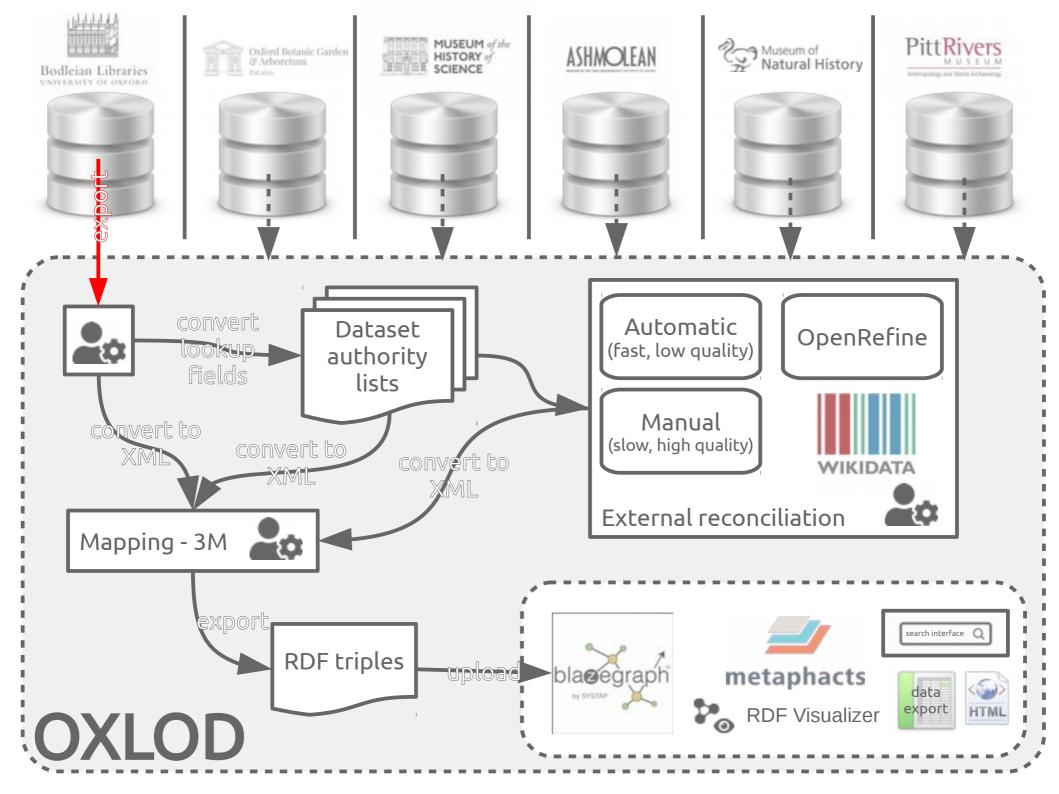






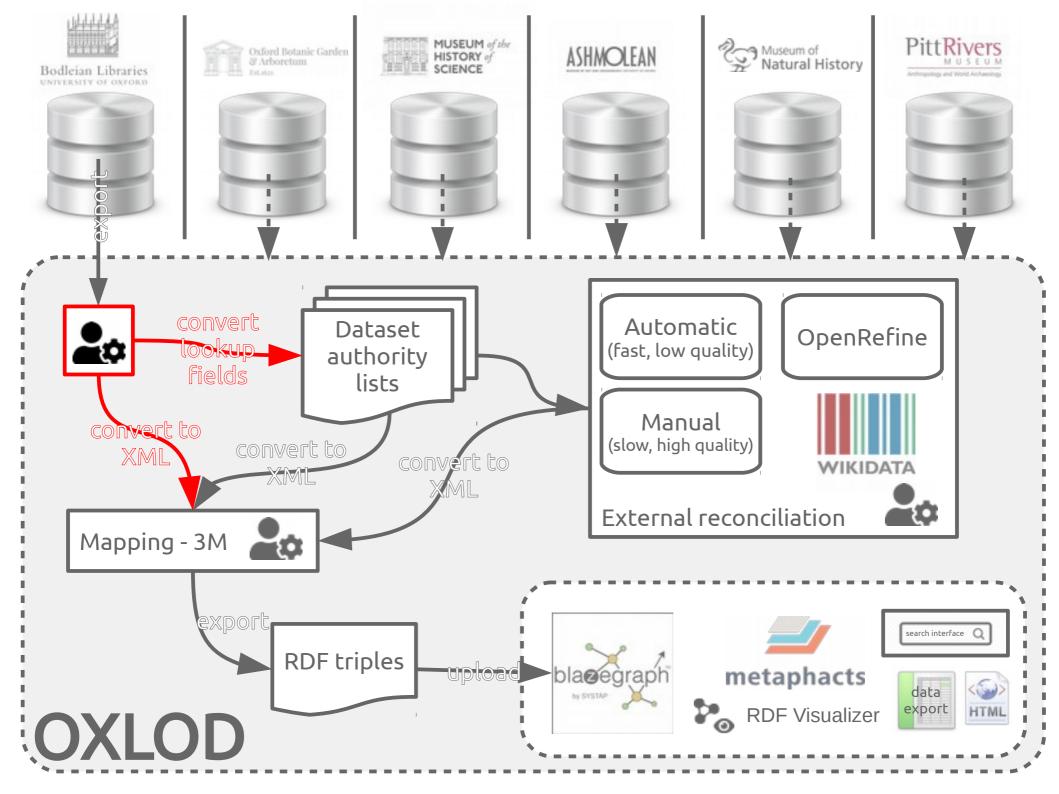






Export formats

- Allegro key, value pairs in blocks
- BRAHMS CSV
- EMu XML
- MuseumPlus SQL Server
- Bodleian MSs Text Encoding Initiative XML
- FileMaker CSV, XML
- MS Excel CSV



Pre-processing

• Separate lookup fields from other data

Pre-processing

- Separate lookup fields from other data
- Specific to the dataset
- Often requires programming
 - parsing records

Inconsistent input

- 01/1976
- 01/09/1993
- 02 October 2013 mid 20th century
- 02/1983
- 1974
- 1998?
- 1999 2000
- 1999-2000
- 28.01.15

- 30/11-01/12/1991
- February 1983
- c. 1950
 2nd half of 20th century
- early 19th century
- before 1880
- post 1910
- pre 1790

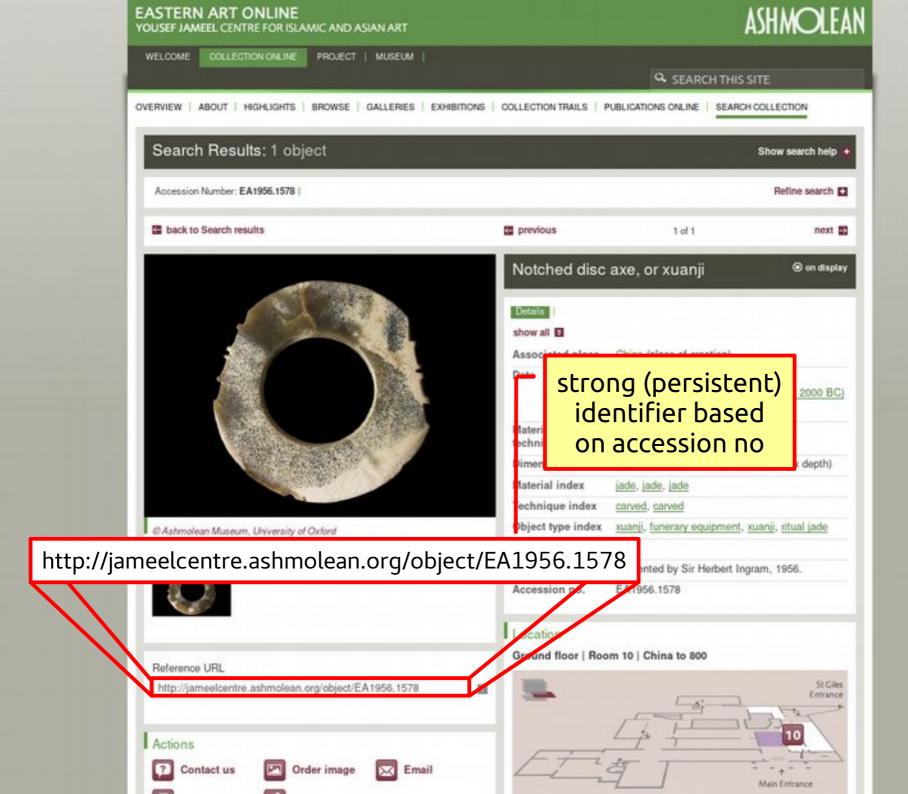
encury —		
У		
<date></date>		
<from></from>	19510101T00:00:00	
<to>20</to>	001231T23:59:59	

Pre-processing

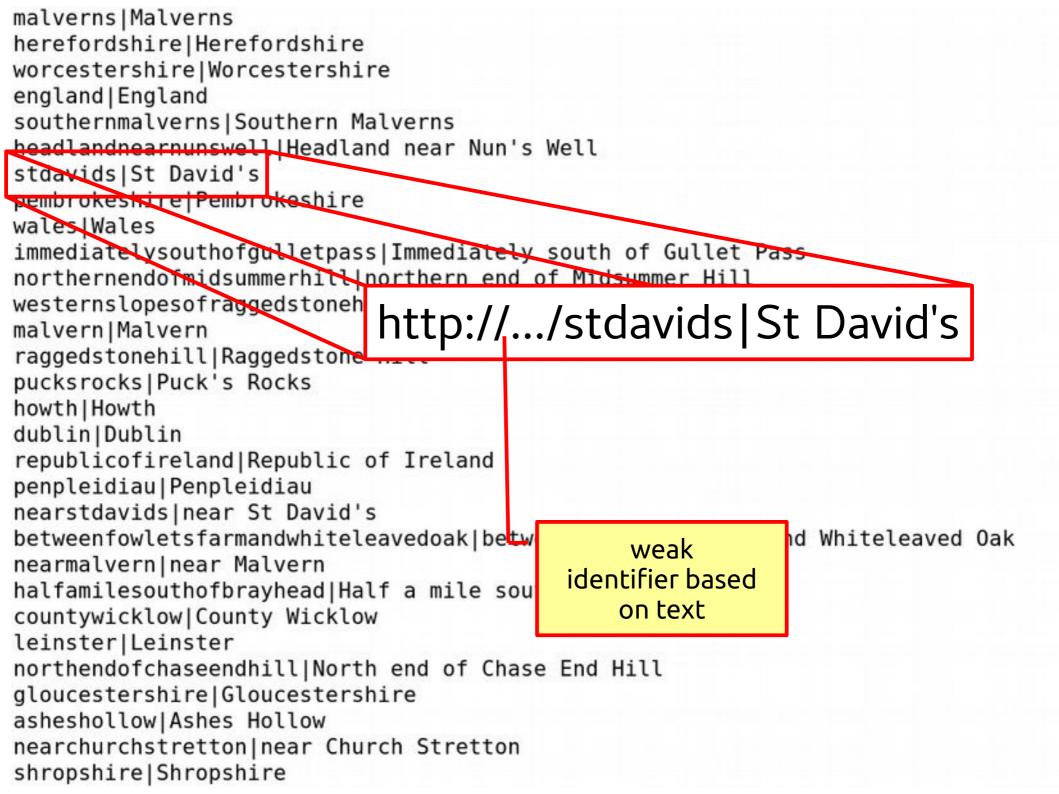
- Separate lookup fields from other data
- Specific to the dataset
- Often requires programming
 - parsing records
 - locating/creating identifers

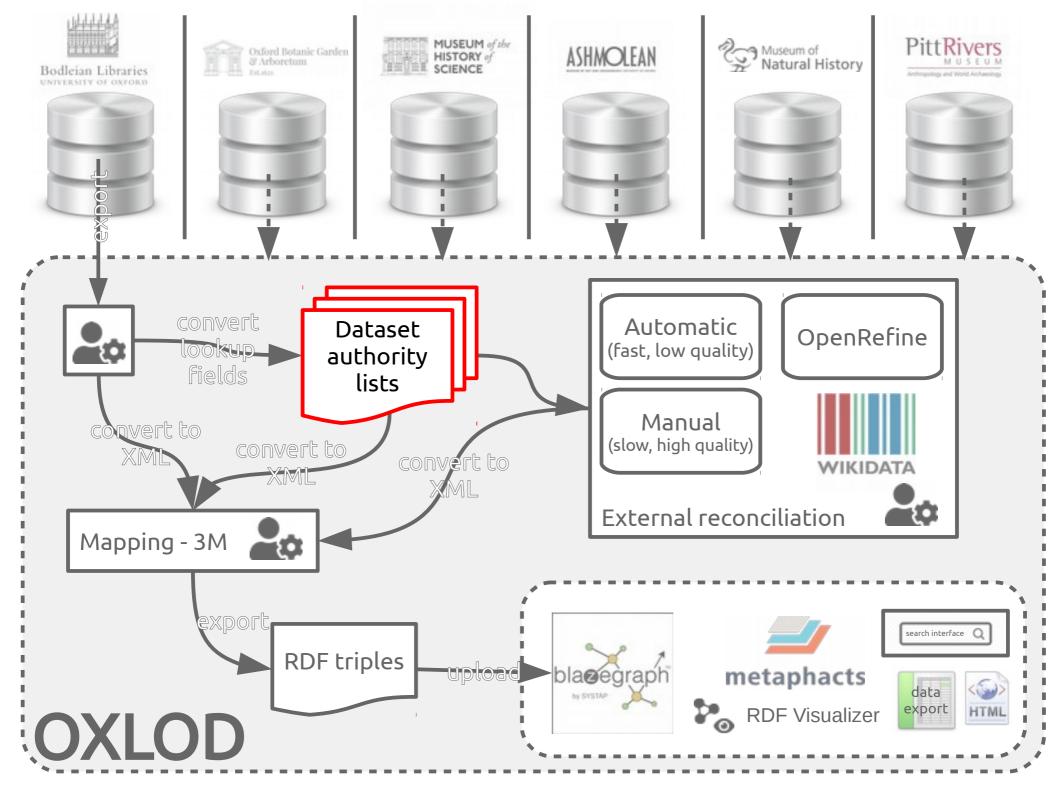
- Separate lookup fields fr
- Specific to the dataset
- Often requires program
 - parsing records
 - locating/creating identifers

http:// vief.org/vief 42620183 John Teatmoord	 hema.org/aut/	wor	http://	
	wrote		yr/work/id/ 7760377 Asseum escentesam	



malverns|Malverns herefordshire|Herefordshire worcestershire|Worcestershire england | England southernmalverns|Southern Malverns headlandnearnunswell|Headland near Nun's Well stdavids|St David's pembrokeshire|Pembrokeshire wales | Wales immediatelysouthofgulletpass | Immediately south of Gullet Pass northernendofmidsummerhill|northern end of Midsummer Hill westernslopesofraggedstonehill | Western slopes of Raggedstone Hill malvern|Malvern raggedstonehill | Raggedstone Hill pucksrocks|Puck's Rocks howth|Howth dublin|Dublin republicofireland | Republic of Ireland penpleidiau | Penpleidiau nearstdavids|near St David's betweenfowletsfarmandwhiteleavedoak|between Fowlet's Farm and Whiteleaved Oak nearmalvern|near Malvern halfamilesouthofbrayhead | Half a mile south of Bray Head countywicklow | County Wicklow leinster|Leinster northendofchaseendhill |North end of Chase End Hill gloucestershire|Gloucestershire asheshollow|Ashes Hollow nearchurchstretton|near Church Stretton shropshire|Shropshire





Pre-processing

- Separate lookup fields from other data
- Specific to the dataset
- Often requires programming
 - parsing records
 - locating/creating identifers
- Bash, AWK, Python, XQuery, XSLT

Preprocessing records

Andrew Morrison Software Engineer Bodleian Digital Library Systems and Services

Chinese catalogue and medieval MSs

- Chinese catalogue
 - Allegro
- Export in text format
 - Records separate by blank lines
 - Records mixed together, linked by ad hoc methods
 - Fields identified by first three characters
 - Subfields delimited by pipe symbols

- Medieval Manuscripts
 - Text Encoding Initiative
- In XML format
 - Emphasis on provenance
 - Mapping Manuscript Migrations
 - Local authority files
 - Work titles
 - Person names
 - Places

Need converting into a suitable structure for mapping

Solution: XQuery

- Filter out data
 - Administrative info, tracking barcodes, etc
- Keep data to share
 - Titles, authors, publication dates and places, provenance, languages, subject classifications, identifiers
- Build XML export
 - Separate records by type
 - Normalize dates
 - Manuscripts containing parts containing works
 - Former owners linked to periods of provenance (where known)
- Identifiers
 - Match countries and languages to Getty identifiers
 - Build local URIs

Example of Allegro data

#0rr 19930601/12:27:54|odh #0ca d1961 #Occ us|teng #200 Japanese botany during the period of wood-block printing #290 by Harley Harris Bartlett & Hide Shohara #300 Bartlett, Harley Harris #300aShohara Hide #410 Los Angeles #420 Dawson's Book Shop #430 1961 #470 271 p. : ill. ; 24 cm #600 Repr. from Asa Gray bulletin NS3[1961], 289-561 #803 19165 d.28 #000 19921029/15:03:09|osn #0rr 20130520/13:53:51|osn #0ca d1983 #0cc cc|tchi #130 11285.6 #200 自立會史料集 |9zi li hui shi liao ji #290 杜邁之,劉泱泱,李龍如輯 #300 杜邁之|9du mai zhi #300a劉泱泱 |9liu yang yang #300b李龍如|9li long ru #410 長沙 | 9chang sha #420 岳麓書社|9yue lu shu she #430 1983 #470 平装1冊(371頁) : 圖 ; 20公分 #800 Chin.e.7731 #900 r

Example of resulting XML

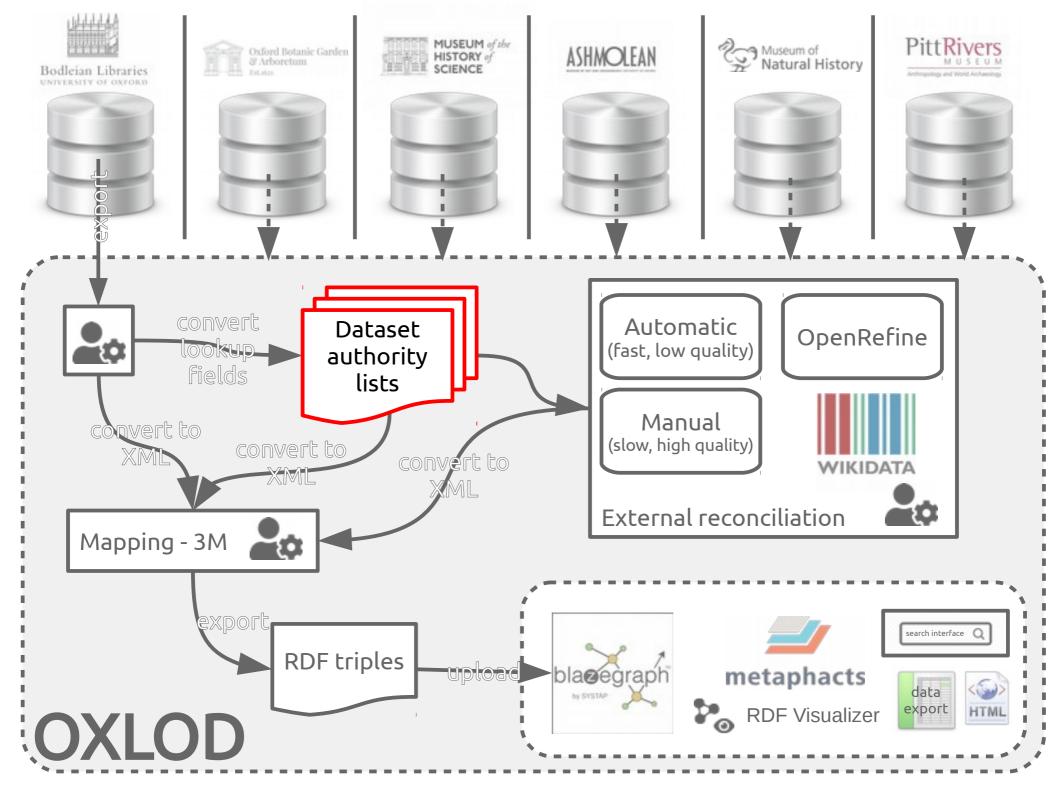
```
<?xml version="1.0" encoding="UTF-8"?>
<books>
  <book>
     <uri>http://allegro.bodleian.ox.ac.uk/chinese/19920109163415odh</uri>
     <title>
        <main>Japanese botany during the period of wood-block printing</main>
     </title>
     <author>
        <uri>http://allegro.bodleian.ox.ac.uk/chinese/author/name/bartlett%20%20harley%20harris</uri>
        <main>Bartlett, Harley Harris</main>
     </author>
     <author>
        <uri>http://allegro.bodleian.ox.ac.uk/chinese/author/name/shohara%20hide</uri>
        <main>Shohara Hide</main>
     </author>
     <shelfmark>RSL 19165 d.28</shelfmark>
     <date>
        <from>1961-01-01T00:00:00</from>
        <to>1961-12-31T23:59:59</to>
     </date>
     <pubplace>
        <main>Los Angeles</main>
     </pubplace>
     <pubcountry>
        <uri>http://vocab.getty.edu/tgn/7012149</uri>
        <label>United States</label>
        <code>us</code>
     </pubcountry>
     <language>
        <uri>http://vocab.getty.edu/aat/300388277</uri>
        <label>English</label>
        <code>eng</code>
     </language>
  </book>
  <book>
     <uri>http://allegro.bodleian.ox.ac.uk/chinese/19921029150309osn</uri>
     <title>
        <main>自立會史科集</main>
        <alt>zi li hui shi liao ji</alt>
     </title>
     <author>
        <uri>http://allegro.bodleian.ox.ac.uk/chinese/author/name/%E6%90%90%E9%82%81%E4%B9%88</uri>
        <main>####></main>
```

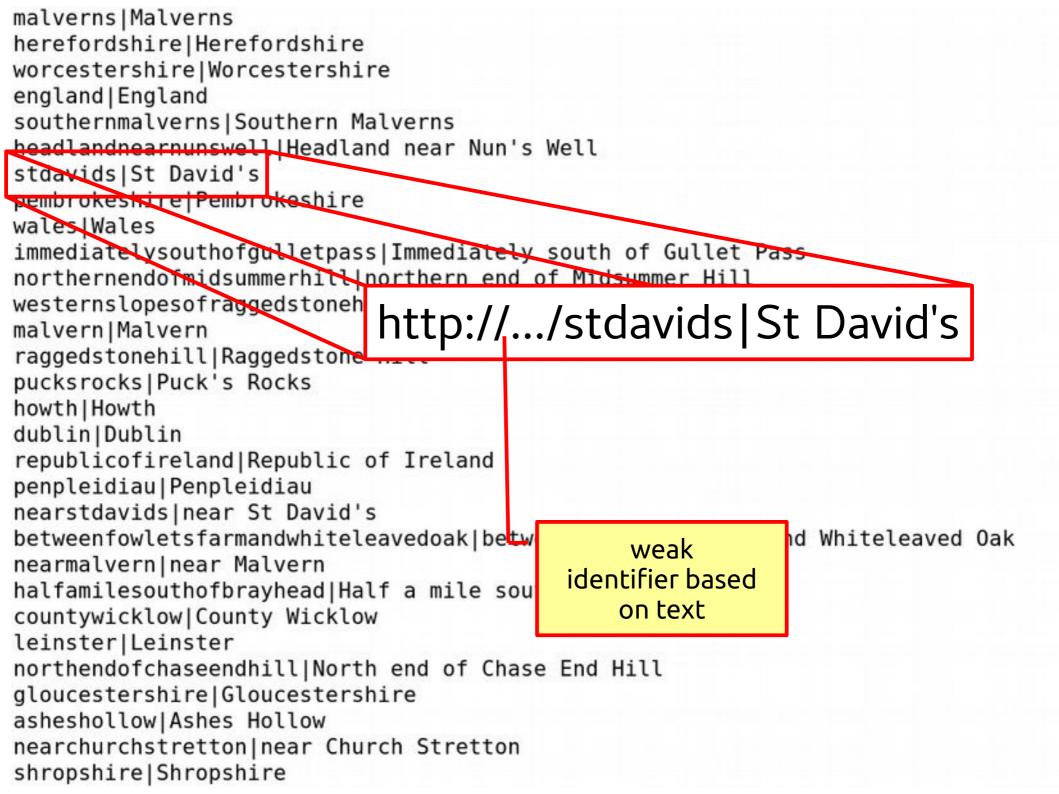
Example of provenance in TEI

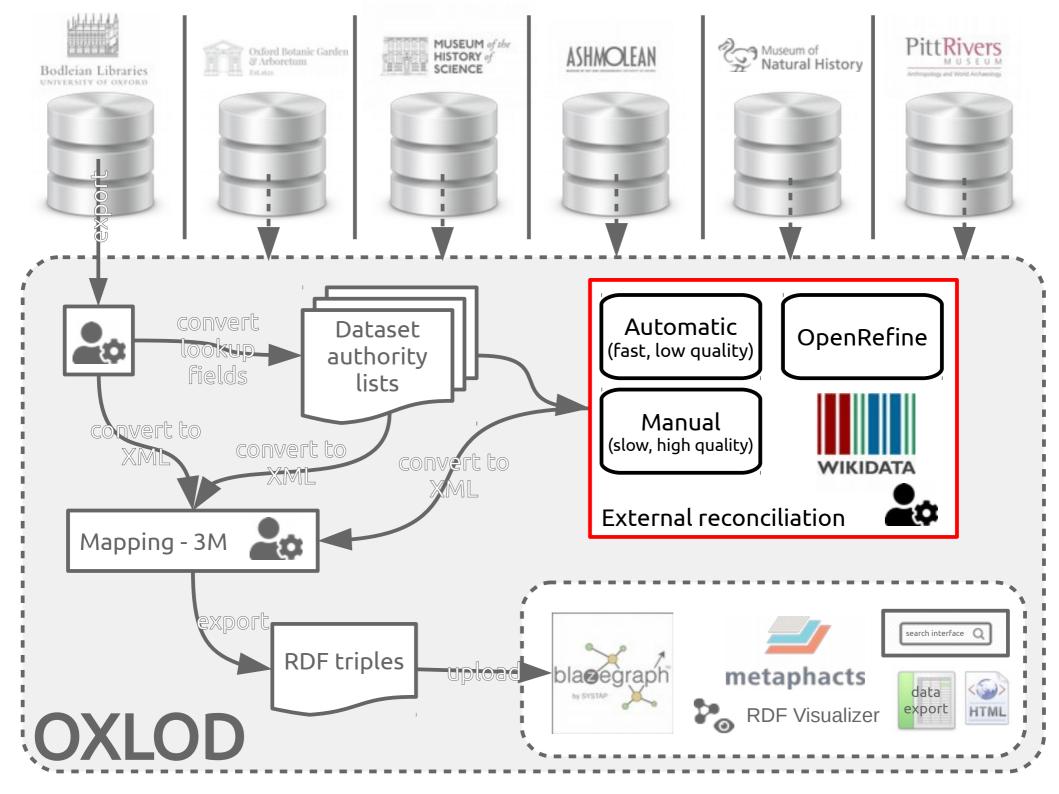
```
<history>
     <origin resp="#PA">
          <origDate calendar="Gregorian" notAfter="1450" notBefore="1400">15th century, first half</origDate>
          <origPlace>
               <country key="place 7002445">English</country>
          </origPlace>
     </origin>
     cyconstance resp="#VD">Liturgical evidence for <placeName key="place 7012044">Canterbury</placeName> (?):
           tag for the mass of St. Augustine of Canterbury, and, in the calendar, the Translations of St. Thomas,
           St. Edmund and St. Richard, all in red.</provenance>
     convenance resp="#SC">'Willelmus Brocas', p. 160, 16th-17th cent.</provenance>
     cycone content   // state  // stat
     cycone="1633" notAfter="1660"><persName role="formerOwner" key="person 76667490">William
           Sprigg, c. 1633 - c. 1701</persName>; given by him to Anthony Wood.</provenance>
     <!-- Sprigg was ejected from Lincoln College in 1660: ODNB -->
     convenance resp="#SC" notAfter="1690" notBefore="1660">'Liber <persName role="formerOwner"</pre>
           key="person 14803186">Antonii Wood</persName> [1632-1695] e coll' Merton Oxonie ex dono [Willelmi]
           Sprigges nuper socii coll' Lync' Oxon' Novembris' [after 1657], p. iii.</provenance>
     <acquisition when="1690">Bought by the library in 1690.</acquisition>
     <!-- check: index other names -->
</history>
```

Example of resulting XML

```
<date context="origin"><from>1400-01-01T00:00:00</from><to>1450-12-31T23:59:59</to></date>
<date context="acquisition"><from>1690-01-01T00:00:00</from><to>1690-12-31T23:59:59</to></date>
<place context="origin">
   <uri>https://medieval.bodleian.ox.ac.uk/catalog/place 7002445</uri>
   <label>English</label>
</place>
<prevenance xml:id="manuscript 9055 provl">
   <place>
     <uri>https://medieval.bodleian.ox.ac.uk/catalog/place_7012044</uri>
      <label>Canterbury</label>
   </place>
   <text>Liturgical evidence for Canterbury (?): tag for the mass of St. Augustine of Canterbury, and, in the calendar, the
      Translations of St. Thomas, St. Edmund and St. Richard, all in red.</text>
</provenance>
<inscription xml:id="manuscript_9055_prov2">
   <text>'Willelmus Brocas', p. 160, 16th-17th cent.</text>
</inscription>
<inscription xml:id="manuscript 9055 prov3">
   <text>'Willelmus Fitz Willelmus', p. 260 rev, 16th-17th cent.</text>
</inscription>
<prevenance xml:id="manuscript 9055 prov4">
   <date><from>1633-01-01T00:00:00</from><to>1660-12-31T23:59:59</to></date>
   <person>
      <uri>https://medieval.bodleian.ox.ac.uk/catalog/person 76667490</uri>
      <label>William Sprigg, c. 1633 - c. 1701</label>
      <role>formerOwner</role>
   </person>
   <text>William Sprigg, c. 1633 - c. 1701; given by him to Anthony Wood.</text>
</provenance>
<inscription xml:id="manuscript 9055 prov5">
   <date><from>1660-01-01T00:00:00</from><to>1690-12-31T23:59:59</to></date>
   <person>
      <uri>https://medieval.bodleian.ox.ac.uk/catalog/person_14803186</uri>
      <label>Antonii Wood</label>
      <role>formerOwner</role>
   </person>
   <text>'Liber Antonii Wood [1632-1695] e coll' Merton Oxonie ex dono [Willelmi] Sprigges nuper socii coll' Lync' Oxon'
      Novembris' [after 1657], p. iii.</text>
</inscription>
```







Getty Vocabula	aries: LOD SPARQL	Queries	TGN - Search	Search	Full -			
Saint David	d's							
Source.neto://vocab.getty.edu								
Subject (38) Predicate	Object All		***	hoite Hierarchy Down	load in: JSON JSONLD RDF N3/Turtle N-Triples			
					Inference Explicit only			
		Statemer	nts in which the resource exists as a	subject.				
Predicate	Object	httr		ttv odu/t	gn/7008839			
rdf:type	gvp:AdminPlaceConcept	Ince	vocab.ge	lly.edu/l	gii//000055			
rdfs:seeAlso	http://www.getty.edu/vow/TGNFu	IllDisplay /find=&	place-anation-asubjectid=/008839	9				
dcterms:created	1991-09-13T04:48:00							
dcterms:modified	2011-09-16T12:55:43, 2011-09-16T12:55:44							
skostchangeNote	tgn_rev:5000891297, tgn_rev:5	tgn_rev:5000891297, tgn_rev:5013622493, tgn_rev:5013622500						
gvp:parentString	Pembrokeshire, Wales, United K	ingdom, Europe	, World					
gvp:parentStringAbbrev	Pembrokeshire, Wales, World							
gvp:displayOrder	226							
xl:prefLabel	tgn_term:65407-en							
xl:altLabel	tgn_term:1001833420-cy, tgn_te	erm:170429, tgn	_term:173996					
gvp:broaderPartitive	tgn:7018993							
gvp:broaderPreferred	tgn:7018993							
gvp:prefLabelGVP	tgn_term:65407-en							
skostinScheme	tgn							
skos:scopeNote	tgn_scopeNote:48292							
dcterms:contributor	tgn_contrib:10000000, tgn_cont	rib:10000001, tg	in_contrib:10000003					
dcterms:source	tgn_source:2009007144-subjec 7008839, tgn_source:9006561	1-7008839, tgn_s	source:9005218-subject-7008839, to	in_source:9006249, tgn_s	ource:9006449, tgn_source:9006548-subject-			
minipipionaTurneProferred	aat-200008247							

External authorities in OXLOD

- Virtual Authority Files (VIAF)
- International Plant Names Index (IPNI)
- Getty Thesauri
 - Arts and Architecture Thesaurus (AAT)
 - Thesaurus of Geographic Names (TGN)
- British Museum Thesaurus
- China Bibliographical Database (CBDB)
- China Historical Geographic Information System (CHGIS)
- Geonames
- Wikidata

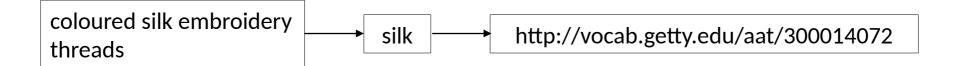
Reconciling records

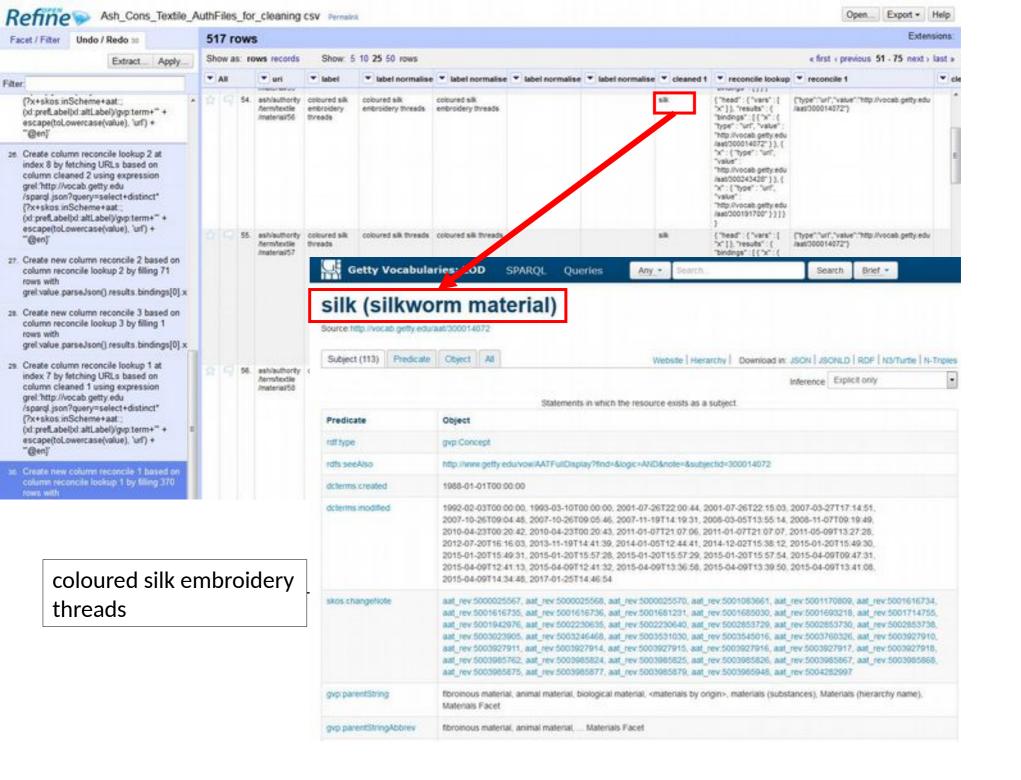
Sarah Joomun Digital Collections Manager Oxford University Museum of Natural History

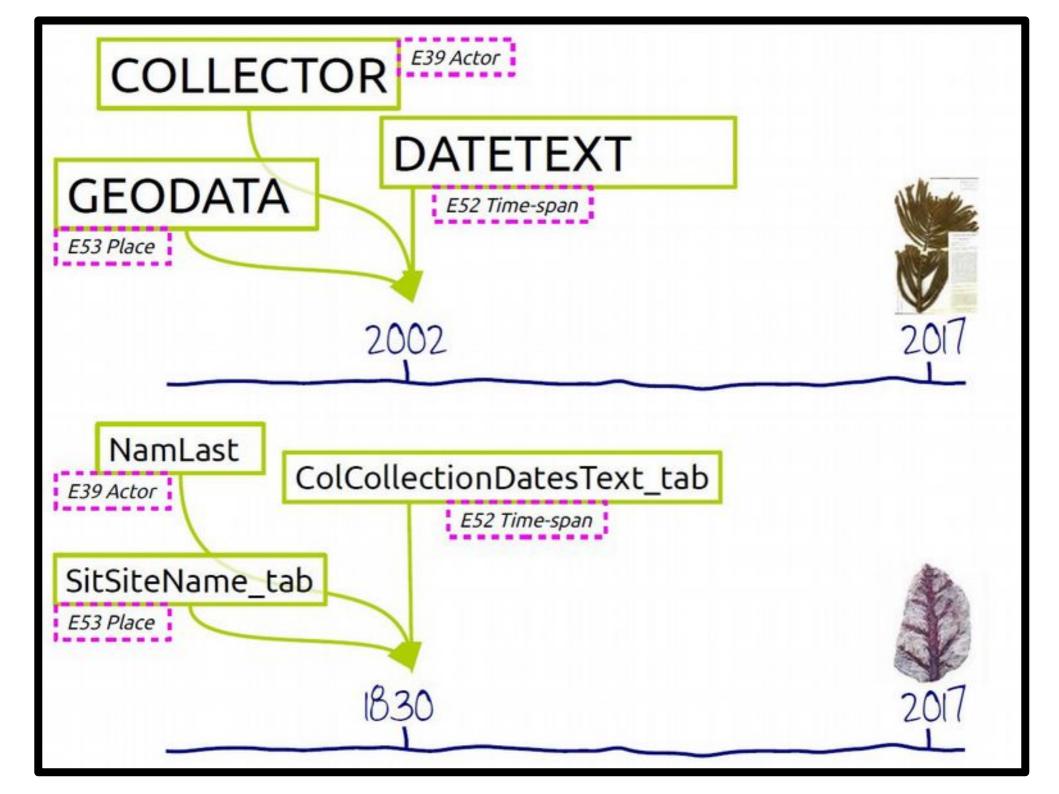
efine	Ash_Co	ns_Textile	AuthFiles_fe	or_cleaning	CSV Perma	ini,						Open	Export +	Help
acet / Filter	Undo / Redo 30		517 row	/s									Exte	ensions:
	Extrac	Apply	Show as:	rows records	Show:	5 10 25 50 rows						« first « previous	51 - 75 next	> last >
5			▼ A1	💌 uri	Tabel	 label normalise 	 label normalise 	▼ label normalise	· label normalise	cleaned 1	reconcile lookup	reconcile 1		T ci

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(?x+skos:inScheme+aat:; (xl:prefLabel)xl:altLabel)/gvp.term+" + escape(toLowercase(value), 'url') + "@en)'			54.	ash/authority Aerm/textile /material/56	coloured silk embroidery threads	coloured allk embroidery threads	coloured sik embroidery threads			sik	("head": ("vars": ["x")), "results": { "bindings": [("x": ("type": "url", "value") "http://vocab.petby.edu /sat/300014072")), {	("type","un","value","http://vocab.getty.edu /aas/300014072")	
26. Create column reconcile lookup 2 at index 8 by fetching URLs based on column cleaned 2 using expression grel/http://vocab.getty.edu /spardi.json?query=select+distinct* (?x+skos.inScheme+aat:; (xl:prefLabel)xi.altLabel)/gvp.term+** + escape(toLowercase(value), urf) +											"X": ["type": "urf, "value": "http://vocab.getty.edu /aat/00243428" } } { "X": ["type": "urf, "value": "http://vocab.getty.edu /aat/300191700" } }] }		ι.
escape(toLowercase(value), un) + "@en)"			55.	ash/authority /term/textile	coloured silk threads	coloured silk threads	coloured silk threads			sik	{ "head" : { "vars" : { "x"] }, "results" : {	("type","un","value","http://vocab.getty.edu /aat/300014072")	
27 Create new column reconcile 2 based on column reconcile lookup 2 by filling 71 rows with grel:value.parseJson().results.bindings[0].x				/material/57							"bindings": [("x": { "type": "url", "value" "http://vocab.getty.edu /aat/300014072" }], { "x": { "type": "url", "value": "http://vocab.getty.edu		
 Create new column reconcile 3 based on column reconcile lookup 3 by filing 1 rows with grel.value.parseJson().results.bindings[0] x 											/ast/300243428")), { "x": { "type": "url", "value": "http://vecab.getty.edu /ast/300191700") } }		
28. Create column reconcile lookup 1 at index 7 by fetching URLs based on column cleaned 1 using expression grel: http://vocab.getty.edu /sparql.json?query=select+distinct* (?x+skos.inScheme+aat:; (xl:prefLabel)xl:atLabel)/gyp.term+" + escape(toLowercase(value); 'url') + "@en)"			56.	ash/authority Aermitextile /materiai/58	coloured silks	coloured silks	coloured siks			sk	<pre>} { "head":{\vars^:! "head":{\vars^:! "bindings":{\vars^:! "hindings":{\vars^:! "hindings":{\vars_! "hindings":{\vars_!</pre>	("type":"un","value","http://vocab.getty.edu /sat/300014072")	
so. Create new column reconcile 1 based on column reconcile lookup 1 by filling 370 rows with											x (type : un, "value": "http://vocab.getty.edu /sat/300191700" })])		



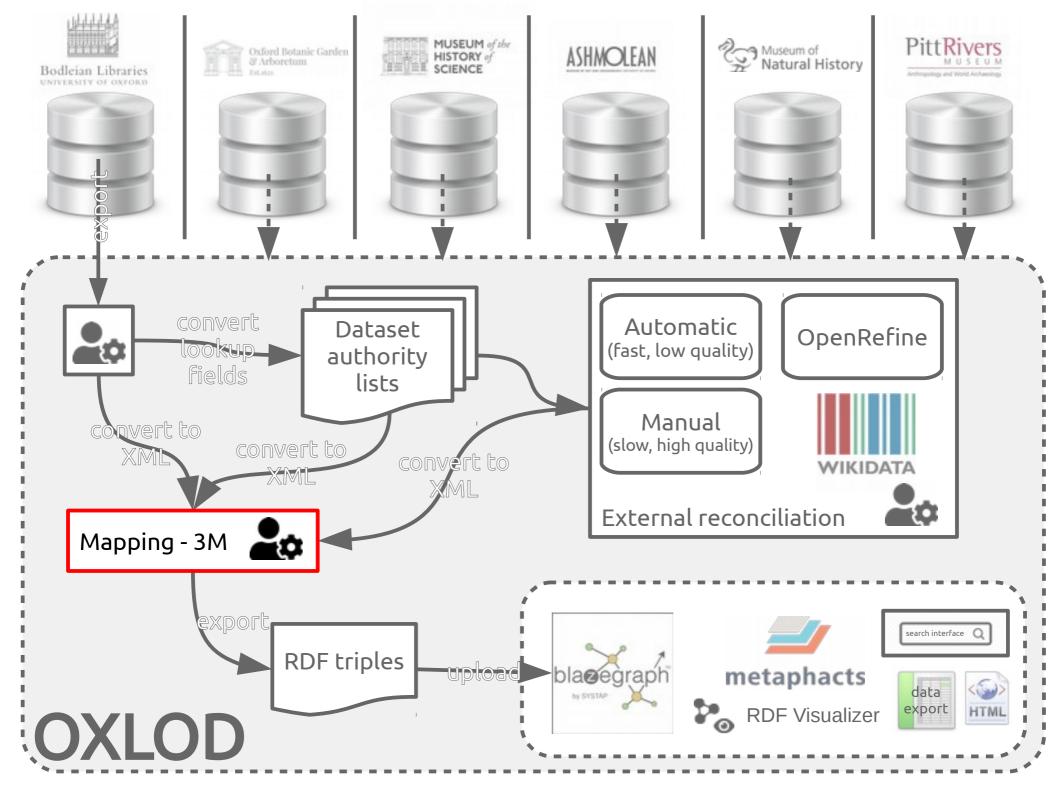


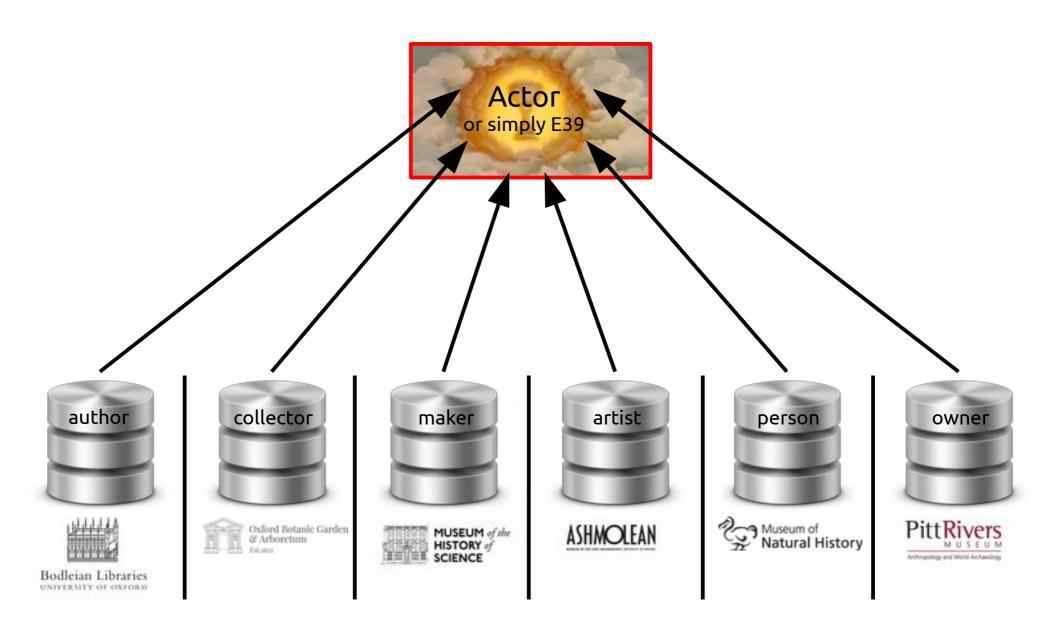


	View Tools	Tabs	Parts Mu		Vindow	Help ▶ ▶I	[• G •	
1115 nventory No. 828 Tucher, Hans	328, "Diptych D	ial, by H	ans Tuche	er, Nurembe	erg, 1567'	" [1924-0/pa	rt].		
Title Main Title: [Diptych Dial, by Ha	ans Tuche	er, Nurember	g, 1567					
Object Details Inventory Number: Object Name:	ntory Number: 82828			Access	Accession Details Accession Status: Gift Accession No: 1924-0/part				
Object Type: Collection:	sundial, diptych d 1 Lewis Evans C		-	Handling Instructions					
Condition Status:			•						
Persons									
Name		Role		Date of B	Date of	Nationality	1112	8 D	
1 Tucher, Hans *		Mak	er (Signed						
Date Created: D	ated 1567		Earliest:	1567	L	atest: 1567			
	Title Mu	ltimedia	Narrativ	es Loc	ation	Creation (1)	Creation (2)	Ni 4	

MHS EMu catalogue module, Summary view, 2007-2018







3 Mapping : OXLOD-Ashmolean	-exemplar			
Info Matching Table Generators Analys	is Transformation Configuration	n About		
(ALL) SOURCES ++	(ALL) TARGETS ++	(ALL) IF RULES ++	(ALL) COMMENTS ++	(ALL) MAPS
			Click on a roo	w to edit the matching table
# SOURCE	TARGET	CONSTANT EXPRESSION	IF RULE	COMMENTS
1 D //dataroot/dbo_tObject	crm:E22_Man-Made_Object		I TIVEE	+
P 1 Accno	↓ crm:P1_is_identified_by			
1.1 R Acono	crm:E42_Identifier			
P L Collection	↓ crm:P46i_forms_part_of			
1.2 R Collection	crm:E78_Collection			
P L CreditLine	↓ crm:P3_has_note			
1.3 R CreditLine	http://www.w3.org/2000/01/rdf-s	chema#Literal		
P ↓ dbo_tObjectDates/DateText 1.4				
R dbo_tObjectDates/DateText	http://www.w3.org/2000/01/rdf-s	chema#Literal	/DateType/text() = display	(We do not want to include peri.)
1.5 P ↓ dbo_tObjectDates/DateFrom				
R dbo_tObjectDates/DateFrom	http://www.w3.org/2000/01/rdf-s	chema#Literal	/DateType/text() = display	
P ↓ dbo_tObjectDates/DateTo				
R dbo_tObjectDates/DateTo	http://www.w3.org/2000/01/rdf-s	chema#Literal	/DateType/text() = display	
1.7 P ↓ dbo_uri_Technique_REL				
R dbo_uri_Technique_REL	crm:E55_Type			
P dbo_uri_Material_REL	↓ crm:P45_consists_of			
R dbo_uri_Material_REL	crm:E57_Material			

3 Mapping : OXLOD-Ashmolean-	exemplar			
Info Matching Table Generators Analysis	Transformation Configuration	About		
▲ TOP ▼ BOTTOM				
(ALL) SOURCES ++	(ALL) TARGETS ++	(ALL) IF RULES ++	(ALL) COMMENTS ++	(ALL) MAPS
			Click on a rov	v to edit the matching table COMMENTS
# SOURCE	TARGET	CONSTANT EXPRESSION	IF RULE	:
1 D 📩 /dataroot/dbo_tObject	crm:E22_Man-Made_Object	the second s		
P Accno	↓ crm:P1_is_identified_by			
R Accno	crm:E42_Identifier			
1.2 P L Collection	↓ crm:P46i_forms_part_of			
R Collection	crm:E78_Collection			
P CreditLine	↓ crm:P3_has_note			
R CreditLine	http://www.w3.org/2000/01/rdf-sche	ma#Literal		
P ↓ dbo_tObjectDates/DateText 1.4	↓ crm:P108i_was_produced_by crm:E12_Production ● [p] ↓ crm:P4_has_time-span crm:E52_Time-Span ● [ts] ↓ crm:P3_has_note			
R □ dbo_t0 1.5 P ↓ dbo_t0	http://www. form:P108i_ crm:P108i_ crm:l=9.Pt form:P4_has		/DateType/text() = display	(We do not want to include peri)
R dbo_tObjectDates/DateFrom	crm:E52_Ti ↓ crm:P82a_t http://www.woong.zoooona.com ↓ crm:P108_was_produced_by	TOPLETON	/DateType/text() = display	
P ↓ dbo_tObjectDates/DateTo				
R dbo_tObjectDates/DateTo	http://www.w3.org/2000/01/rdf-sche	ma#Literal	/DateType/text() = display	
1.7 P ↓ dbo_uri_Technique_REL				
R dbo_uri_Technique_REL	crm:E55_Type			
P dbo_uri_Material_REL	↓ crm:P45_consists_of			
R dbo_uri_Material_REL	crm:E57_Material			

Mapping records

Chris Powell Digital Collections Team Ashmolean Museum

Regular tasks for the Digital Collections Team

- Improving the quantity and quality of data stored in the Collections Management System (CMS).
- Mapping legacy databases to the CMS.
- Devising appropriate schemes for transcribing and importing paper records.
- Measurable validation of data in the CMS.
- Turning down requests by other institutions for our data.

Relational Table data

dbo_tObjectDates					
OdaId 🚽	OdaObjId 🚽	DateType 🚽	DateText 🚽	DateFrom 🚽	DateTo 🚽
93645	389571	display	1700 - 1780	1700	1780
93646	389572	display	1700 - 1740	1700	1740
93647	389573	display	1680 - 1720	1680	1720
93670			Ming Dynasty,	1522	1567
93671		display	18th century	1701	1800
93673	389599	display	16th century	1501	1600
93676		display	16th century	1501	1600
93679	389605	display	1755	1755	1755
93680	389606	display (peri	Qing Dynasty,	1736	1795
93681	389607	display	1724	1724	1724
175768	361806	display	1961	1961	1961
168541		display	1740 - 1780	1740	1780
139823	738084	display (peri	Yuan Dynasty	1279	1368
202153		display	1946 - 1948	1946	1948
304983	789394	display	20th century	1901	2000

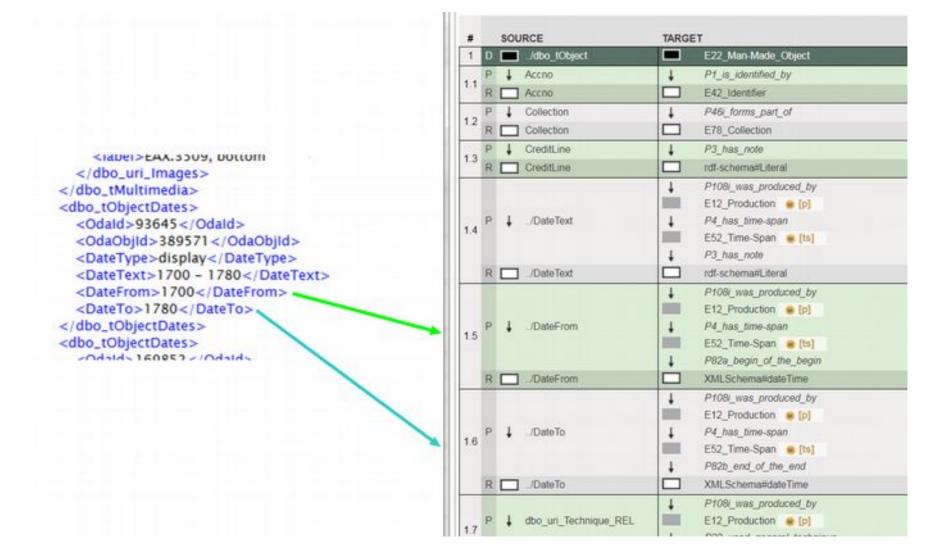
Relational Table data

OdaId 🚽	OdaObjId 🚽	DateType 🚽	DateText 🚽	DateFrom 🚽	DateTo 🚽
93645	389571	display	1700 - 1780	1700	1780
93646	389572	display	1700 - 1740	1700	1740
93647	389573	display	1680 - 1720	1680	1720
93670	389595	display (peri	Ming Dynasty,	1522	1567
93671	389597	display	18th century	1701	1800
93673	389599	display	16th century	1501	1600
93676	389602	display	16th century	1501	1600
93679	389605	display	1755	1755	1755
93680	389606	display (peri	Qing Dynasty,	1736	1795
93681	389607	display	1724	1724	1724
175768	361806	display	1961	1961	1961
168541	696655	display	1740 - 1780	1740	1780
139823			Yuan Dynasty	1279	1368
202153		display	1946 - 1948	1946	1948
304983	789394	display	20th century	1901	2000

Export to XML

- Dat	teFrom 🚽 Da	teTo 🚽	
J	1700	1780	
0	1703	1741	<iddel>EAX.3509, DOLLOM</iddel>
0	1680	1720	
ty.	1522	1567	
ry	1701	1000	<dbo_tobjectdates></dbo_tobjectdates>
ry	1501	1600	<odald>93645</odald>
ry	1501	1600	<odaobjid>389571</odaobjid>
	1755	1755	<datetype>display</datetype>
ty,	1736	1795	<datetext>1700 - 1780</datetext>
	1724	1724	
	1961	1961	<datefrom>1700</datefrom>
0	1740	1780	<dateto>1780</dateto>
5y	1279	1368	
	1946	1948	<dbo_tobjectdates></dbo_tobjectdates>
	1901	200	Zodalds 160952 Z/Odalds

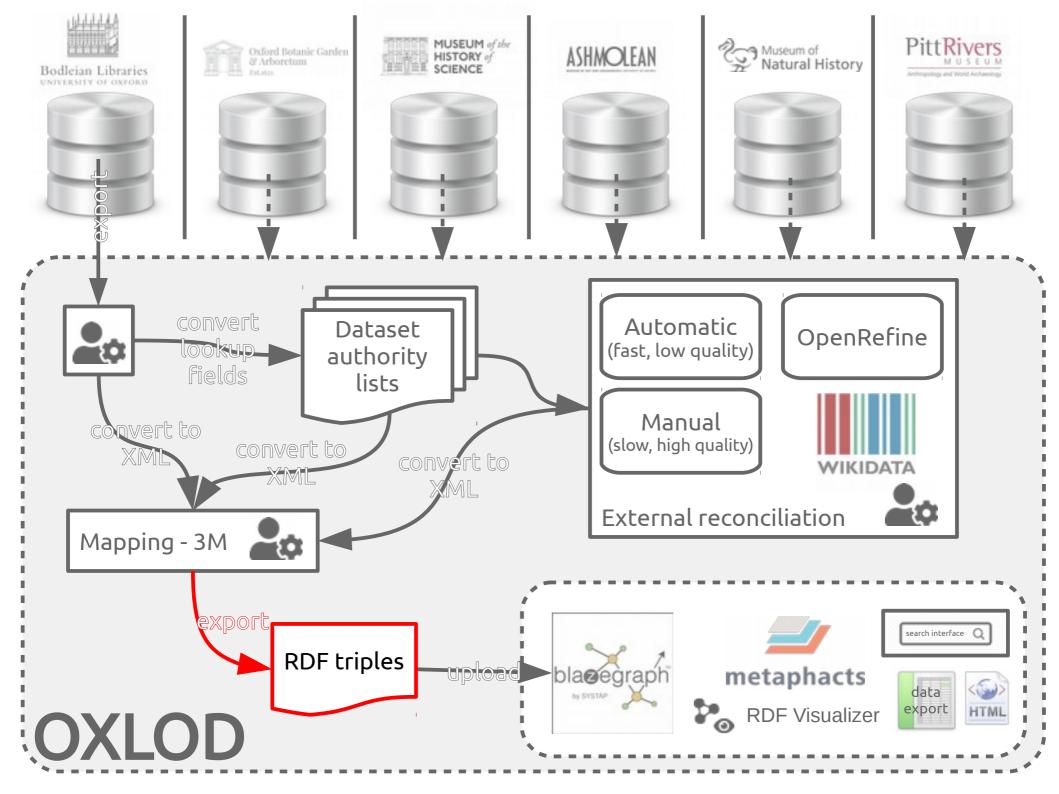
Describing column semantics: Mapping



Impact on tasks of the Digital Collections Team

In addition to gaining hands-on experience of the tools and techniques needed to publish LOD I have learned that:

- Mapping to CIDOC:CRM retain source database structure (if normalised!)
- We should record the uri of reconciled data in our CMS (Getty).
- Combining our data with that of other institutions in new ways becomes possible (BM/Egypt)
- LOD expands possibilities for collaborative research (BM).
- Meet external demands for transportable exports of our data.



```
<mapping>
    <domain>
        <source node>/dataroot/dbo tObject</source node>
        <target node>
            <entity>
                <type>crm:E22_Man-Made_Object</type>
                <instance generator name="Entity">
                    <arg name="identifier" type="xpath">ObjId/text()</arg>
                </instance generator>
                <label generator name="Literal">
                    <arg name="text" type="xpath">concat(Accno/text(), ' - ', Title/text())</arg>
                    <arg name="language" type="constant">en</arg>
                </label generator>
            </entity>
        </target node>
    </domain>
```



X3ML Engine supports the data transformation which is part of the data provisioning and aggregation process.

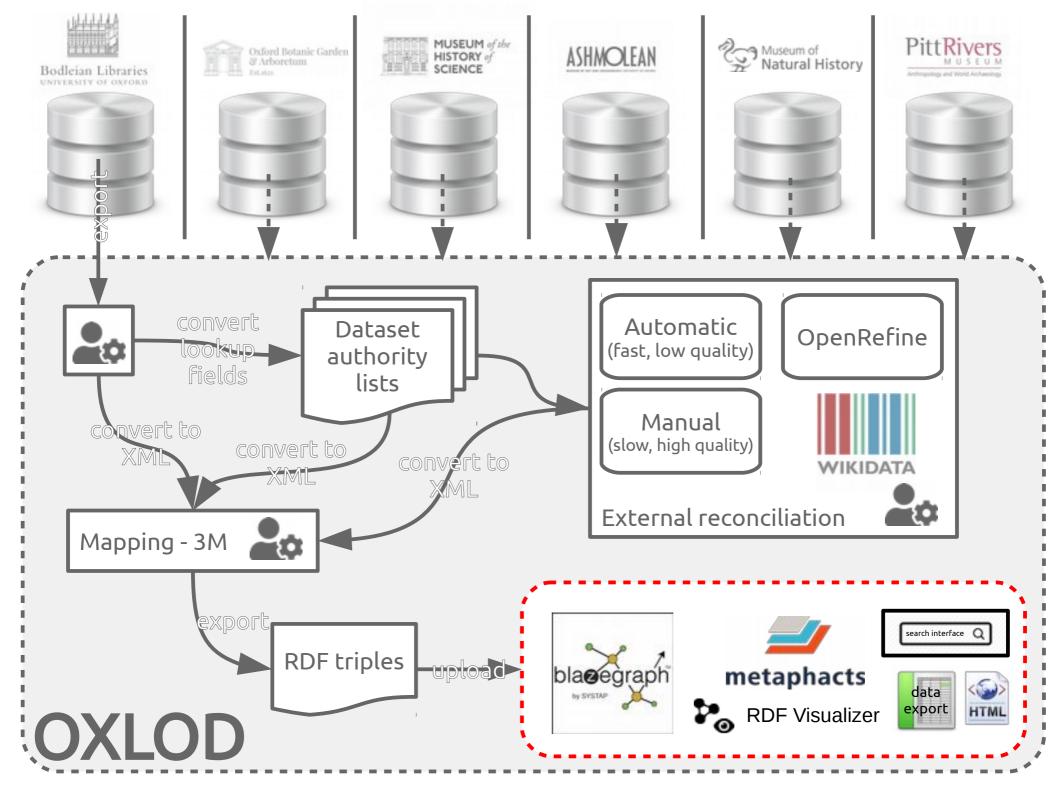
@ 943 commits	¥ 6 branches	S 20 releases	<u>\$1</u> 4 co	ntributors		∲ Apache-2.0
Branch: master + New pull reques	t		Create new file	Upload files	Find file	Clone or download *
This branch is 759 commits ahead	of delving:master.				្រា Pull រ	request 📄 Compare
ymark Merge branch 'new_genera	tor-issue_129'			L	atest commi	t 3f99922 20 days ago
docs	new issue					20 days ago
example	fixed examples					3 months ago
resources/X3ML Schema	Merge branch 'ma	ister' into namedgraphs				3 months ago
In src	added junit tests f	or testing UriExistingOrN	lew generator			20 days ago
gitignore	updated gitignore					5 years ago
E LICENSE	Initial commit					5 years ago
README.md	Update README.	md				4 months ago
D pom.xml	removed duplicate	e dependency				3 months ago

I README.md

X3ML Engine

Introduction

The X3ML engine handles the URI generation and the data transformation steps of the data provision and aggregation process. It realizes the transformation of the source records to the target's format. The engine takes as input the source data (currently in the form of an XML document), the description of the mappings in the X3ML mapping definition file and the URI generation policy file and is responsible for transforming the XML document into a valid RDF document which is equivalent with the XML



5min break

OXLOD live demo

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-1 回 & Edit Page Ê EA1965.184 - Object (Man-Made Object) record, (http://www.ashmus.ox.ac.uk/) OXLOD pilot Summary Annotations 🕕 **Explore** Related interface Links from here Links to here Production Filter Results Property Object is identified by EA1965.184 was produced by Production of EA1965.184 fan-painting has type has type painting has type drawing Purchased, 1965. has note consists of gold consists of paper has representation EA1965.184, front has dimension width

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EA1965.184 - Object (Man-Made Object) record, (http://www.ashmus.ox.ac.uk/) OXLOD: Annotations 🕕 **Explore** Related Summary structured data Links from here Links to here consistent Prod terminology Filter Results (above existing data) Object Property is identified by EA1965.184 was produced by Production of EA1965.184 fan-painting has type has type painting has type drawing Purchased, 1965. has note consists of gold consists of paper has representation EA1965.184, front has dimension width

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EA1965.184 - • Object (Man-Made Object) record, (http://www.ashmus.ox.ac.uk/)

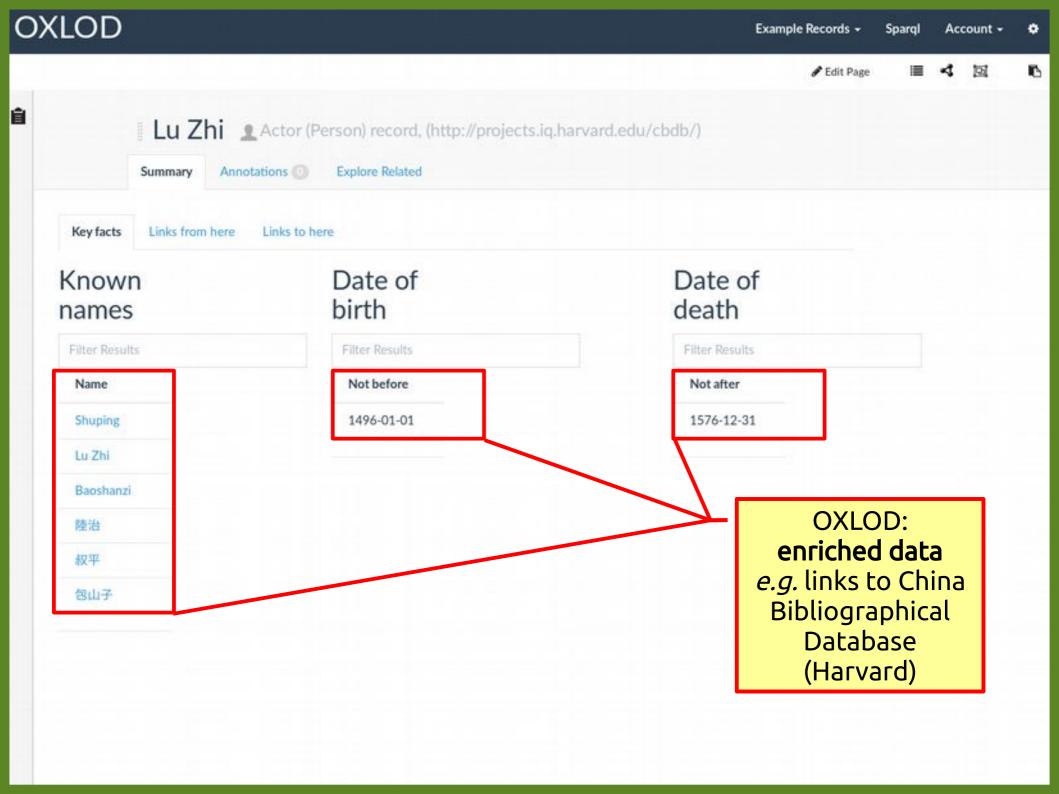
Summary Ar

Annotations 🕕



OXLOD: **enriched data** *e.g.* links from Ashmolean...

ore Related	
Links from here Links to here	Production
Producer	
Filter Results Producer	Role
Lu Zhi	artist
Production dates	Value
Event start	1496
vent end	1576
roduction place	
Filter Results Place	
China	
Suzhou	



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EA1965.184 - Object (Man-Made Object) record, (http://www.ashmus.ox.ac.uk/)

Summary

Annotations 🕕

Explore Related

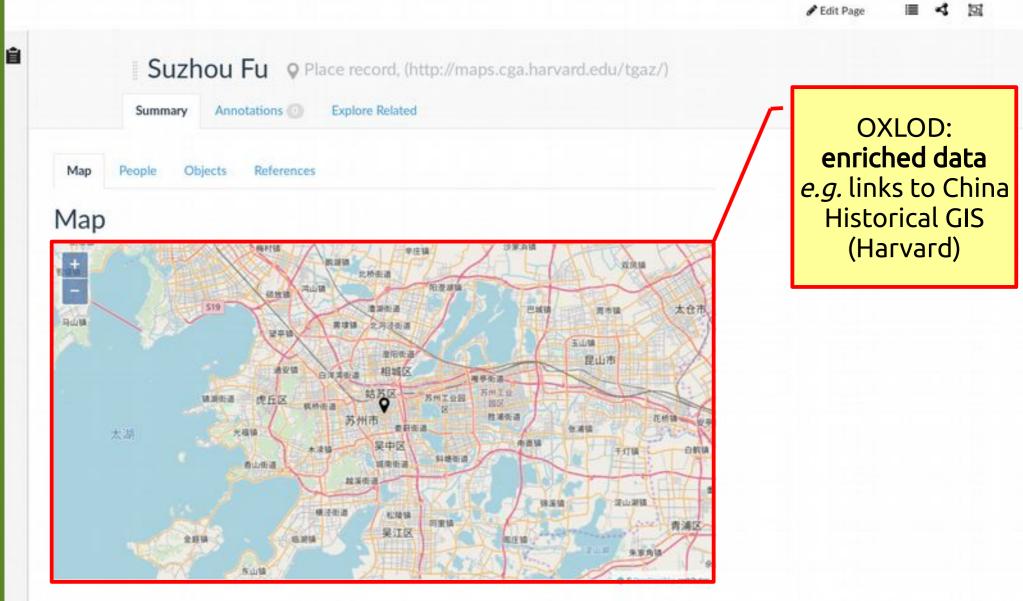


Links from here Lin	ks to here Production		
Producer			
Filter Results			
Producer		Role	
Lu Zhi		artist	

Production dates

Field	Value
Event start	
Event end	¹ OXLOD: enriched data
Production place	<i>e.g.</i> links from Ashmolean
Filter Results	Asnmolean
Place	
China	
Suzhou	





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EA1965.184 - Object (Man-Made Object) record, (http://www.ashmus.or.a

Summary

Annotations 🕐

Explore Related

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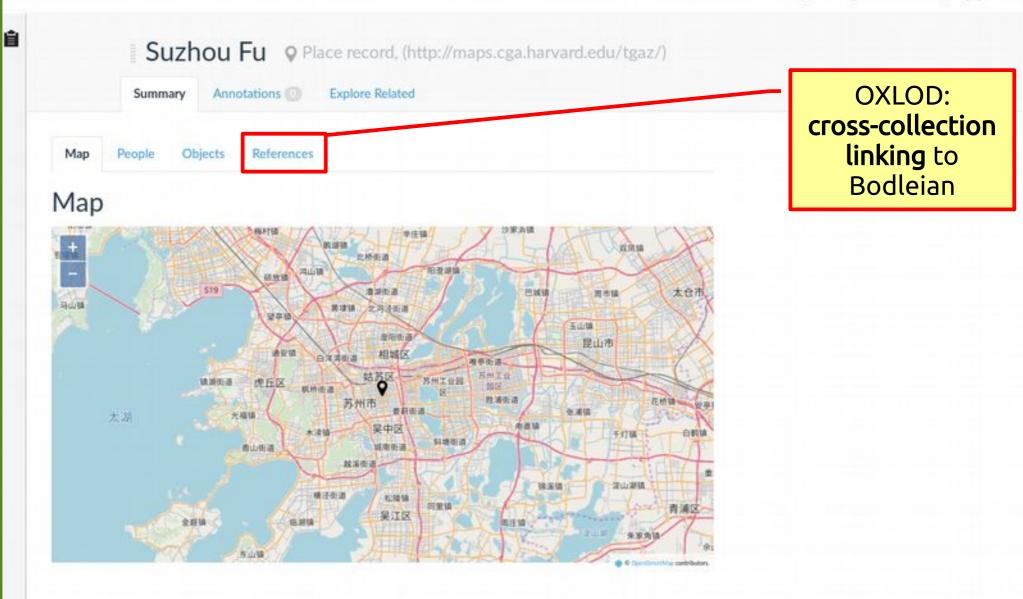


Links from here	Links to here	Production	lin corre types
Filter Results			-515
Property		Object	
is identified by		EA1965.184	
was produced by		Production of EA1965.184	
has type		fan-painting	
has type		painting	
has type		drawing	
has note		Purchased, 1965.	
consists of		gold	
consists of		paper	
has representation		EA1965.184, front	
has dimension		width	

OXLOD: **faster search** links to corresponding types of objects



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Summary Annotations () Explore Related	
Map People Objects References	cross-collec linking t Bodleia
Shown on No recorded depictions.	DOULEIal
Reference in Filter Results	
Object	Dataset
真理問答	http://allegro.bodleian.ox.ac.uk/chinese/
聖書典論	http://allegro.bodleian.ox.ac.uk/chinese/
	http://allegro.bodleian.ox.ac.uk/chinese/
真道路論. 上卷	
真道路論. 上卷 蒙童訓: 蘇州土白	http://allegro.bodleian.ox.ac.uk/chinese/
	http://allegro.bodleian.ox.ac.uk/chinese/ http://allegro.bodleian.ox.ac.uk/chinese/
蒙童訓:蘇州土白	
蒙童訓:蘇州土白 蘇州舊街巷醫錄 = Traditional Suzhou streets and lanes	http://allegro.bodleian.ox.ac.uk/chinese/
蒙童訓:蘇州土白 蘇州舊街巷圖錄 = Traditional Suzhou streets and lanes 蘇州博物館藏明清書畫 = ^The^ paintings and calligraphy of Ming and Qing dynasties collected by Suzhou Museum	http://allegro.bodleian.ox.ac.uk/chinese/ http://allegro.bodleian.ox.ac.uk/chinese/

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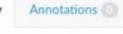
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EA1965.184 - Object (Man-Made Object) record, (http://www.ashmus.ox.ac.uk/)

Summary



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Links from here	Links to here	Production		OXLOD: cross-collection	
Filter Results				linking to	
Property		Object		Oxford Herbaria	
has dimension		height			J
has dimension		width			
has dimension		height			
forms part of		EA China			
has number of part	ts	1			
depicts		Cardiocrinum giga	anteum (Wall.) Makino		
shows visual item		Inscription of EA1	1965.184		
shows visual item		Inscription of EA1	1965.184		
is referred to by		Information object	t of EA1965.184		
is referred to by		Information object	t of EA1965.184		



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Summary	- (Wall.) Makino - A - s.n A - 2008 - Inc Annotations () Explore Related	dia Object (Man-Made Object) record (http://herbaria.plants.ox.ac.uk/)
Links from here	s to here Production	
Filter Results		
Property	Object	OXLOD:
nas type	Cardiocrinum giganteum	record of
as type	Liliaceae	specimen
ias type	Cardiocrinum	
nas type	NOT CULTIVATED	
nas type	NOT PHENOTYPE IN CULTIVATION	
nas type	V	
as preferred identifier	OXF - (Wall.) Makino - A - s.n A - 2008 - India	
orms part of	Container for OXF - (Wall.) Makino - A - s.n A - 2008 - India	
O5i_was_removed_by	Collection of specimen OXF - (Wall.) Makino - A - s.n A - 2008 - India	
vpe	Man-Made Object	

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