Data Federation and Interoperability in Europe
FAIMS workshop, Sydney, Australia, 16 August 2012

Julian Richards, Director
Archaeology Data Service

http://archaeologydataservice.ac.uk
Research Infrastructure
Cross-searching of data & archives

The Vision:
• Interoperable search and analysis

The Challenge:
• How far do individual projects and researchers have to follow agreed ontologies and controlled word lists?
Three answers to interoperability

(1) Tight adherence to core data standards e.g.
   • English Heritage: The Heritage Gateway

(2) Formal mapping to core data standards e.g.
   • ARENA / ARENA2
   • TAG: UK/US Transatlantic Archaeology Gateway

(3) Use of Natural Language Processing and Data Mining to index data against core data standards e.g.
   • Archaeotools – ADS ArchSearch
   • Linked Data – STAR/STELLAR
Solution One:
Adherence to core data standards

MIDAS Heritage is the UK data standard for information about the historic environment. It states what information should be recorded to support effective sharing of the knowledge of the historic environment.
It covers all aspects of the historic environment, including:

- individual assets such as buildings, archaeological sites, shipwrecks, areas of interest and artefacts.
- work that is done to understand, protect and manage change to those assets
- sources of further information
MIDAS Heritage has been developed in the UK building on:

• *CIDOC core data standards for Archaeological Sites + the index to Historic Buildings and Monuments of the Architectural Heritage*

• *MIDAS – A Manual and Data Standard for Monument Inventories (RCHME 1998).*

• International data standards for the cultural heritage sector, in particular ISO 21127 (2005) the CIDOC Conceptual Reference Model

• The work of the Forum on Information Standards in Heritage (FISH) and its earlier interoperability tool-kit
  • MIDAS XML, the tool-kit data validator and the Historic Environment Exchange Protocol
  • INSCRIPTION controlled vocabulary identifiers

• The experience of the organisations which have reviewed and implemented MIDAS
Search for information on England’s historic sites and buildings, including images of listed buildings.

The Heritage Gateway allows you to cross-search 40 resources, including:
- Over 50% of local English Historic Environment Records (HERs)
- The National Heritage List for England (including listed buildings)
- 6 other national resources, including Images of England

New!
You can now view the results of your Heritage Gateway search on a map. Carry out a search to see this in action or find out more on the About the Heritage Gateway page.

Quick Search

- any order
- exact
- any words

More Detailed Search
More Detailed Search

The detailed search allows you to search using any combination of location (Where), type (What), period (When) and person (Who). You may also select which resources you would like to search, e.g. specific Historic Environment Record only.

Click to search by Grid Reference
More Detailed Search

The detailed search allows you to search using any combination of location (Where), type (What), period (When) and person (Who). You may also select which resources you would like to search, e.g. specific Historic Environment Record only.

Search for a Specific Type:

Type in box and select matching term from the list

OR browse the thesaurus of site, monument and object types:

- [ ] Search Terms
  - [ ] All Building And Site Types
    - [ ] Agriculture And Subsistence
    - [ ] Civil
    - [ ] Commemorative
    - [ ] Commercial
    - [ ] Communications
    - [ ] Defence
    - [ ] Domestic
    - [ ] Education
    - [ ] Gardens Parks And Urban Spaces
    - [ ] Health And Welfare

Of Specific Grade: [ ] All Grades [ ] For Listed Building searches only

Search Summary

Reset Search
More Detailed Search

The detailed search allows you to search using any combination of location (Where), type (What), period (When) and person (Who). You may also select which resources you would like to search, e.g. specific Historic Environment Record only.

<table>
<thead>
<tr>
<th>Search for a Specific Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type in box and select matching term from the list</td>
</tr>
</tbody>
</table>

OR browse the thesaurus of site, monument and object types:

- **Search Terms**
  - **All Building And Site Types**
    - **Agriculture And Subsistence**
      - **Agricultural Building**
        - Apiary
        - Ash House
        - Back House
        - Bark House
        - Bark Pools Hut
        - Dovecote
        - Duck House
        - Farm Building

Of Specific Grade: **All Grades**

For Listed Building searches only

Search Summary

- You must complete at least 1 section of the form.
- **What** = Thesaurus Terms (Dovecote)
Your search returned 0 results from 0 of the 49 resources available on the Heritage Gateway.
Results from 0 of the 0 resources are visible on the map.

- What= Thesaurus Term's (Burnt Mound)

### Summary Results

#### Statutory Data

<table>
<thead>
<tr>
<th>The National Heritage List for England</th>
<th>Searching:</th>
</tr>
</thead>
</table>

#### Non-Statutory National Data

<table>
<thead>
<tr>
<th>EH PastScape</th>
<th>Searching:</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Trust HBSMR</td>
<td>Searching:</td>
</tr>
<tr>
<td>Parks &amp; Gardens UK</td>
<td>Searching:</td>
</tr>
<tr>
<td>NMR Excavation Index</td>
<td>Searching:</td>
</tr>
</tbody>
</table>

#### Local Records

<table>
<thead>
<tr>
<th>Bedfordshire HER</th>
<th>Searching:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berkshire Archaeology HER</td>
<td>Searching:</td>
</tr>
<tr>
<td>Buckinghamshire HER</td>
<td>Searching:</td>
</tr>
<tr>
<td>Cambridgeshire HER</td>
<td>Searching:</td>
</tr>
<tr>
<td>Canterbury UAD</td>
<td>Searching:</td>
</tr>
<tr>
<td>Cheshire HER</td>
<td>Searching:</td>
</tr>
<tr>
<td>City of York HER</td>
<td>Searching:</td>
</tr>
</tbody>
</table>
Your search returned 3569 results from 37 of the 49 resources available on the Heritage Gateway. Results from 8 of the 37 resources are visible on the map.

- What = Thesaurus Term/s (Dovesite)

**Summary Results**

<table>
<thead>
<tr>
<th>Statutory Data</th>
<th>View Results on a Map (Beta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The National Heritage List for England</td>
<td>Returned first 1000 of 2411 results</td>
</tr>
</tbody>
</table>

**Non-Statutory National Data**

<table>
<thead>
<tr>
<th>Database Name</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>EH PastScape</td>
<td>561</td>
</tr>
<tr>
<td>National Trust HBSMR</td>
<td>No records matched your search</td>
</tr>
<tr>
<td>Parks &amp; Gardens UK</td>
<td>83</td>
</tr>
<tr>
<td>NMR Excavation Index</td>
<td>No records matched your search</td>
</tr>
</tbody>
</table>

**Local Records**

<table>
<thead>
<tr>
<th>Location</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedfordshire HER</td>
<td>188</td>
</tr>
<tr>
<td>Berkshire Archaeology HER</td>
<td>2</td>
</tr>
<tr>
<td>Buckinghamshire HER</td>
<td>72</td>
</tr>
<tr>
<td>Cambridgeshire HER</td>
<td>131</td>
</tr>
<tr>
<td>Canterbury UAD</td>
<td>No records matched your search</td>
</tr>
<tr>
<td>Cheshire HER</td>
<td>20</td>
</tr>
<tr>
<td>City of York HER</td>
<td>No records matched your search</td>
</tr>
<tr>
<td>Colchester UAD</td>
<td>1</td>
</tr>
<tr>
<td>Cornwall &amp; Scilly HER</td>
<td>121</td>
</tr>
</tbody>
</table>
Your search returned 5552 results from 38 of the 49 resources available on the Heritage Gateway. Results from 6 of the 38 resources are visible on the map.

- What = Thesaurus Term/s (Dovecote)

**Summary Results**

### Statutory Data
- The National Heritage List for England: Returned first 1000 of 2411 results

### Non-Statutory National Data
- EH PastScape: 551 results
- National Trust HBSMR: No records matched your search
- Parks & Gardens UK: 83 results
- NMR Excavation Index: No records matched your search

### Local Records
- Bedfordshire HER: 188 results
- Berkshire Archaeology HER: 2 results
- Berkshire Archaeology HER: 2 results

**Berkshire Archaeology HER**
The Berkshire Archaeology Historic Environment Record (HER) is a record of the known archaeology and historic environment within the 5 Unitary Authorities areas in the east of Berkshire - Reading Borough Council, Wokingham Borough Council, Bracknell Forest Borough Council, Slough Borough Council and the Royal Borough of Windsor and Maidenhead. The western half of what was the post 1974 county of Berkshire is covered by West Berkshire HER.

**Berkshire Archaeology HER returned 2 records matching your search.**

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Abbey - Dovecote</td>
<td>Reading</td>
</tr>
<tr>
<td>Dovecote at Byoken Manor</td>
<td>Horton</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Buckinghamshire HER**

- 72 results
Berkshire Archaeology HER

Any Questions? Please try here first

If you have any comments or new information about this record, please email us.

Name: Reading Abbey - Dovecote
HER Number: RD15571
Record Type: Monument

Grid Reference: SU 718 734
Administrative Area/Parish: Reading, Reading, Berkshire
Map: Show location on GoogleMaps (to an accuracy of 100m only)

Summary
The dovecote stood immediately to the west of the Abbey mill. Its exact location, however, is unknown.

Monument Types
DOVECOTE (Medieval - 1066 AD to 1539 AD)

Description
The dovecote stood immediately to the west of the Abbey mill. Its exact location, however, is unknown.

Sources
--- Hurry, J. B. 1901. Reading Abbey. [Bibliographic reference / SRD8335]

Associated Events:
ERW232 Abbey Mill House and Forbury Vaults
ERW830 Abbey Mill House and Forbury Vaults (Ref. BR-ABB02)

Associated Monuments
MRD1374 Reading Abbey, Reading, Berkshire [Monument]
MRD1374 Reading Abbey, Reading, Berkshire [Monument]
MRD1374 Reading Abbey, Reading, Berkshire [Monument]
Solution Two:
Mapping to core data standards

Archaeological Records of Europe - Networked Access

Welcome to the ARENA search portal.

Please select a flag from the right to start searching in your language.

The ARENA search portal allows you to search for archaeological sites and monuments from six European countries: Denmark, Great Britain, Norway, Iceland, Romania and Poland.

The content of this project does not necessarily reflect the position of the European Community, nor does it involve any responsibility on the part of the European Community.

Culture 2000

© ADS 1990. Edited by Jo Clarke, email. Cite only: http://ads.ahds.ac.uk for this page
Archaeological Records of Europe - Networked Access
The ARENA Portal

This is the search interface of the ARENA project. It allows you to search archaeological resources from six European countries by period, theme and place. You can build your search by selecting below. Choose a Period (When) and a Theme (What), remembering to store your selection. You may wish to use the where option to select a place and refine your search. Warning! Searches are limited to 5,000 hits. If your search exceeds this limit use the where option to narrow your search.

When
You can choose to search for site within a certain period range.

What
Choose a type of monument/site from a list of archaeological themes

Where
Using a map of Europe choose the area you would like to search

Search
Clear all values
Help on searching
Advanced search

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Archaeological Records of Europe - Networked Access

The ARENA Portal

When

Select a period from the list below. Your choice will be highlighted on the diagram. For more information on the time span for each period hover your mouse over the period diagram.

- Palaeolithic
- Mesolithic
- Neolithic
- Bronze Age
- Iron Age
- Greek
- Roman
- Early Medieval
- Medieval
- Post Medieval
- Modern
- All periods

Store value

- Palaeolithic
- Mesolithic
- Neolithic
- Bronze Age
- Iron Age
- Greek
- Roman
- Early Medieval
- Medieval
- Post Medieval
- Modern

29. august 2012
Archaeological Records of Europe - Networked Access

The ARENA Portal

When

Select a period from the list below. Your choice will be highlighted on the diagram. For more information on the time span for each period hover your mouse over the period diagram.

- Palaeolithic
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Store value
- Palaeolithic
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29. august 2012
This is the search interface of the ARENA project. It allows you to search archaeological resources from six European countries by period, theme and place. You can build your search by selecting below. Choose a Period (When) and a Theme (What), remembering to store your selection. You may wish to use the where option to select a place and refine your search. Warning! Searches are limited to 5,000 hits. If your search exceeds this limit use the where option to narrow your search.

**When**
Your chosen period:

**Iron Age**

**What**
Choose a type of monument/site from a list of archaeological themes

**Where**
Using a map of Europe choose the area you would like to search

**Search**

Choose what

Clear all values
Help on searching
Advanced search

The content of this project does not necessarily reflect the position of the European Community, nor does it involve any responsibility on the part of the European Community.
Archaeological Records of Europe - Networked Access
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This is the search interface of the ARENA project. It allows you to search archaeological resources from six European countries by period, theme and place. You can build your search by selecting below. Choose a Period (When) and a Theme (What), remembering to store your selection. You may wish to use the where option to select a place and refine your search. Warning! Searches are limited to 5,000 hits. If your search exceeds this limit use the where option to narrow your search.

When
Your chosen period:
Iron Age

What
Your chosen theme:
Agriculture and Subsistence

Where
Using a map of Europe choose the area you would like to search

Search
Clear all values
Help on searching
Advanced search

If you press search now you will search all countries with less than 5000
Archaeological Records of Europe - Networked Access

The ARENA Portal

Where

You can define an area to search. Click on the map below to zoom into a more detailed map of the area.

Map of density of records available: Iron Age
Please use the arrows around the map to navigate to your area of interest, then click on the map at the centre of the area you want to search. The search will cover half a degree of latitude/longitude around your point.
### Arena 2 Archive Service [UK]

#### Title

See More Results

### Arena 2 Archsearch Service

#### Title

See More Results

### CIMEC Web Service [Romania]

#### Title

See More Results

### DANS Web Service [Netherlands]

Results: Listing top 5 of 89 records held in our database relevant to this query.

<table>
<thead>
<tr>
<th>Title</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archeologische waarneming op bastion IX, Dalemwai te Gorinchem</td>
<td>DANS</td>
</tr>
<tr>
<td>Het dirtproject in Zutphen. 25 verhalen uit de middeleeuw</td>
<td>DANS</td>
</tr>
<tr>
<td>Grachten, wallen en Berkelwater in de fietsenkelder. Versia</td>
<td>DANS</td>
</tr>
<tr>
<td>Het Hoornwerk (2). Proefsleuvenonderzoek op het Hoornwerk</td>
<td>DANS</td>
</tr>
<tr>
<td>Het Hoornwerk (1). Archeologisch onderzoek aan het contrees</td>
<td>DANS</td>
</tr>
</tbody>
</table>

See More Results
Transatlantic Archaeology Gateway
Searching digital archives in the UK and the USA

QUERY BUILDER

KEYWORD

Add keyword

WHAT
- Agriculture and Subsistence
- Civil
- Commemorative
- Commercial
- Communications
- Defence
- Domestic
- Education
- Health and Welfare
- Industrial
- Maritime
- Recreational
- Religious, Ritual and Funerary
- Transport
- Water Supply and Drainage

WHERE

Navigate map

Click and drag selected box

WHEN

From [ ] to [ ]

Set date range

TAG is hosted by the Archaeology Data Service | Legal statements and disclaimers

JISC
### ADS Archive Web Service [UK]:

Results: Listing top 5 of 15 records held in our database relevant to this query.

<table>
<thead>
<tr>
<th>Title</th>
<th>Depositor</th>
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<tbody>
<tr>
<td>Bremetenacum: Excavations at Roman Ribchester 1980, 1989-19 ...</td>
<td>Oxford Archaeology North</td>
</tr>
<tr>
<td>Pig Measurements from Durrington Walls (Wiltshire, England)</td>
<td>Umberto Albarella</td>
</tr>
<tr>
<td>Colin Gravel, Thornhill Farm, Fairford, Gloucestershire</td>
<td>Oxford Archaeology</td>
</tr>
<tr>
<td>Radiocarbon Dating Bone Samples Recovered from Gravel Sites</td>
<td>Christopher Bronk Ramsey</td>
</tr>
<tr>
<td>The Welsh Roundhouse</td>
<td>Eleanor Ghey</td>
</tr>
</tbody>
</table>

See More Results

### tDAR TAG Gateway Service [USA]:

Results: Listing top 6 of 32 records held in our database relevant to this query.

Compare datasets within these results:

<table>
<thead>
<tr>
<th>Title</th>
<th>Depositor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ojo Bonito Archaeological Project (OBAP)</td>
<td>Statistical Research, Inc.</td>
</tr>
<tr>
<td>The Lower Verde Archaeological Project</td>
<td></td>
</tr>
<tr>
<td>The Archaeology of Rota, Northern Mariana Islands</td>
<td></td>
</tr>
<tr>
<td>The Archaeology of Petrified Forest National Park</td>
<td></td>
</tr>
<tr>
<td>The Archaeology of Yosemite National Park</td>
<td></td>
</tr>
</tbody>
</table>

See More Results
A very quick overview of Archaeotools.

Work package 1
- Advanced Faceted Classification /Geo-spatial browser
- 1m+ records
- 3 primary facets (What, Where, When).

Work package 2
- Natural language processing /Data-mining of Grey Literature

Work package 3
- Data-mining of Historic Literature
- plus geoXwalk
ABBEY FIELDS ABBEYMead
English Heritage NMR Excavation Index for England
Followed by excavation 14/86 (UID 652906). Observation of sewer trench.
GLOUCESTERSHIRE

APPLEGARTH WEST OF ST ANDREWS CHURCHYARD
English Heritage NMR Excavation Index for England
Two small trial trenches in the garden of a 1950s bungalow adjacent to the
churchyard boundary wall on the west side of St Andrew's Church revealed traces of
the Roman road from the Mendips to the River Avon, possibly RR540. There were
also indications of a possible Roman roadside settlement, as well as earlier medieval
activity pre-dating the laying out of the market place.
AVON

Abington deserted medieval village
Milton Keynes HER
1) C13th St Neots ware sherds; 2) Lyveden-type sherds, found by Mr B
(b1-2). 3) Medieval sherds from Abington DMV, found by Mr P (b3-5). 4) Area of
NGR (b7).

Method of Discovery: Chance find

History: 1967 artefacts found & 1973

Buckinghamshire

Abington deserted medieval village
Milton Keynes HER
Disturbed ground surrounded by ridge and furrow suggests a deserted hamlet

Method of Discovery: Fieldwalking

History: 1979 excavation

Buckinghamshire
APPLEGARTH WEST OF ST ANDREWS CHURCHYARD

English Heritage NMR Excavation Index for England

Two small trial trenches in the garden of a 1960s bungalow adjacent to the churchyard boundary wall on the west side of St Andrew's Church revealed traces of the Roman road from the Mendips to the River Avon, possibly RR540. There were also indications of a possible Roman roadside settlement, as well as earlier medieval activity pre-dating the laying out of the market place.

AVON

BEHIND SINCLAIRS COACH FACTORY

English Heritage NMR Excavation Index for England

CHESHIRE

BERMONDSEY MEWS 614 LEROY STREET

English Heritage NMR Excavation Index for England

Site code: LER91. Project funded by Durkan Southern Ltd. Excavation located a sequence of drainage or boundary ditches, several of which were sealed by a compact gravel surface, and two rubbish pits, one a brick lined soakaway. SMR number (Greater London): 091419-29. Information from Greater London SMR.

GREATER LONDON

BURDENS SWAN STREET

English Heritage NMR Excavation Index for England

WARWICKSHIRE
259 Total results

**DRUMBUIOY WIG TOWNSHIRE**
- National Monuments Record of Scotland
- No description
- DUMFRIES AND GALLOWAY

**WAUCHOPE BRIDGE LANGHOLM**
- National Monuments Record of Scotland
- Alternative name(s): LANGHOLM, BOATFORD BRIDGE, LANGHOLM, TOWNHEAD BRIDGE
- DUMFRIES AND GALLOWAY

**AIRD**
- National Monuments Record of Scotland
- No description
- DUMFRIES AND GALLOWAY

**AMISFIELD TOWER**
- National Monuments Record of Scotland
- Alternative name(s): AMISFIELD
- DUMFRIES AND GALLOWAY

**ANNAN BUTTS STREET**
- National Monuments Record of Scotland
- No description
4 Total results

**BUTTERHOLE BRAE DALSWINTON**
National Monuments Record of Scotland
No description
DUMFRIES AND GALLOWAY

**CARNSALLOCH**
National Monuments Record of Scotland
No description
DUMFRIES AND GALLOWAY

**THORNHILL**
National Monuments Record of Scotland
Alternative name(s): TEMPLAND MAINS
DUMFRIES AND GALLOWAY

**WARD LAW**
National Monuments Record of Scotland
Alternative name(s): WARDLAW
DUMFRIES AND GALLOWAY
BUTTERHOLE BRAE, DALSWINTON

Description: No description

Parish: KIRKMAHOE

County: DUMFRIES AND GALLOWAY

Grid reference: NX938843

Map reference: [EPSG:27700] 293800, 584340

Period: ROMAN;

Subject: ROMAN SIGNAL STATION (POSSIBLE); Henge (POSSIBLE);

Identifiers:
[ADS] Depositor ID - NX938SW 49
[ADS] Import RCN - RCAHMS06-65935

People Involved:
[Publisher] Royal Commission on the Ancient and Historical Monuments of Scotland - National Monuments Record of Scotland

Cite record using this URL: http://archaeologydataservice.ac.uk/archsearch/record.jsf?titield=1410307

View Canmore record

View larger map
View historic maps
Solution Three.5

The Semantic Web: STAR & STELLAR projects

**STAR**: Develop new methods for enhancing linkages between databases and grey literature, exploiting the potential of a high level, core ontology, and apply multi-concept queries to archaeological research.

**STELLAR**: Develop an enhanced mapping tool for non-specialist users to map and extract archaeological datasets into RDF/XML representation conforming to CIDOC CRM-EH, and publish corresponding Linked Data.
• Project management & recording system
• Excavation projects from EH
Archaeology Data Service Linked Data

These Linked Data are made available as a direct result of the STELLAR project, a joint project between the University of Glamorgan, the ADS and English Heritage. Linked Data is a growing part of the Web where data is published on the Web and then linked to other published data in much the same way that web pages are interlinked using hypertext. The term Linked Data is used to describe a method of exposing, sharing, and connecting data via URIs on the Web. For more information go to http://linkeddata.org. The ADS cannot give advice or support on using RDF, SPARQL or SPARQL Endpoints. For a full description of the ADS datasets used in this initial evaluation version of an ADS Linked Data store please see the ADS STELLAR Research Page. The STELLAR tools and templates are available from the University of Glamorgan.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>:coverage</td>
<td><a href="http://data.ordnancesurvey.co.uk/id/country/england">http://data.ordnancesurvey.co.uk/id/country/england</a></td>
</tr>
<tr>
<td>:description</td>
<td>The Archaeology Data Service (ADS) supports research, learning and teaching with high quality and dependable digital resources. It does this by preserving ...</td>
</tr>
<tr>
<td>:exampleResource</td>
<td><a href="http://data.archaeologydataservice.ac.uk/10.5264/f1000230/ccbham/">http://data.archaeologydataservice.ac.uk/10.5264/f1000230/ccbham/</a></td>
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<td><a href="http://data.archaeologydataservice.ac.uk/10.5264/f1000230/tust/">http://data.archaeologydataservice.ac.uk/10.5264/f1000230/tust/</a></td>
</tr>
<tr>
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This page shows information obtained from the SPARQL endpoint at http://data.archaeologydataservice.ac.uk/sparql/repositories/archives. This data is also available as RDF/XML and Turtle.

View the data in the following other browsers:

- Discov
- Tabulator

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Some conclusions

(A) 3 approaches:
- Tight adherence to core data standards
- Formal mapping to core data standards
- Use of Natural Language Processing and Data Mining to index data against core data standards

(B) Each has implications re the degree of conformity required of individual researchers – and the depth of analysis possible, but all require existence of core standards

(C) See what thesauri can be borrowed
http://archaeologydataservice.ac.uk/