Metadata and semantic tools for data interoperability: some examples from the Digital Cultural Heritage field

FAIR implementation
for NI4OS-Europe service providers

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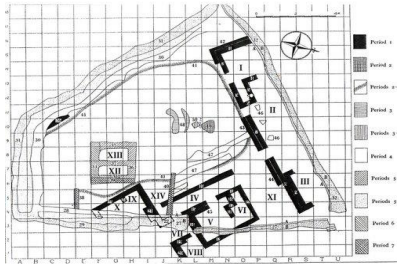
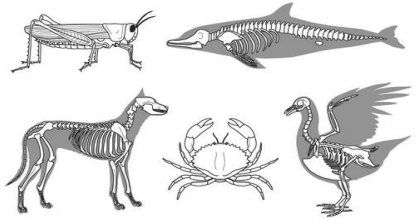
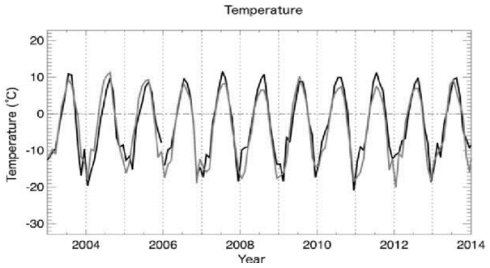
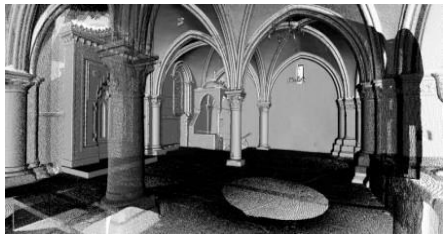
Cultural Heritage community data

Various types of content coming from the Cultural Heritage community



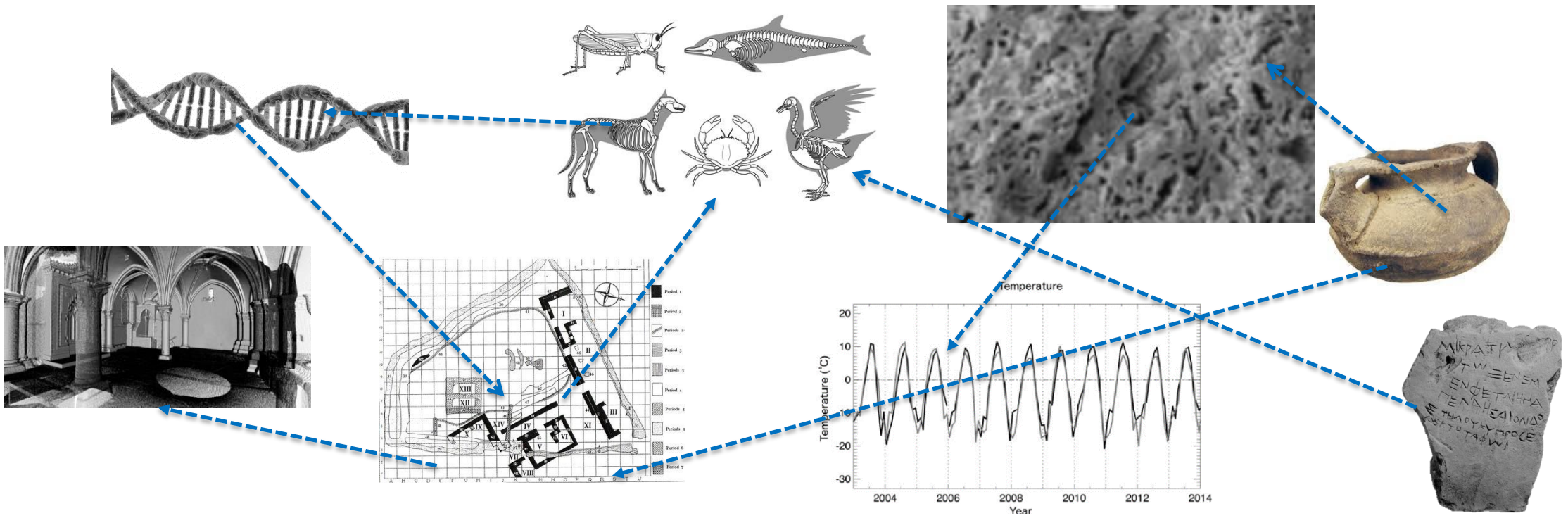






Every sub-field produces datasets that are documented following different approaches and according to different data descriptions

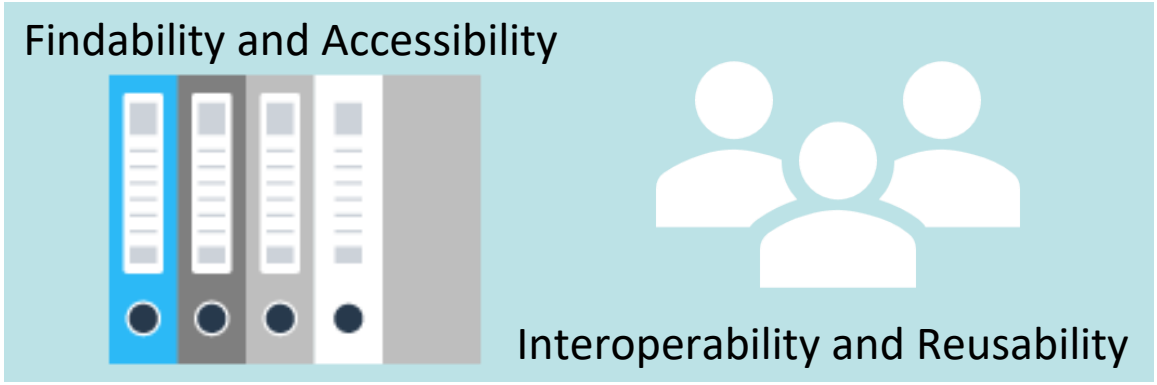
Knowledge communication framework



Establishing a knowledge communication framework that guarantees: a comprehensive description and documentation of CH digital resources, their long term preservation, publication, access, use and reuse

That’s FAIR!

Why are these aspects so important?



- **F** **Findability**
- **A** **Accessibility**
- **I** **Interoperability**
- **R** **Reusability**

Findability and Accessibility are guaranteed by the common access at the research infrastructure level, giving direct access to providers’ data and enabling search for relevant information through their metadata, by linking them. The possibility to access data at the source enables to investigate data reliability and data transparency.

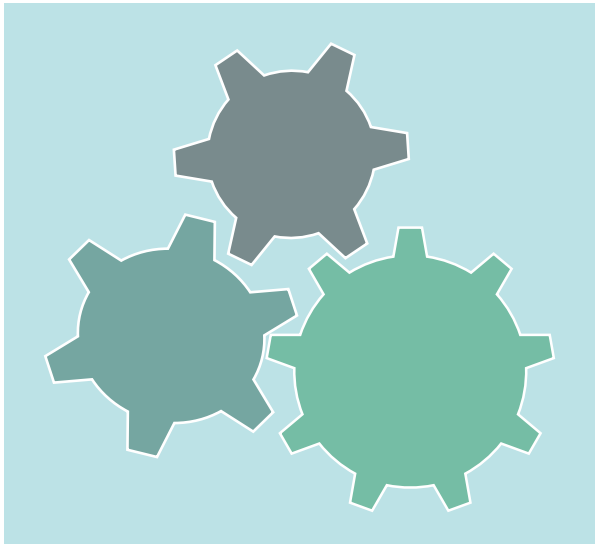
Interoperability is guaranteed by the use of semantic solutions at the research infrastructure level, aligning the multidisciplinary datasets homogeneously: it facilitates the management, integration, and access to research data by describing their semantic relationships.

Such choice brings to data Reusability, giving users the possibility to both find data within a specific research field and reuse them even within other research communities

That’s FAIR!

How?

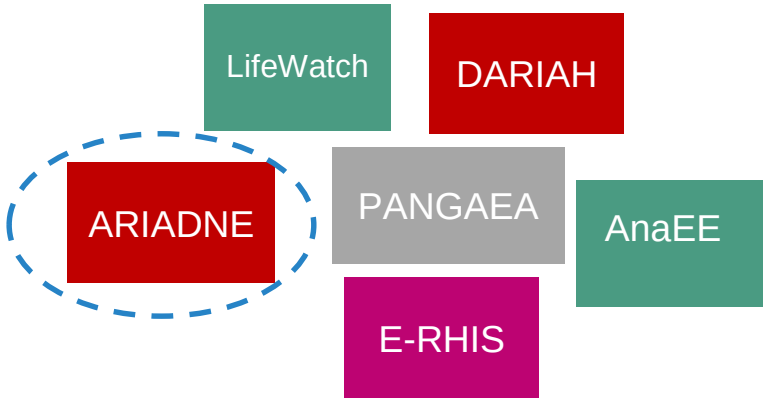
- Tools, standards and guidelines
- Harmonization and interoperability within the (Digital) Cultural Heritage community



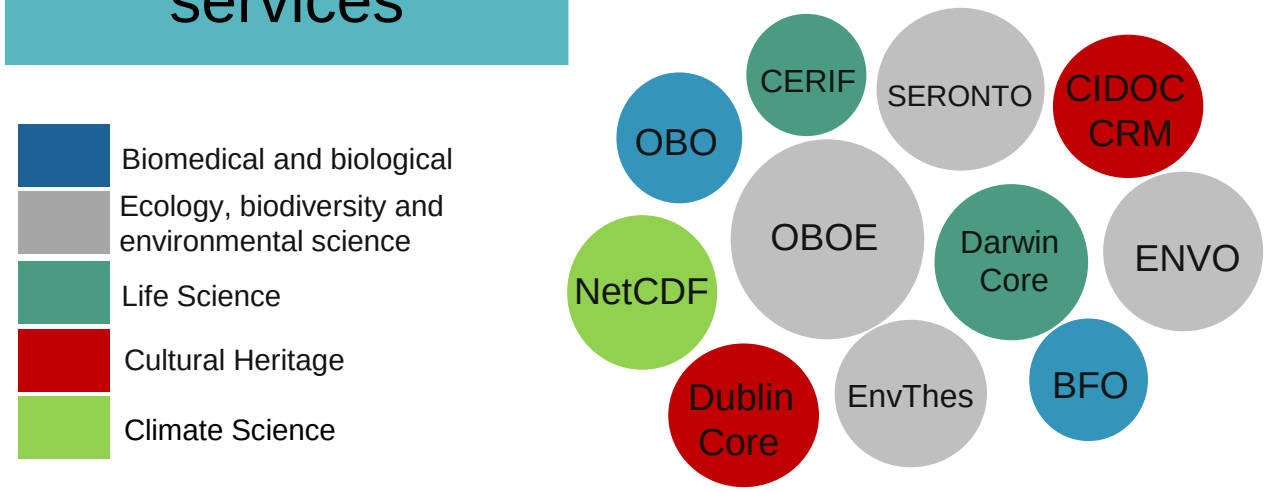
Background

Research Infrastructures (RI)

- State of the art about integration and interoperability tools and services

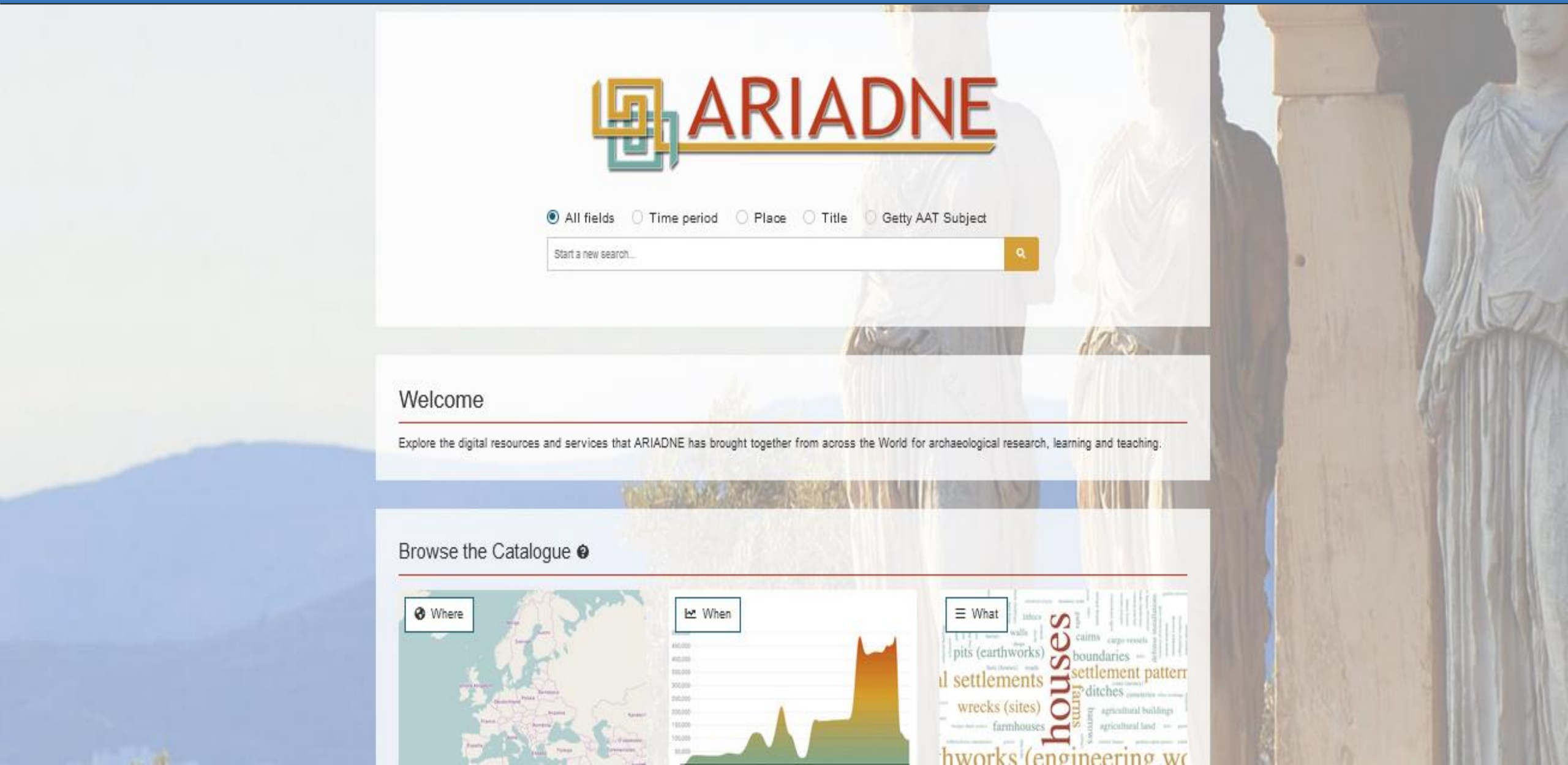


Tools and services



- Semantic solutions (data models, ontologies and vocabularies) used for describing, integrating, and normalizing datasets within related domain research infrastructures

Research Infrastructure for Archaeology



Some examples

- Two collections:

1. Collection of ancient coins
2. Collection of Ancient Greek epigraphies

Cypriot Medieval Coins

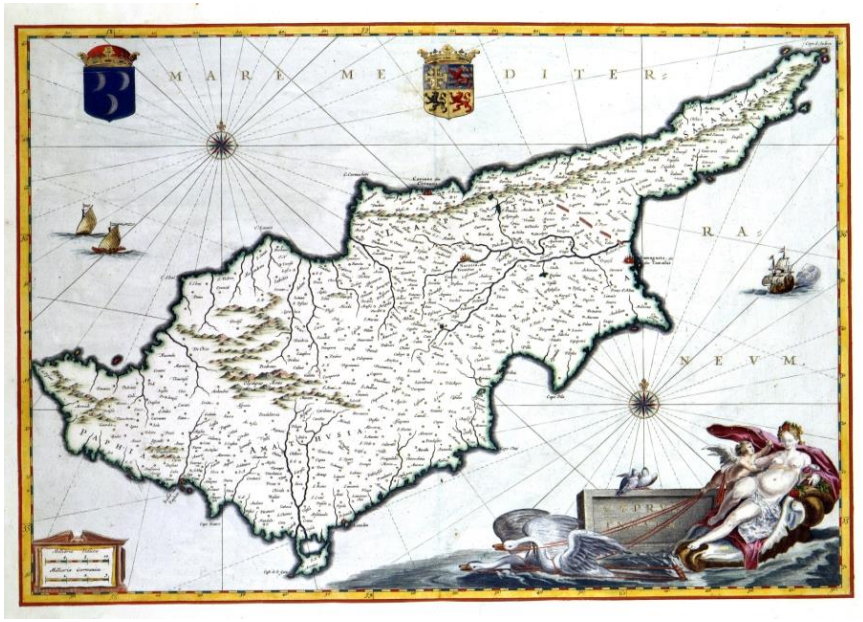
- The Cypriot Medieval Coins collection documents the use of currency on the island of Cyprus during the 12th-16th centuries (during the Frankish and Venetian period).

Frankish Period (*Cyprus*)

1192-1489

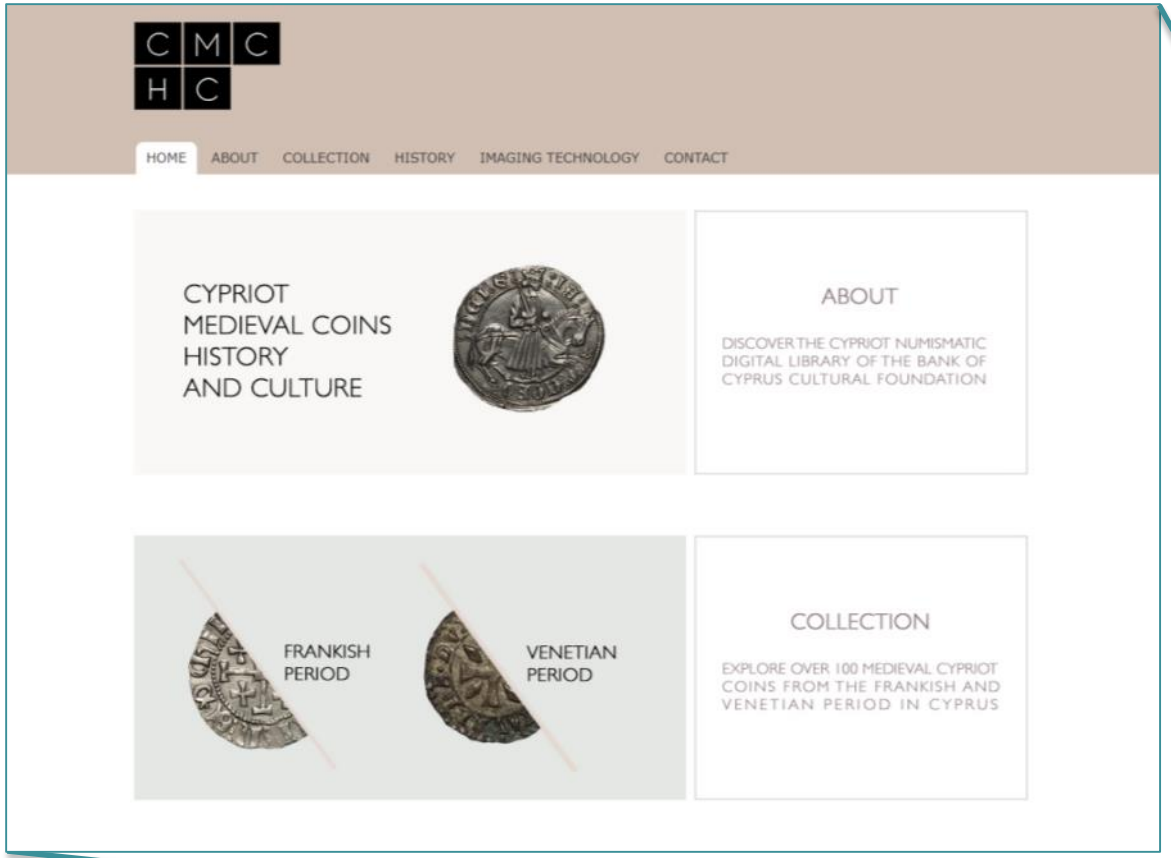
Venetian Period (*Cyprus*)

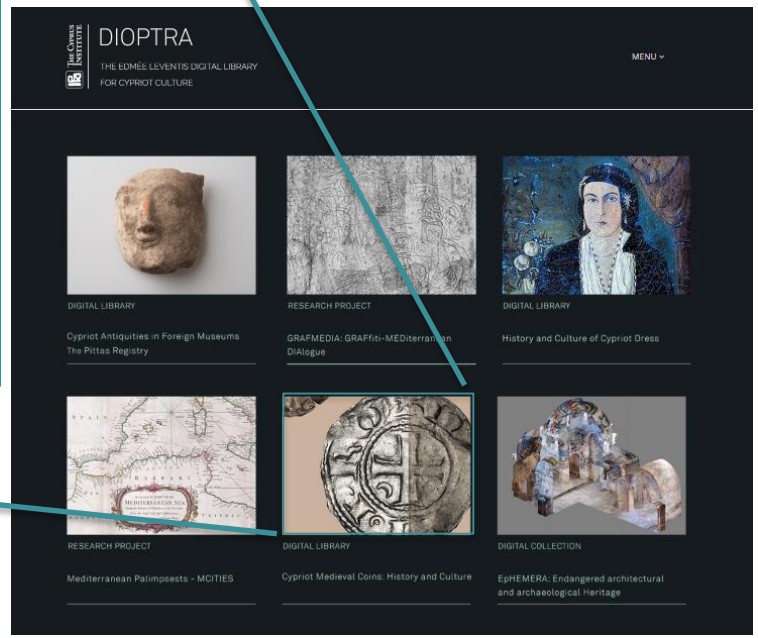
1489-1571



Cyprus in the Middle Ages (W. J. Blaeu and J. Blaeu, 1635)

Cypriot Medieval Coins



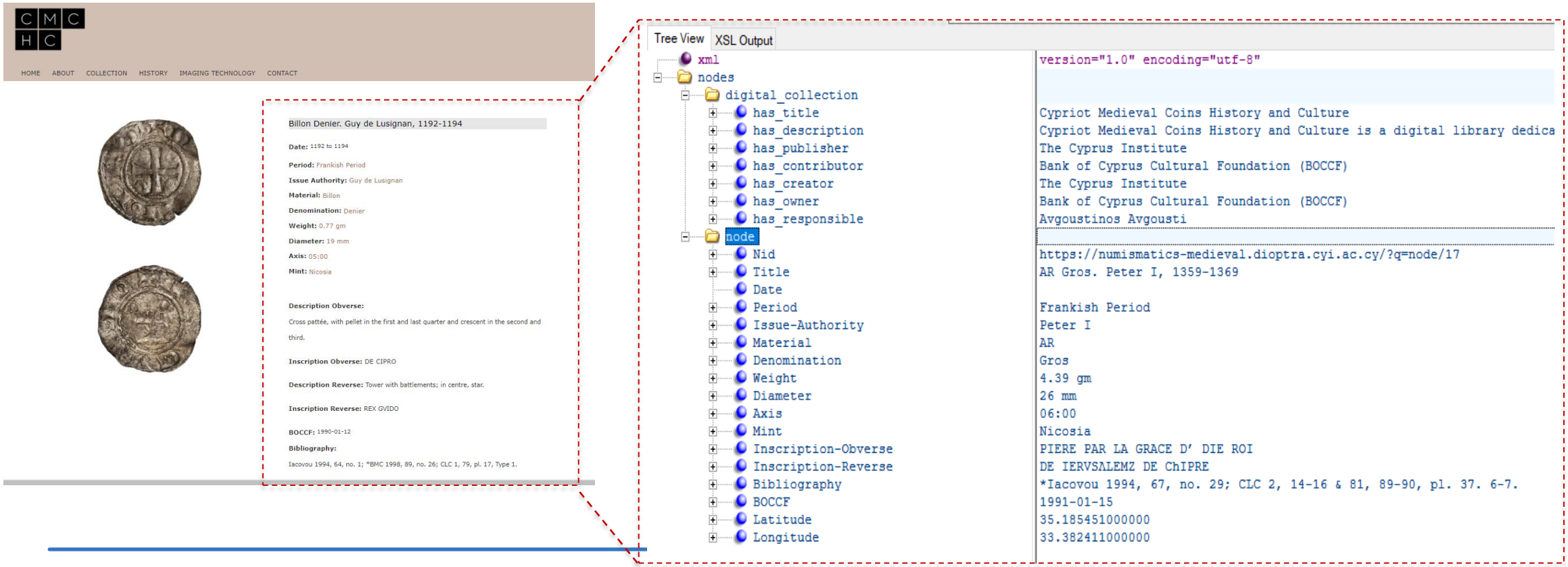


Beyond the access to the coinage of the period, the digital platform offers an interactive exploration of the medieval collection with the implementation of Reflectance Transformation Imaging (RTI) and high-resolution super-zoom, complemented with text descriptions, links to other collections and repositories.

https://numismatics-medieval.dioptra.cyi.ac.cy/

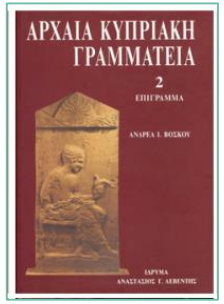
Metadata

- No standardized description
- Creation and use of a in-house metadata standard



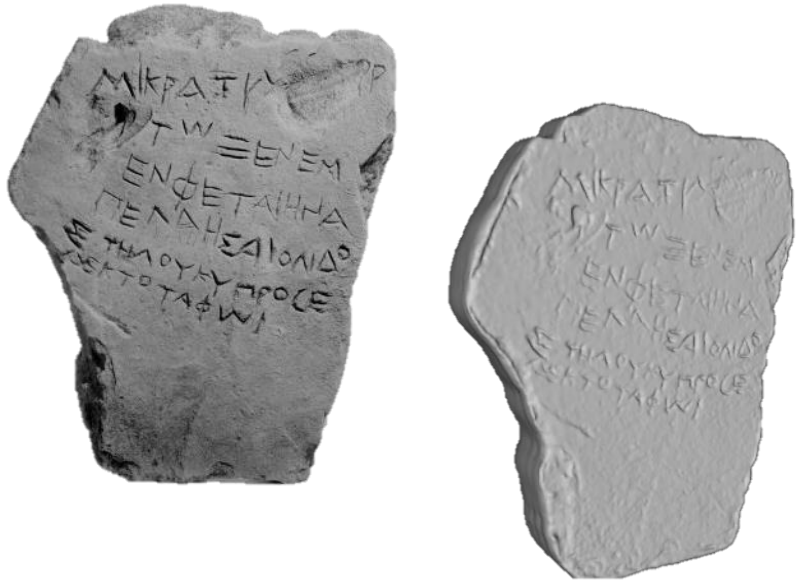
Archeia Kpypriaki Grammateia

- The Archeia Kypriaki Grammateia consists of a corpus of Ancient Greek Cypriot inscriptions collected in a series of volumes. The ancient texts corpus includes a wide range of literary genres (e.g., epic, lyric and dramatic poetry, epigrams on stone, prose, medical and philosophical texts). Specifically, the digital collection documents the corpus of the Cypriot ancient epigrams inscribed in stone and found both in Cyprus and abroad (e.g., Greece).



From 7th century BC

to 5th-6th century AD



E21

Μικρὰ Τύχ[ηι] Μ̣υρτώ, ξένε, μένφεται, ἣν ἀπ' Ἐλα⟨ί⟩ης
2 *Αἰολίδος τηλοῦ Κύπρος ἔδεκτο τάφωι.*

E21

Ἡ μικρὴ Μυρτὼ τὴν Τύχη, ξένε, μέμφεται, ποὺ ἀπ' τὴν Ἐλαία τῆς Αἰολίδας μακριὰ ἡ Κύπρος δέχτηκε σὲ τάφο.

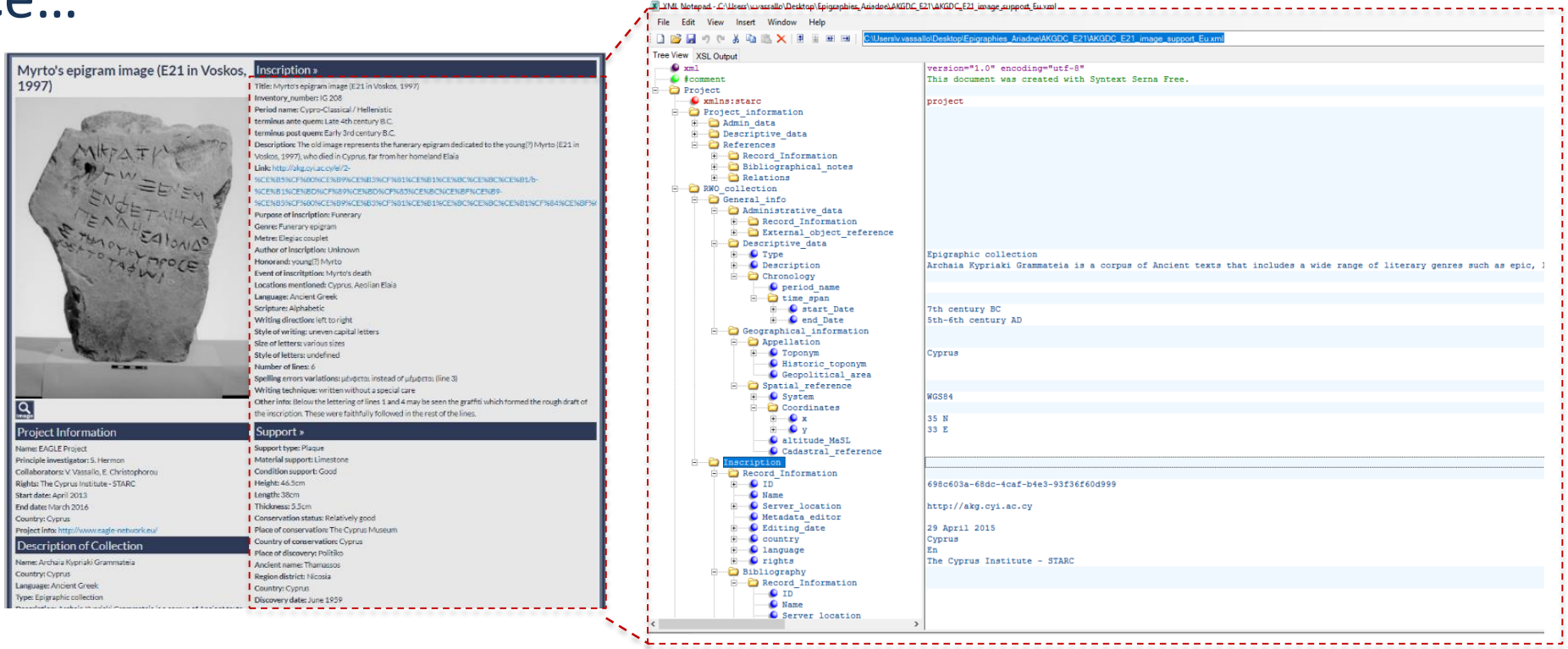
11 E21 ΣΧΟΛΙΑ 285

Ἀ. Βοσκοῦ, «Ἡ Ὁμηρικὴ Ἀλληγορία τῶν Λιτῶν καὶ τῆς Ἄτης», *ΕΚΕΕΚ* 12 [1983] 318 κέ.). Τὸ ἐδῶ *ὤλεσας ἀκμαίαν ἡλικίαν* φαίνεται νὰ ἀνήκει μᾶλλον στὴν πρώτη κατηγορία (ἔχασες νεαρὸς τὴ ζωή σου), μὰ δὲν ἀποκλείεται νὰ ἐπαινίσσεται καὶ τὴν ἐνεργ. μεταβ. σημ.: ξεκίνησες νὰ ἐξολοθρεύσεις τὸν ἐχθρό κι ἔχασες τὴ ζωή σου (ἢ ἀκόμα, καὶ κατέστρεψες τὸν ἑαυτό σου σὲ ἀκμαία ἡλικία). Γιὰ τὸ *ὤλεσας ἡλικίαν* πβ. τὸ *ὤλεσας γένος* (μὲ μεταβ. ὅμως μόνο σημ., Αἰσχ. *Ἑπτ.* 1056, κ. ἀ.). Ὁ λογότυπος **ἀκμαία ἡλικία** κ. τ. τ. συχνὰ στὴν ποίηση καὶ στὸν πεζὸ λόγο: βλ. π. χ. *Ἀνθ. Παλ.* 7.188.2 *ἀκμαίης… ἡλικίης* καὶ 12.14.2 *ἀκμαίην… ἡλικίην*, πβ. Αἰσχ. *Ἑπτ.* 11 *ἥβης ἀκμαίας* (μὲ ἀρχ. σχόλ. στὸ χωρίο) καὶ *Σοῦδ.* σ. λ. *πρίγκηπες· οὕτως καλοῦσι Ῥωμαῖοι τοὺς ἀκμαιοτάτους ταῖς ἡλικίαις.*

Voskos A. , Michaelides K., Taifacos I.G., Αρχαία Κυπριακή Γραμματεία, Stavrou P. (Ed.), Leventis Foundation 1995-2008

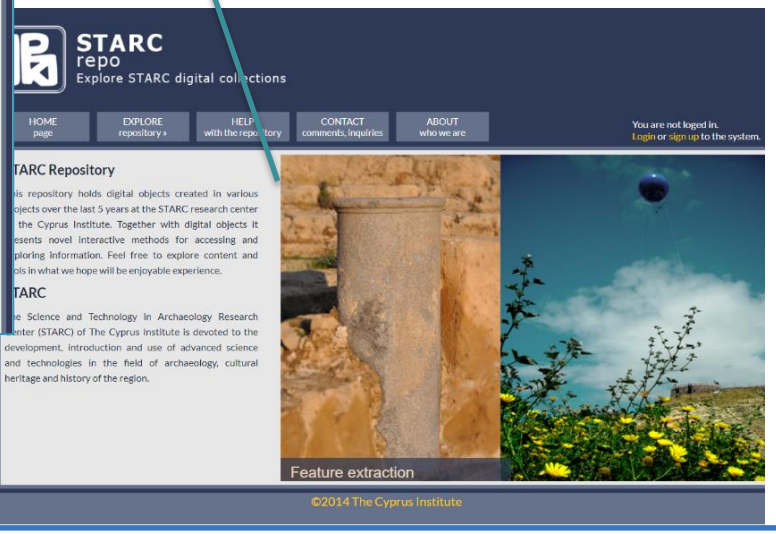
Metadata

- “*CyInscriptions* “metadata schema creation(compliant with community standard s and CIDOC-CRM ontology)
- Analysis of the epigraphic data, e.g. conservation place(s), discovery place…

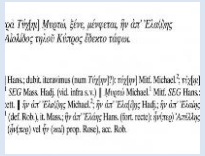
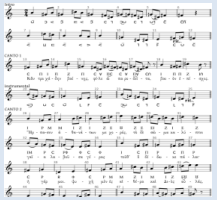


Vassallo et al. 2013, Revealing cross-disciplinary information through formal knowledge representation – a proposed Metadata for ancient Cypriot inscriptions. Digital Heritage.

Archeia Kypriaki Grammateia



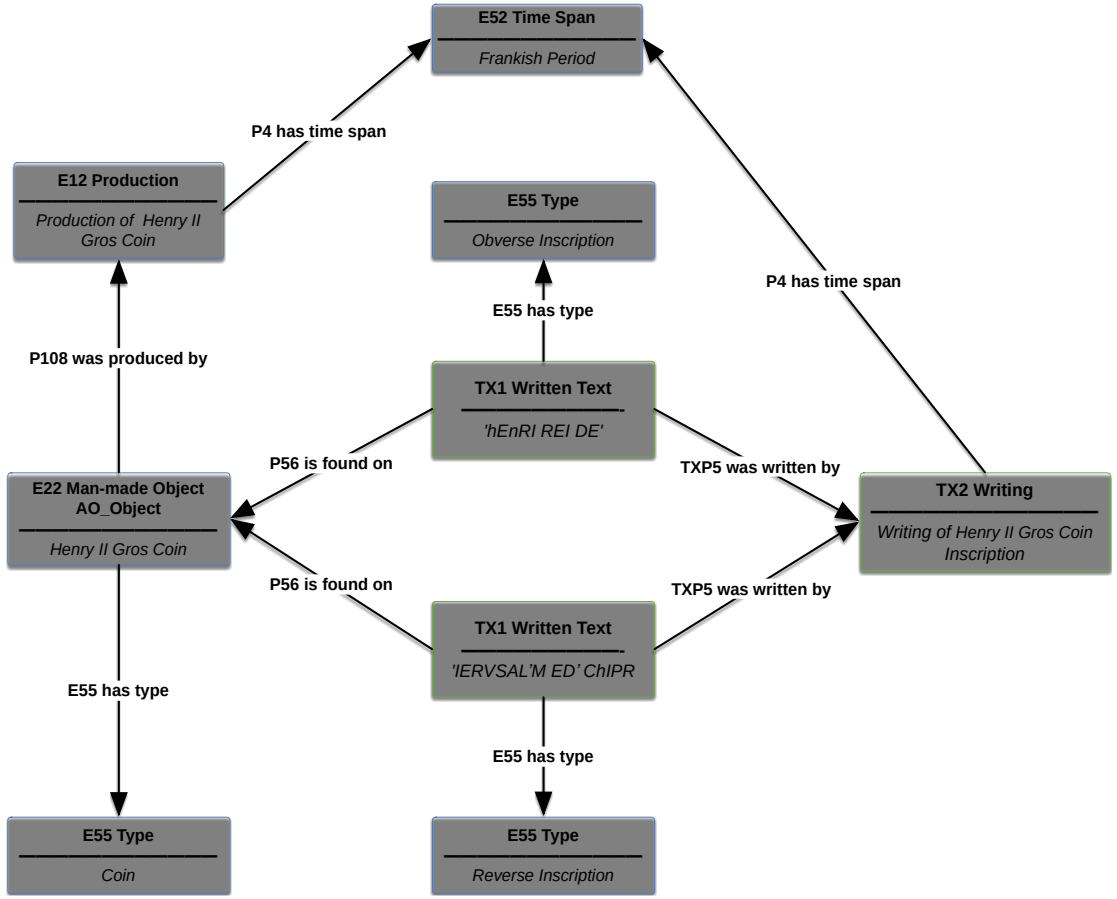
- The collection gives access to different resources such as the transcribed Ancient Greek text, the translated Modern Greek text, the scholia, the support image and 3D.

Object	Format
	Text
	Image
	3D
	Audio

http://public.cyi.ac.cy/starcRepo/explore/objects

Mapping

- Mapping to ontology (e.g. CRMtex)



Semantic alignment

inscriptions on coins

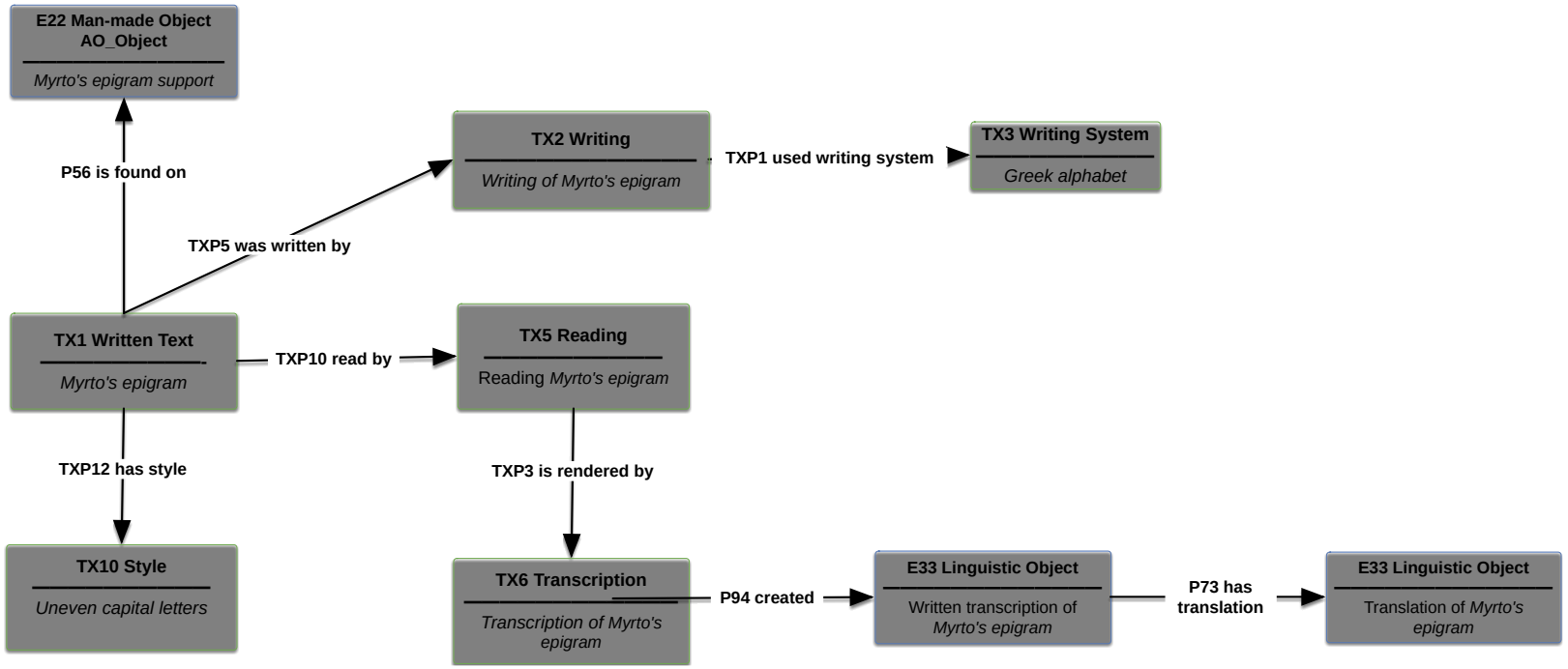
obverse **'hEnRI REI DE'**

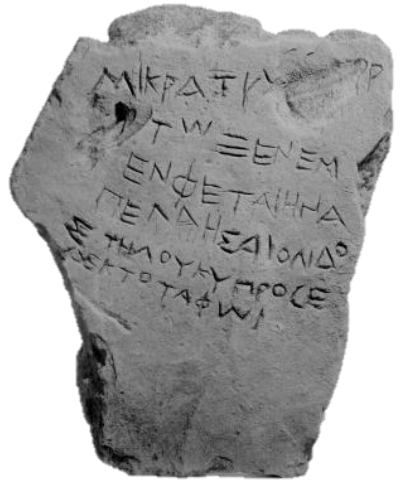
reverse **'IERVSAL'M ED' ChIPR**

Mapping

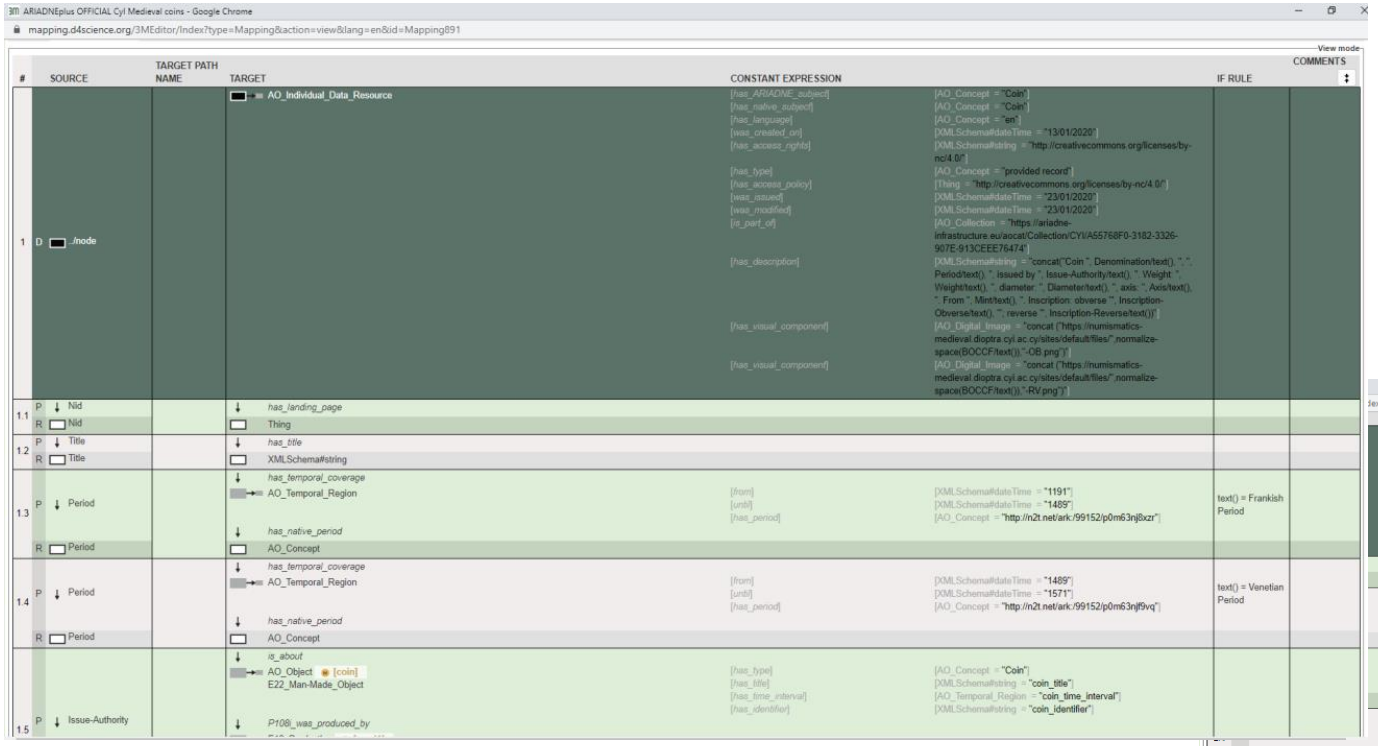
- Mapping to ontology (e.g. CRMtex)

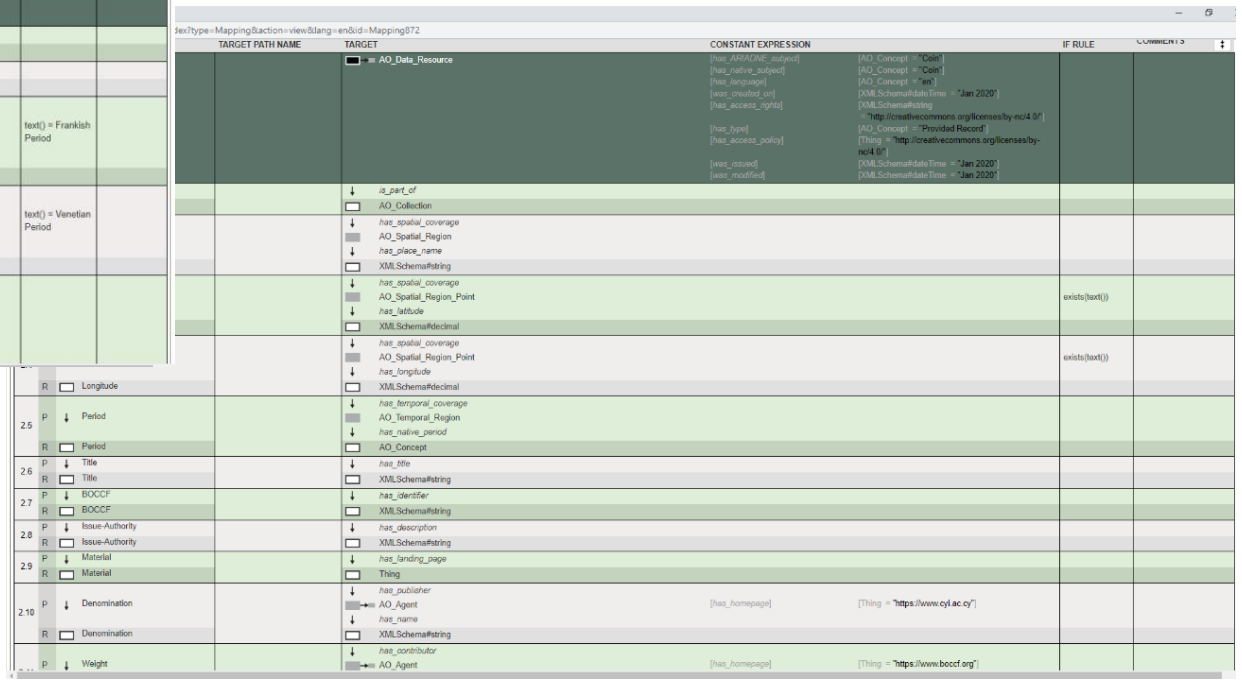
Semantic alignment





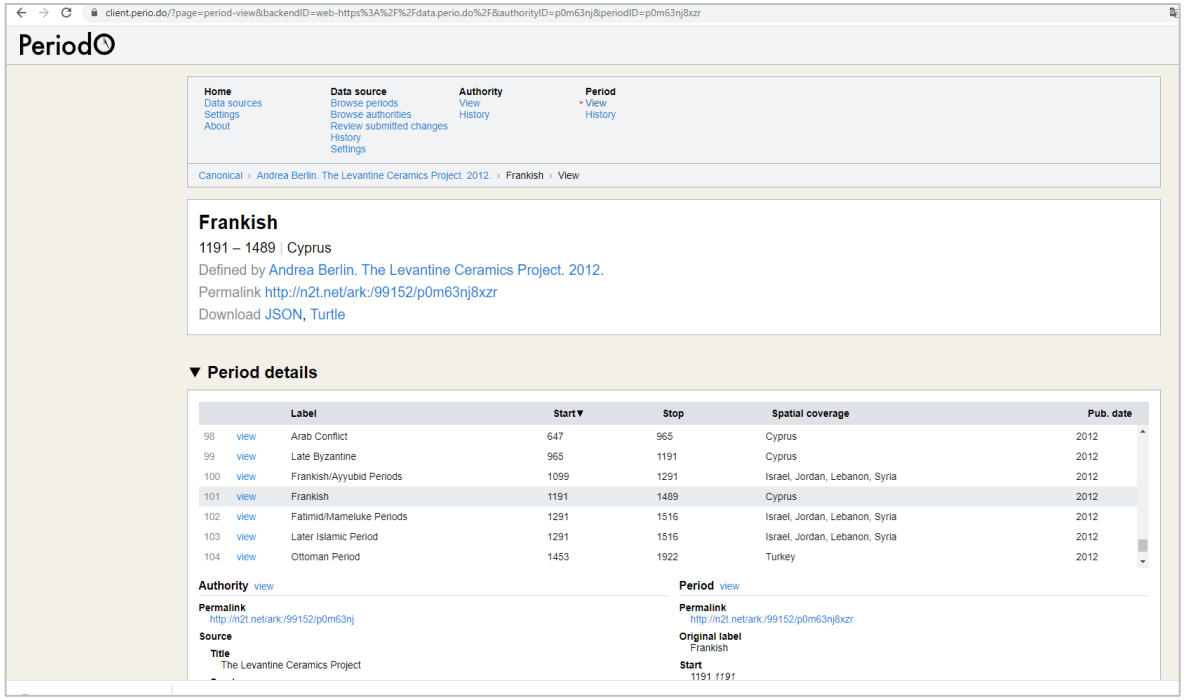
Mapping (X3ML mapping tool)





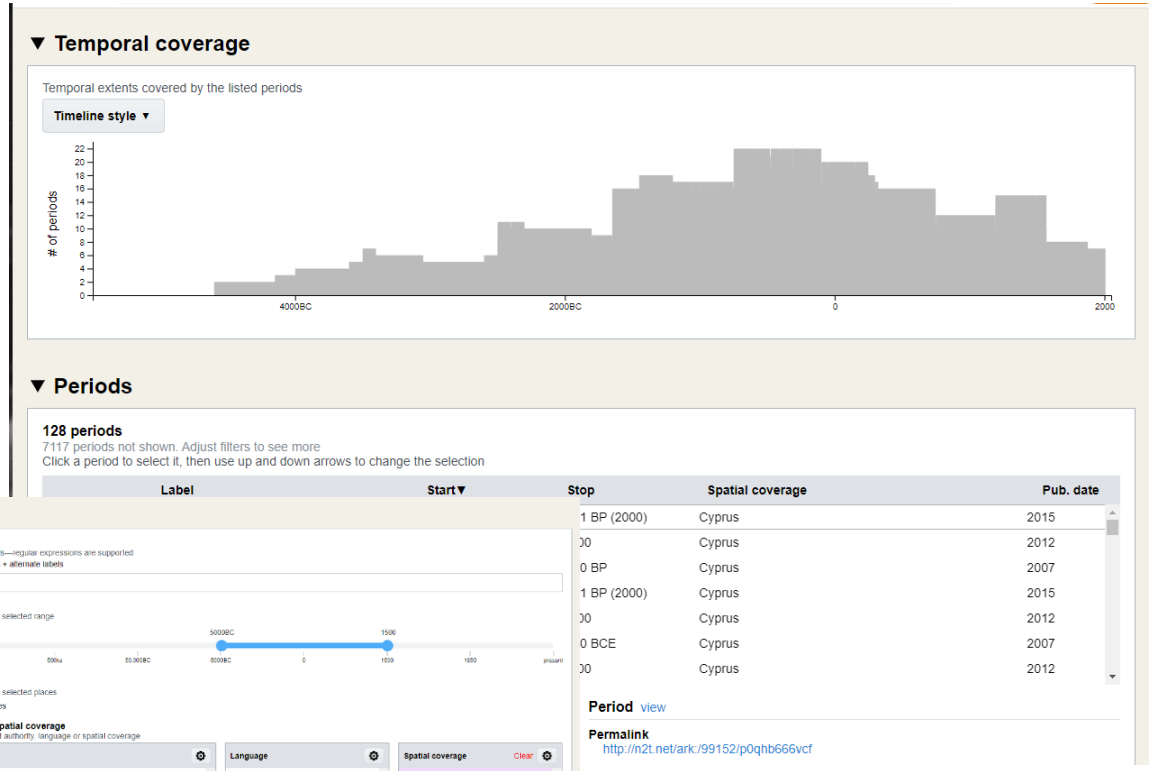
To solve semantic heterogeneity:
mapping from different metadata
to a single semantic solution

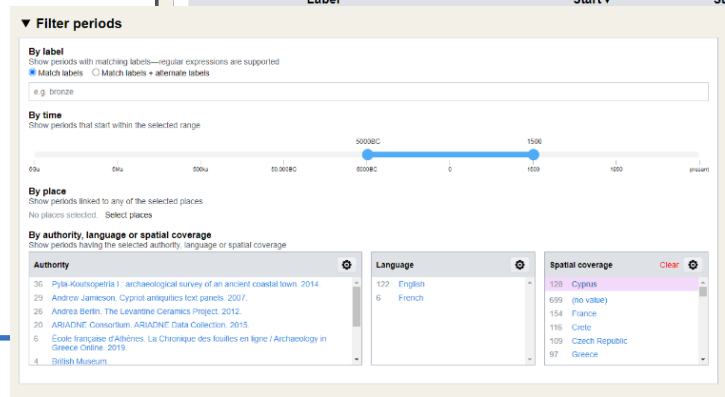
PeriodO matching



PERIOD

Venetian Period
http://n2t.net/ark:/99152/p0m63njf9vq

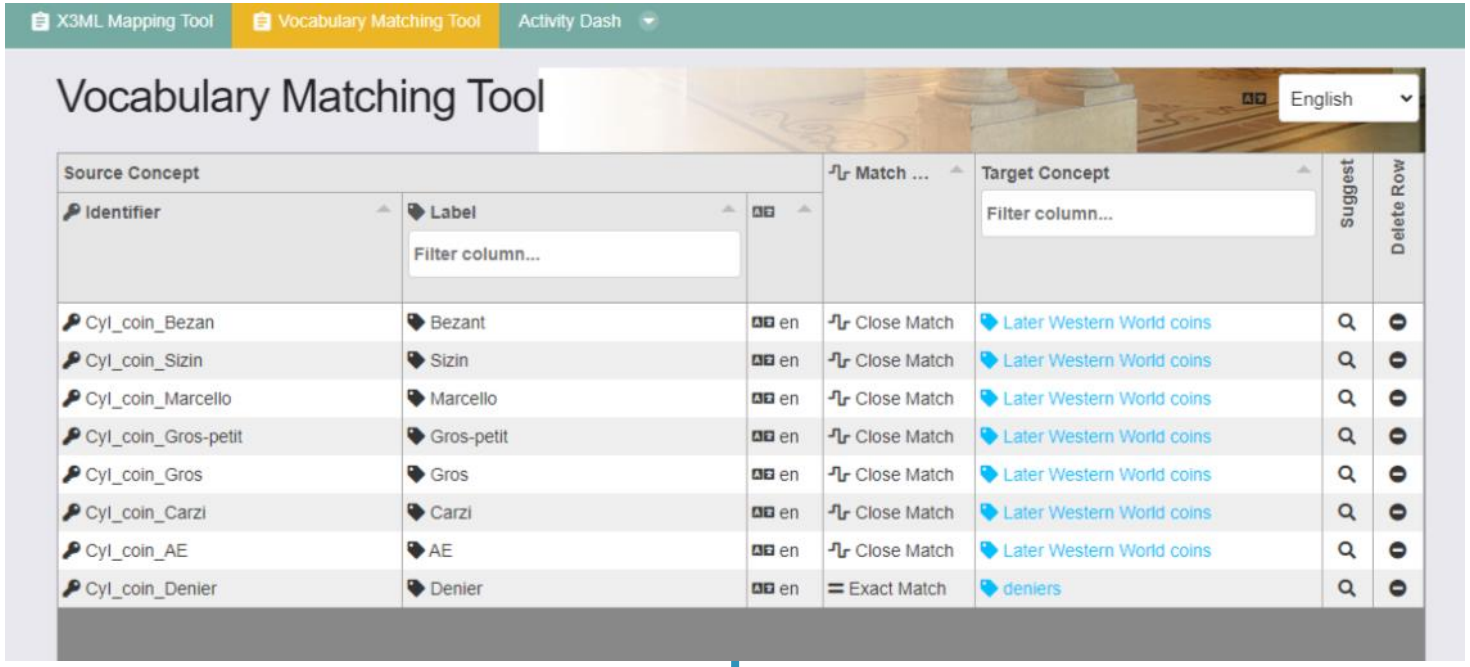




PeriodO is a public domain gazetteer of scholarly definitions of historical, art-historical, and archaeological periods.

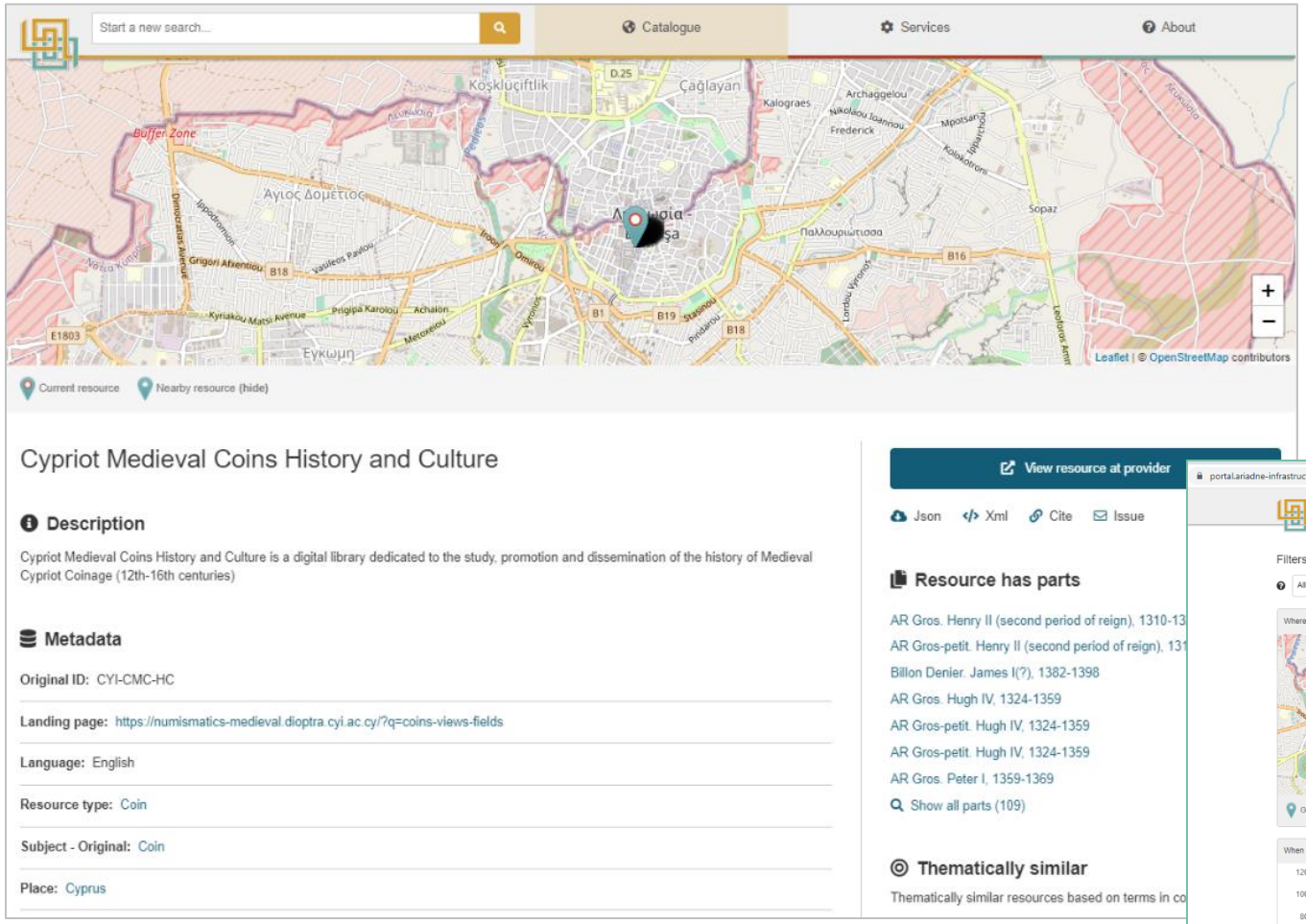
Vocabulary Matching Tool

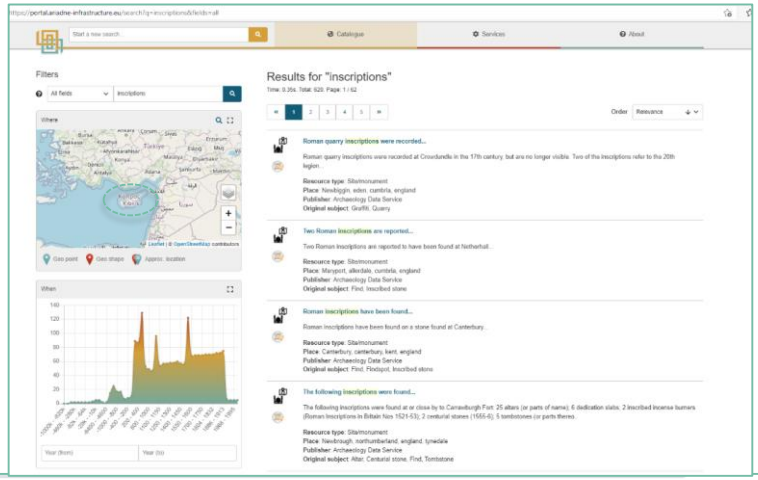
- Terminology extraction
- Matching between the terms and the AAT entries

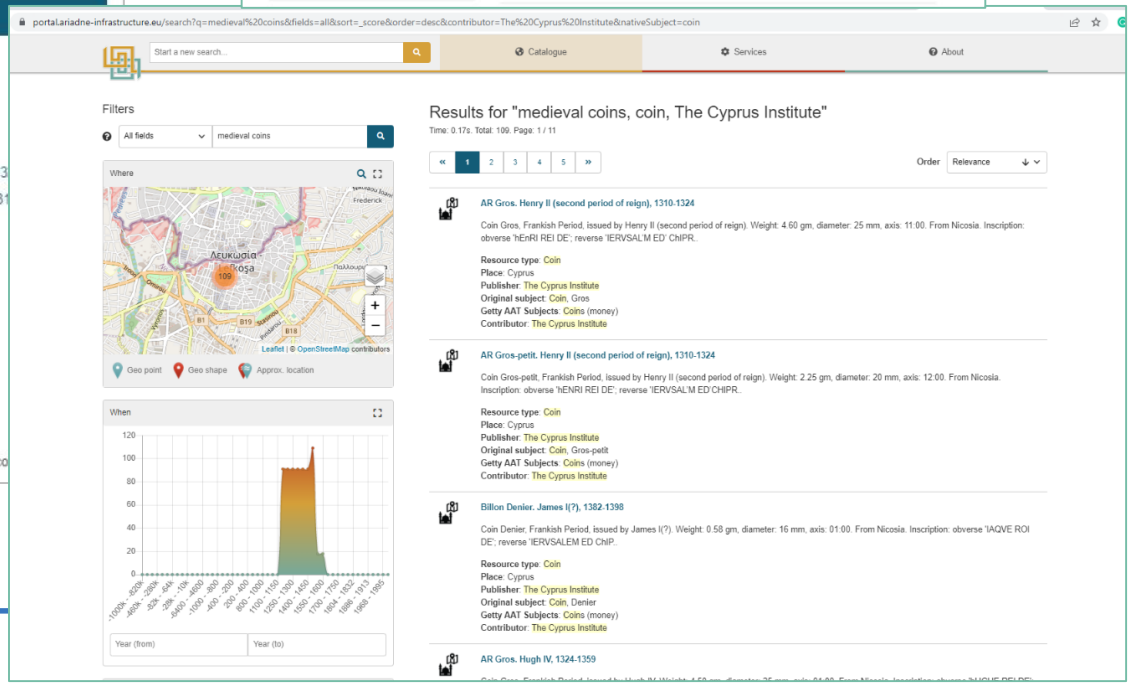


AAT: Getty Art & Architecture Thesaurus

Integration and publication (interoperability)







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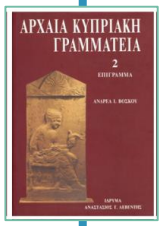
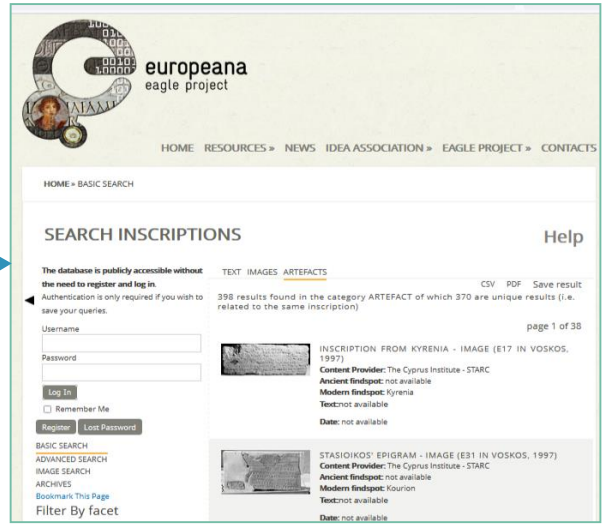
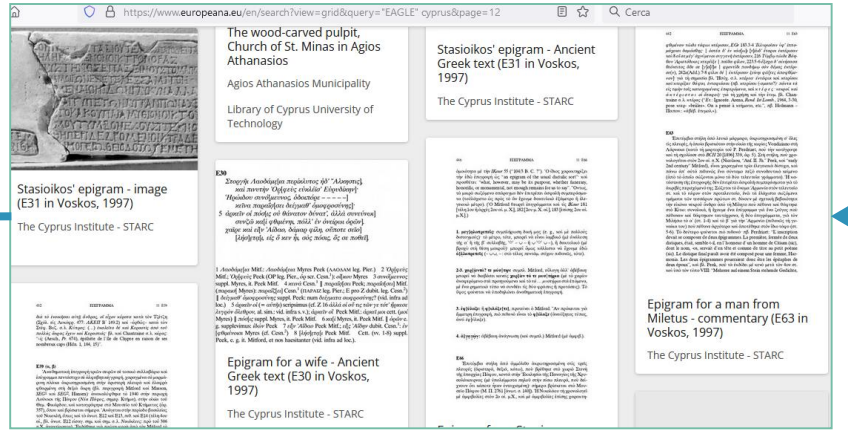
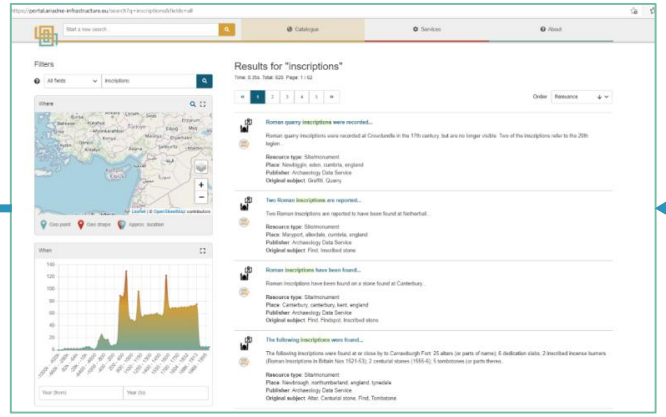








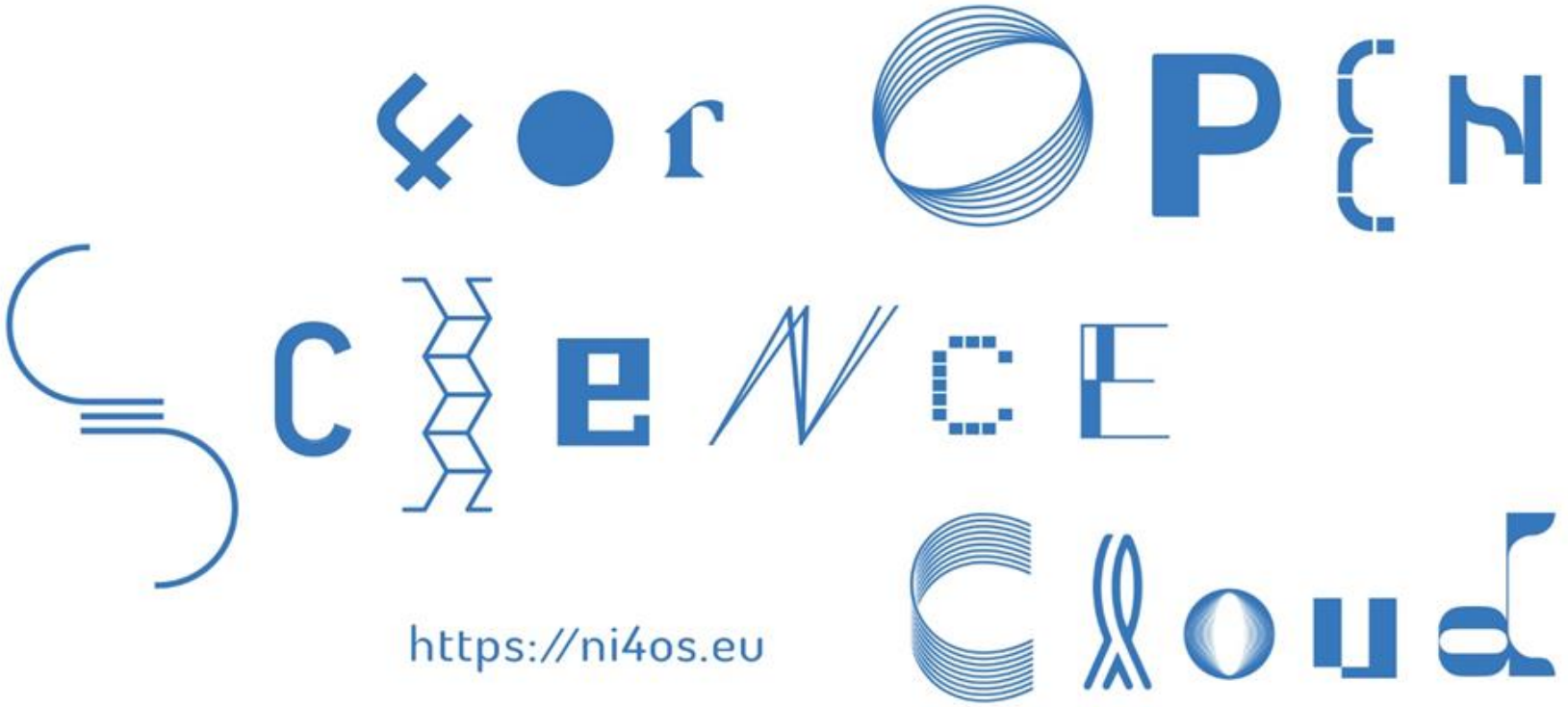
Conclusions

Recommendations

- Case study addressing the issue of the development of a semantic knowledge framework to support the data management of multidisciplinary research infrastructures and guarantee its FAIRness

- Semantic solutions (e.g., metadata, ontologies, controlled vocabularies, thesauri and other knowledge organization systems) are fundamental for the implementation of the FAIR principles, especially, for instance, concerning the Interoperability principle

Thanks!



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