The ARIADNE Mortuary Data Application Profile

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The ARIADNE ontology and Application profiles

Our contribution will discuss the development and application of standards to increase interoperability of data from archaeological mortuary contexts. More specifically, we will present the development of the ARIADNE Mortuary Data Application Profile (Aspöck, Theodoridou and Felicetti 2021), that is an extension of the ARIADNE project ontology (Richards, Felicetti, Meghini & Theodoridou 2020) and based on the CIDOC CRM (Doerr 2003). Together with other APs it will be the basis for cross-querying datasets from different providers via the ARIADNE infrastructure.

The ARIADNE Ontology is a modular ontology providing the terms for expressing the statements of the ARIADNEplus infrastructure and the information it aggregates. The ARIADNEplus Ontology is structured into sub-ontologies, including a Catalogue ontology, named AO-Cat, providing terms for the statements in the ARIADNE Catalogue, and several Application Profiles (APs), providing terms for the domain-specific parts of the ARIADNE ecosystem. Branches of this ontology have been used to encode the mortuary data presented in this paper and to model it on various levels, for the pure description, at collection level, of datasets and their structure, down to their content and specific items. The ontology is designed to achieve integration and establish interoperability among aggregated data and is able to provide layers of query across the integrated semantic graph it implements.

Researching mortuary evidence: the workflow and its digital products

Mortuary archaeology consists of a series of research activities and analyses carried out either directly on the archaeological evidence in the field and/or on documentation and finds derived from there (Aspöck, Theodoridou and Felicetti 2021). It provides information on the disposal of the corpse, past funerary activities and other practices that involved human remains; secondly, mortuary data is used as a proxy for many aspects of past societies, such as identities, migration, social complexity, landscape and memory, beliefs, art and craft, technologies.

Data are generated and archived at different stages of the scientific workflow:

1. Datasets that are generated in the field and do not include any post-excavation analysis (or only very limited one) – typically from excavation companies, or governmental organisations.
2. Datasets that are generated as results of analytical workflows after the completion of field-work (post-excavation). This typically involves analysis of human remains by a biological anthropologist, the assessment of artefacts by finds-specialists and scientific analyses.
3. The third type would be databases that synthesise and aggregate data related to cemeteries and graves based on the above types of data or from publications.

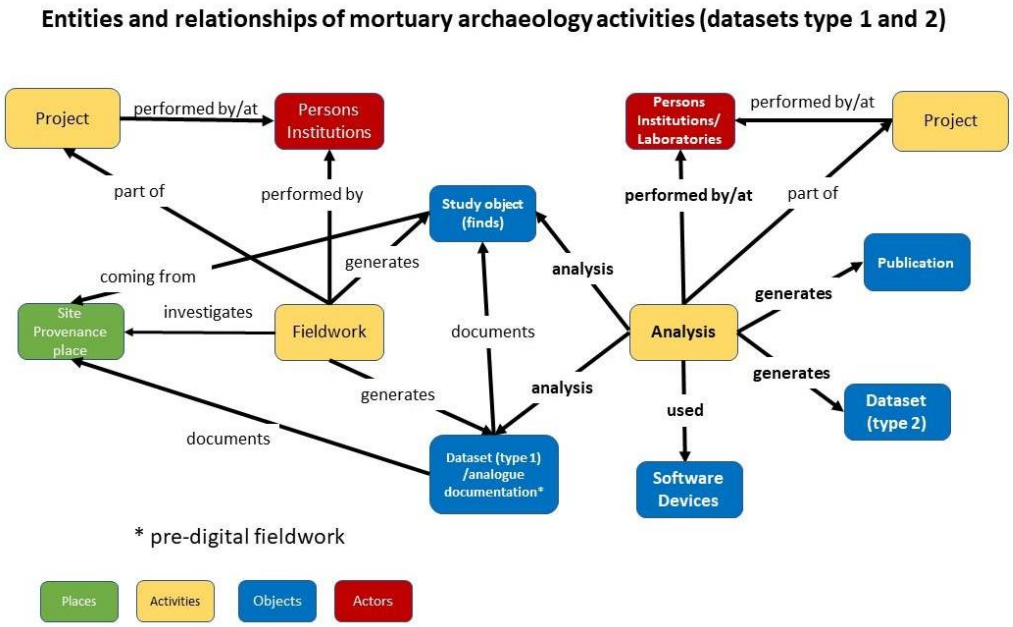

Fig. 1. Graphical representation of research activities leading to datasets type 1 and 2.

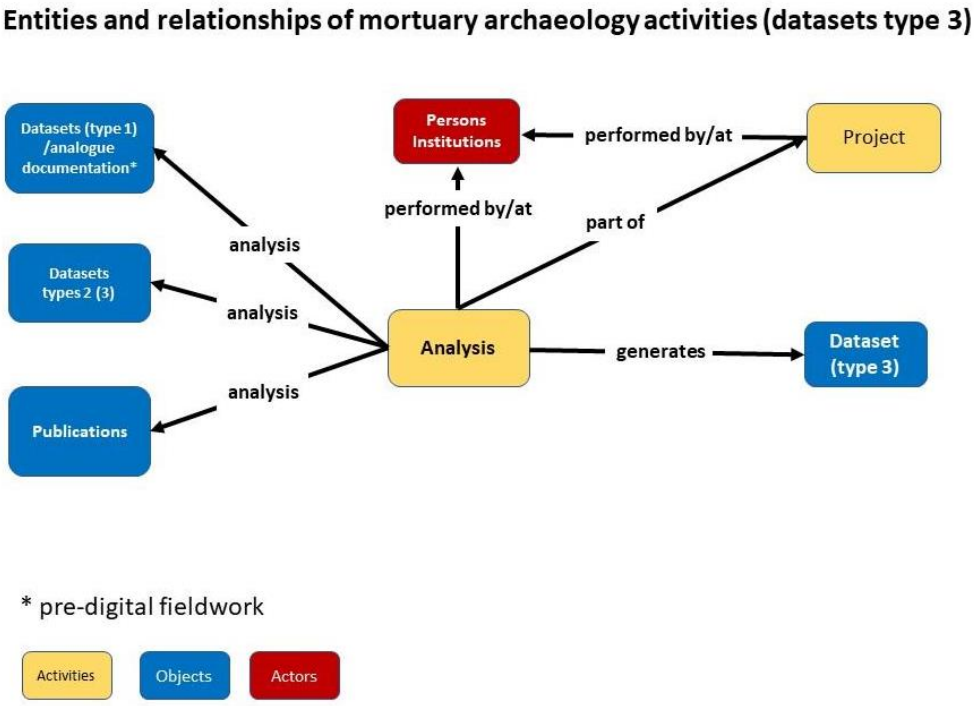

Fig. 2. Entities and relationships of activities leading to datasets type 3.

The Mortuary Data AP

For the development of the Mortuary Data AP we focussed on early medieval graves as a use case, as they provide a rather regular type of evidence in comparison to mortuary evidence from other periods. Our sample data was a relational database on eleven early medieval cemeteries in the Low Countries that was compiled for a PhD thesis at Leiden University and that is held at the DANS repository (Van Haperen 2017). It includes basic information on all 'context' types (inhumation and cremation graves, animal graves, pits, ditches, stray finds), human remains and grave goods (Fig. 3.). In addition, it contains detailed information on the different types of post-depositional interventions which were the focus of investigation. It consists of 7 main tables and 29 reference tables that were mapped using the 3M mapping tool.

The resulting ARIADNE Mortuary Data AP has been structured according to the typical entities of a cemetery database (Fig. 3): Site (cemetery or other site types containing mortuary deposits); feature (different types of graves, ditches, pits and other features); mortuary deposit (the deposit of human remains and other finds, including containers and furniture); finds (human remains, artefacts, animal remains, samples). To make the AP easier to use, we have structured the mappings according to the ARIADNE main questions: Where? When? What? For a semantically rich description of mortuary deposits (i.e. more on the 'What?') that would allow integration on the item-level the ARIADNEplus ontology was not sufficient and we in addition used classes and properties from the CIDOC-CRM (Doerr 2003) and extensions (CIDOC CRM[1] and its compatible extensions CRMsci[2] and CRMarchaeo[3]).

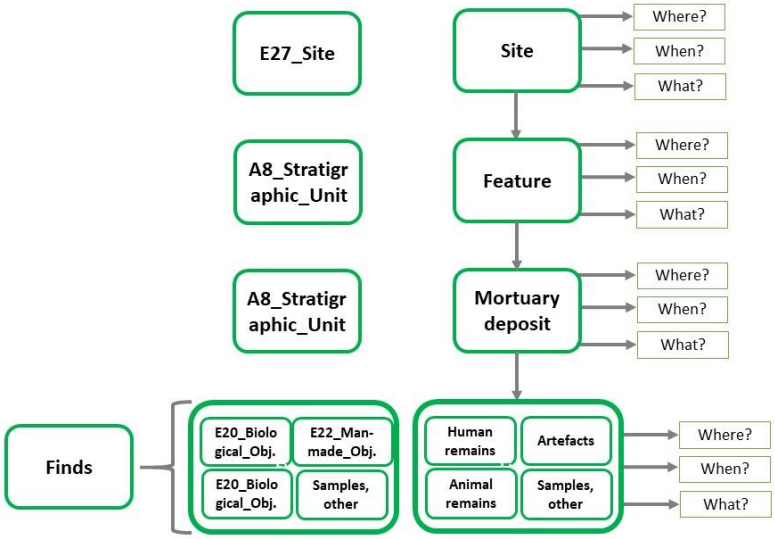

Fig. 3. Typical hierarchical structure and entities of early medieval cemetery databases. A feature may contain multiple deposits.

[1] https://www.cidoc-crm.org/
[2] https://www.cidoc-crm.org/crmsci/
[3] https://www.cidoc-crm.org/crmarchaeo/

Modelling the relativity of data: E13_Attribute_Assignment

In our model, we are suggesting to use an assignment event (E13_Attibute_Assignment) to document that the attribution of types and the observations that were made are to a degree dependent on the methods that were used and on the views of the person who created/curated the database.

P140i_was_attributed_by -> E13_Attribute_Assignment -> *P14_carried_out_by* -> E21_Person = "Name"

Site: E27_Site

On the collection level, data for each site/cemetery will be mapped like ARIADNE site and monuments data. This will cover information about the name, identifier, geographical extent and its date range (expressed via the ARIADNE properties *has_title, has_identifier, has_space_region*, *has_time_interval*) and in most cases there will also be a classification of a site (e.g. a cremation cemetery, an inhumation cemetery). The latter and further specifications of the 'What?' – i.e. information on the type of cemetery or other type of information – will be mapped as *has_type* -> AO_Concept. The original vocabulary of the database will be integrated into the infrastructure via the property 'has_native_subject' which means it can later be queried via the ARIADNE interface. Native site types have to be mapped to the Arts and Architecture Thesaurus (AAT) (http://vocab.getty.edu/page/aat/300387004) which has been chosen as the common thesaurus of the ARIADNEplus infrastructure.

Feature (Context, grave, …): A8_Stratigraphic_Unit

We mapped this information as an 'A8_Stratigraphic_Unit', as on the most general level we are dealing with physical features that archaeologically are consisting of A2 Stratigraphic Volume Units and A3 Stratigraphic Interfaces. Information about the name, identifier, geographical extent, date range and type of feature will be mapped analogue to the same type of information relating to site.

Mortuary deposit: A8_Stratigraphic_Unit

In our test dataset, there was no separate entity for each mortuary deposit, but the finds were described as part of the features. However, many cemetery databases will have entities for the individual deposits as there are frequently more than one burial in a grave – even in the early medieval period. Usually, large finds such as coffins or other furniture related to an individual burial will be described as part of this entity.

Measurements of a coffin or other grave furniture may be mapped analogue to the mapping of the size of the grave pit. For example, a stratigraphic unit contains an object of the type 'coffin', that is a stratigraphic volume unit which had the dimensions length and width.

Finds (grave goods, artefacts): AO_Object & E22_Man-made-Object

We decided to use both, E22 Man-made object as well as AO_Object. The class AO_Object allows to use all the AO-Cat properties. AO_Object is a subclass of E18 Physical thing. The 'When?' and 'Where' questions will be mapped analogue to the other entities.

Finds: Human remains, animal remains: AO_Concept & E20_Biological_Object

Analogue to assignments by archaeologists (finds specialists) all data on human (or animal) remains will also be attributed to a person via an attribute assignment (E13).

Properties attributed by the biological anthropologist, such as sex, age at death, pathologies, preservation, position of the skeleton will all be mapped as types:

has_type ->AO_Concept -> has_type -> E55_Type ['Sex', 'AgeAtDeath', …]

Cross-querying individual resources via the ARIADNE infrastructure

Frequently, materials from mortuary deposits are being analysed repeatedly by specialists for projects with different research questions. The resulting data will in these cases end up in separate data collections. As a result, the integration of information held in different resources is a basic requirement for researching the mortuary evidence. This will usually be done manually or semi-manually, by entering information from publications and legacy datasets in a new database (see above dataset type 3). However, through the integrated approach that is taken for the creation of the ARIADNE infrastructure, a direct search of information kept in dispersed datasets will be possible in the infrastructure's Virtual Research Environment (VRE) in cases where data down to the item-level was integrated by mapping them to the ARIADNE project ontology using APs, such as the Mortuary Data AP. Research questions may for example explore how mortuary practices have developed over time in relation to gender or age groups. Or, how kinship has influenced mortuary treatment or nutrition.

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Writing – review & editing: Edeltraud Aspöck

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