

Digitizing Early Farming Cultures

Abstract

Edeltraud Aspöck

Digitizing Early Farming Cultures aims to create standardized and integrated research data of Neolithic and Chalcolithic sites and finds of Greece and Anatolia (c. 7000–3000 BC according to Greek terminology). The basis for the project are non-digital and digital sources from a series of research projects from the new ÖAW research group Anatolian Aegean Prehistoric Phenomena (AAPP) at the OREA Institute. AAPP studies archaeological sites and finds from the Neolithic to the Bronze Age in Greece and Western Anatolia, two neighbouring and archaeologically closely related regions usually studied in isolation of each other. The group focusses on research questions concerning technological and social changes, settlement patterns, exchange and sourcing of raw materials.

Research across the area currently suffers from fragmented data organized according to differing knowledge schemes, which developed independently in the two different research traditions. Independent terminologies and chronologies have developed, hindering collaborative research. To provide a basis for studying archaeological phenomena collaboratively across the whole region, standardization of research data is required.

The aim of this project is to harmonize existing datasets, digitize analogue data from publications and integrate metadata for easy access and data reuse. The data will be made available in an open access archaeological data management system, using and expanding an existing online platform for archaeological data, which complies with standards of data sharing and interoperability with related initiatives. Digitizing Early Farming Cultures, for the first time, will enable research across several, so far unlinked projects and foster active collaboration between researchers in OREA.

Digitizing Early Farming Cultures

Project outline

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Digitizing Early Farming Cultures is a project that will integrate research data from Neolithic sites and finds of Greece and Anatolia, allowing research across the whole region and overcome fragmentation through differing knowledge schemes. Data will be hosted in an archaeological data management system complying with standards of data interoperability and data sharing and it will be made accessible via an existing online platform for archaeological data.

The archaeological disciplines are unique amongst the humanities in that data is frequently acquired through excavations. Human activities in the past left traces in the soil and above, including remains of material culture, architecture, or changes in environment and landscape, many of which can be accessed through excavation, recorded and studied. Data from archaeological sites and finds provide the basis for archaeological research.

As part of the recently founded ÖAW Institute OREA (Institute for Oriental and European Archaeology), new research groups formed to bridge research of the three formerly independent Departments for European, Aegean and Anatolian as well as Egyptian and Levantine Archaeology. Amplified by different research traditions within these archaeological subfields, the resources of these research groups consist of heterogeneous datasets from a variety of archaeological sites, making comparative research difficult.

The new Anatolian Aegean Prehistoric Phenomena research group (AAPP) studies archaeological sites and finds from the Neolithic to the Bronze Age in Greece and Western Anatolia. Greece and Western Anatolia are two neighbouring and archaeologically closely related regions. They are, however, usually studied in isolation of each other and therefore developed different terminologies and chronologies. AAPP brings together research of the whole area covering main steps of humanity during a time span of around 5000 years. The group focusses on research questions concerning technological and social changes, settlement patterns, exchange and sourcing of raw materials.¹ The basis for studying these phenomena on a larger scale is knowledge of dates

¹ AAPP consists of the following projects (<http://www.orea.oeaw.ac.at/index.php?id=172>): „Die neolithischen und frühbronzezeitlichen Funde der Burg von Midea der Ausgrabungen 2004-2006“, „Visviki-Magula“, „Die Ausgrabungen von

and characteristics of sites and finds. Currently, information for this area is available in non-digital and digital formats and is organised according to different knowledge schemes. To enable collaborative research across the whole area standardization of research data is required.

The overall aim of this project is to produce standardized research data from Greece and Western Anatolia to overcome the fragmentation of research in the area. The aim is to harmonize existing datasets, digitize data in publications and finds that exist only in analogue format and make metadata accessible. The data will be made available via an archaeological data management system ensuring compliance to standards in data production for data sharing (metadata and mappings) and interoperability with related initiatives. The focus of the project will be on information and data from Neolithic and Chalcolithic sites and finds (c. 7000–3000 BC according to Greek terminology).

Objectives

1. Overcome fragmentation of research on Neolithic Greece and Western Anatolia: Creation of standardized research data according to user requirements, making it accessible online and allowing collaborative research across the whole area.
2. Digitizing analogue OREA resources on Neolithic Greece and Western Anatolia: non-digital information and data will be enriched with metadata and integrated with harmonized existing digital datasets.

Methods and platforms

At the start of the project, AAPP focus group meetings will take place to identify user needs and establish requirements to the data and the data management system. In preliminary talks researchers criticized the insufficient level of detail and lack of integration of existing online open access websites or excavation databases such as TAY (Archaeological Settlements of Turkey Project: TAY) and Archaeology in Greece Online (Archaeology in Greece Online). Integration of information on archaeological sites and finds with different levels of detail corresponding to the inconsistency of information available from archaeological investigations will be enabled (e.g. caused by historical excavation techniques versus modern stratigraphic excavations). A multi-scalar approach is thus

required. An important requirement is also adding information on 'closed contexts' (an ensemble of finds deposited together at the same time, such as a depositional contexts or an undisturbed grave) to enable chronological comparison of sites. An English-language system was given preference over a German-language one to reach a larger international audience.

As part of the FP7 project ARIADNE (ARIADNE; Niccolucci and Richards 2013; Aspöck and Geser forth.), an inventory of digital and non-digital resources is presently carried out at OREA. Results so far show that AAPP datasets are largely in German and organized according to different knowledge schemes resulting from separate research traditions within Greek and Western Anatolian archaeology, e.g. different definitions of archaeological periods, different terminology for description of archaeological evidence and geographical reference systems. Standardization of data is required using the CIDOC CRM ontology and linking of existing thesauri. Building on the results of the ARIADNE-OREA data inventory, AAPP datasets will be further analysed. Research groups need to define their data requirements, formulate queries (research questions) and identify possible problems (terminology, chronology). Questions to the research group are for example which types of data they want to integrate/add information to the new online resource. Analysis of online and offline literature, e.g. collect and survey existing thesauri is necessary to find common definitions and solve chronology problems.

An archaeological data management system that facilitates data exchange is required to host the project. This includes systems such as ARK (The Archaeological Recording Kit: Eve and Hunt 2008), Arches (Arches) and Open context (Open context) which differ regarding their flexibility for different user requirements, possibilities to incorporate different data types, whether they are already mapped to CIDOC CRM and the option to create thesauri, amongst others. CIDOC CRM is a standard ontology for cultural heritage data (Le Boeuf et. al. 2013) and will be used in this project. For Thesauri SKOS standard will be used. ARK seems to best comply to the requirements of this project as its framework is open and modular, being able to dealing with any kind of digital information, including photographs, plans and GIS data, 3D reconstructions or bibliographic databases. It allows integration of archaeological site data with different levels of detail. ARK is open source and also allows for full free-text search and querying via both the text and map interface. Currently, the infrastructure necessary for housing metadata standards and mapping is implemented allowing creation of metadata according to the Dublin Core standard for this project.

Functional requirements of the user interface will be defined according to user needs. To achieve this, an existing system such as Fasti Online (Fasti Online) will be modified. Setup and modification of the system according to user requirements will be followed by import of existing databases (e.g. 'Vergleichsdatenbank West Anatolien') as a pilot study. A pilot user interface will be

set up for a first data entry from publications and other sources. The research data will be published open access via the online platform Fasti Online, an open access site for archaeological excavations. Data will be published successively. Fasti Online licenses will apply (Creative Commons Attribution-ShareAlike Unported License CC BY-SA 3.0). It will be possible for registered users to enter information on sites.

Future work will allow integration of external online data from related initiatives such as the historical gazetteer of ancient places Pleiades (Pleiades), Hestia (a project on the places in Herodotus's Histories: Hestia) and PELAGIOS (Pelagios), a platform that links online resources that refer to places in the historic past. Other future applications will be the mapping of data (e.g. finds of raw materials, types of finds, ceramic types) and a timeline to follow changes over time.

The project will be housed on an ÖAW server. To guarantee sustainability of the system and long-term availability of the data a redundancy of the underlying datasets needs to be created and archived. Preparation of data for archiving will be according to standards developed as part of the new ÖAW Austrian Centre for Digital Humanities (ACDH).

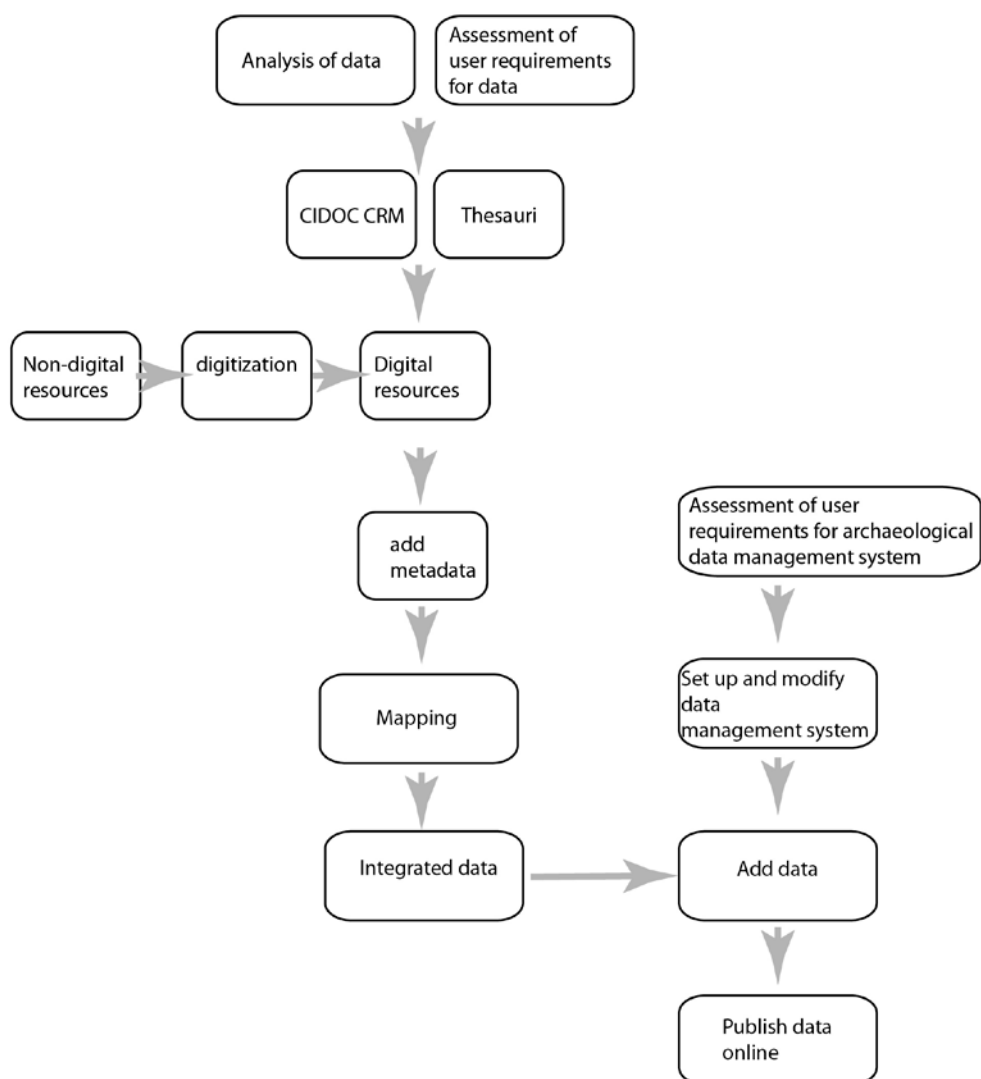


Figure 1: Workflow.

	Year 1				Year 2			
Task	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1 Analysis of data, user requirem. data								
2 Homogenization: CIDOC CRM, thesauri								
3 Scanning of images								
4 Creation of metadata								
4 Add data from publications								
5 Assess user requirem. data manag. Syst.								
6 Set up and modify data manag. System								
7 Add integrated data to system								
8 Publish data online								

Table 1: Work- and Timetable. Duration of the project: 24 months.

Extent and nature of the data resources to integrate: case studies

The aim is to harmonize existing datasets and create access to metadata and data on publications and finds which so far only exist in analogue format. The case studies will bring together results from a series of research projects such as the ongoing ERC project 'Prehistoric Anatolia' (Prehistoric Anatolia) and from projects funded by the Austrian Research Fund (FWF P 4924 G, P 5500 G, P 6532 G, P 7563-HIS, P 7923-HIS, P 8514-SPR, P09713-SPR, P11089-SPR, P12428-SPR, P 16434-GO2, P 18985-G08).

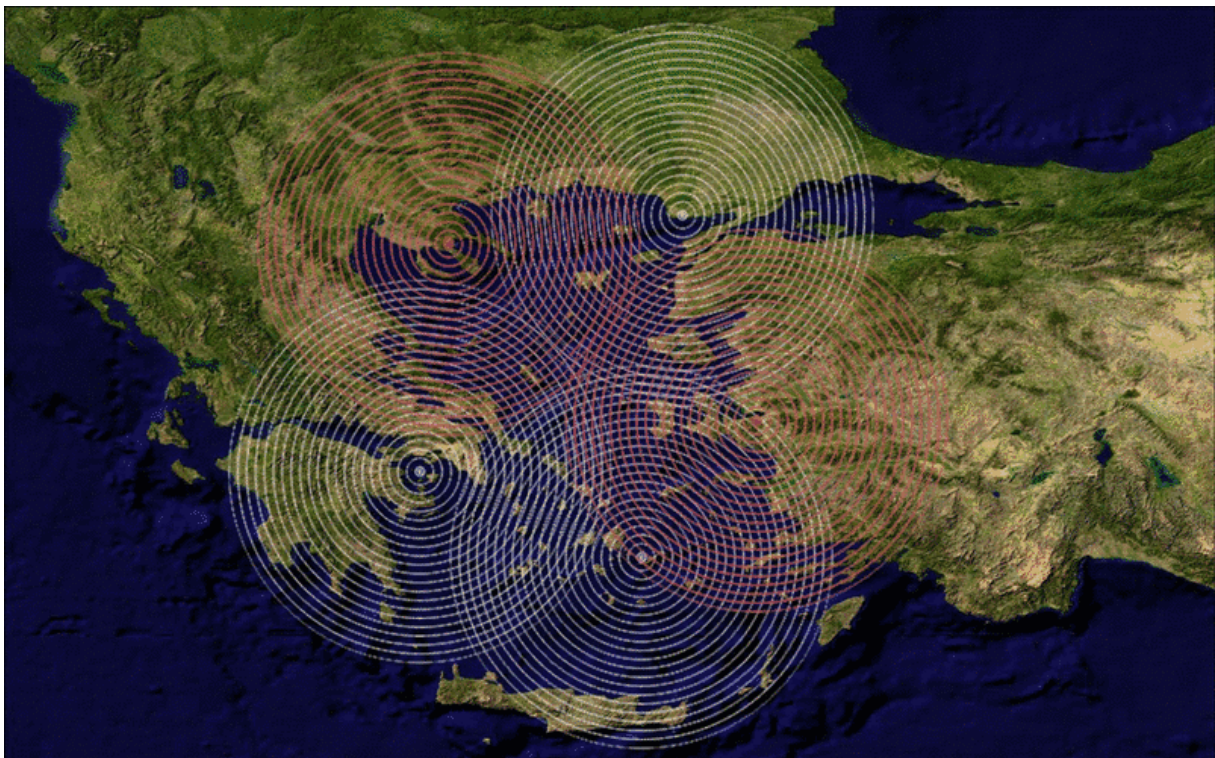


Figure 2: Research area Greece and Western Anatolia

1. Digital resources:

1.a **„Vergleichsdatenbank West Anatolien“** ('Comparative database West Anatolia, C. Schwall, ERC project 'Prehistoric Anatolia', Figure 3): A MySQL site database with a Microsoft Access front end. It contains the following information for each site: GPS coordinates, radiocarbon dates (if available), chronological information (chronological 'steps' of 500 years spanning from the pre-pottery Neolithic 8000 BC to the early Bronze Age 2750 BC) and information on the categories ceramics, architecture, lithics, storage systems, settlement structure, production (textile, metal), weights, graves (intramural), cemetery, bone tools, stone tools.

Figure 3: User interface ‚Vergleichsdatenbank West Anatolien‘

1.b **Site-, finds- and bibliographic databases from Greece and Crete:** information on pottery from Aigeira, all finds (mostly pottery) from Visviki Magula and bibliography of Neolithic and Early Bronze Age Greece and Crete. Database formats are Microsoft Access and AskSam.

2. Resources to be digitized:

2.a Three volumes of the publication series **‘Ägäische Frühzeit’** (Alram-Stern 1995, 2004, 2011). The publications provide analyses and reports on excavations of Neolithic to the early Bronze Age (6500-2000 BC) sites in Greek and Crete (‘gazetteers’).). The books represent the only comprehensive collection of archaeological sites from these periods in Greece.



Figure 4: ‘Ägäische Frühzeit’

2.b **Fritz Schachermeyr's ceramics collection:** a 'teaching collection' of Mediterranean prehistoric ceramics with diagnostic finds including many objects from the Greek and Western Anatolian region. Three volumes were published providing background and analysis of the ceramics (Schachermeyr 1991; Reinholdt 2001; Pavúk and Horejs 2012).



Figure 5: Ceramic fragments from ceramics collection Fritz Schachermeyr.

Digitization projects in archaeology

In recent years several projects have emerged that aim to integrate archaeological data on a large scale in Europe, internationally and multidisciplinary (Richards 2012). Since 2013 the ARIADNE project (Advanced Research Infrastructure for Archaeological Dataset Networking in Europe, ARIADNE; Niccolucci and Richards 2013, Aspöck and Geser forth.) develops an e-infrastructure for archaeological dataset networking in order to leverage the sharing and collaborative use of available data across organizational and national boundaries in Europe. The role of the ÖAW/OREA as an ARIADNE partner includes analysis and preparation of ÖAW datasets (central European Bronze Age cemeteries, sites and image data; numismatic data) for integration into the ARIADNE network. The focus of the first year has been on the mapping of datasets to the ARIADNE standard Conceptual Reference Model CIDCOC CRM (WP14; Le Boeuf et. al. 2013). We also contributed to the extension of

the CIDOC CRM for archaeological subdomains, the CRMarchaeo (FORTH and collaborators 2014, Masur et. al. forth.).

The proposed project will be integrated into the larger framework of ARIADNE for coordination of the project and technical expertise. It will create synergies with ARIADNE and the AAPP research group on various levels. It will be a case study for our work on the CRMarchaeo and it will foster collaborative research within the AAPP research group. The aimed objectives would allow to publish the enormous collection of archaeological data in an online open access platform for a broad audience of users. Complex archaeological studies dealing with different terminologies could be harmonized and integrated for the first time and would therefore step beyond cultural-national-historical borders.

Funding by go!digital will enable a great leap forward in digitizing, standardizing and harmonizing fragmented data from early farming cultures in of Greece and Anatolia. Appointing a pre-doc to work on the project part-time over 2 years will take pressure off individual project team leaders and support them in their participatory goals. 'Digitizing Early Farming Cultures' will not only enable research across several, so far unlinked projects housed in the Institute for Oriental and European Archaeology, but actively foster collaboration between researchers working on the different projects. The synergies created by this collaboration will positively affect the collaborative climate in OREA, leading to cross-fertilisation between projects, new research questions and projects in the future.

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