



## **Digital in pluralism Archaeology and its critic from a states archaeological perspective**

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## Introduction

The digitization of archaeological research represents a similar, but more far-reaching change than the introduction of photography and its various fields of application. Aerial photographs helped to identify large structures. Micro- and macro-photography opened up the smallest structures hidden from human eye. This and much more challenged existing the state of the art of archaeological expertise of that time. The challenge of modern information processing technologies contemporary archaeology has to face is going much further and an end to this process is not in sight.

Already against this background, the subject of archaeology with its different fields of research, working environments and organizational structures requires a moment of self-reflection in order to realize the effects of the development mentioned on the different working environments, the interface between professional and lay research, and last but not least on the qualification of young scientists. A variety of user perspectives and application purposes are characterizing the dialogue to be conducted. In most cases, existing development path dependencies, legal and organizational frameworks conditions or responsibilities are not taken into account. Even less, and this is the central issue, is the question of the qualification of young scientists from the point of view of the state's preservation of historical monuments. What demands will be made on the next generation of scientists? Is the 'digital everyday experience' sufficient?

## Diverging working environments in change

The turnover associated with digitization is very far-reaching. On a content level, it is a technically exciting challenge that, especially in combination with archaeometry, enables new insights and challenges existing knowledge. In this environment, new procedures are quickly introduced and utilized. Collected data are introduced and evaluated very opportunistically and then? At this point, the focus is usually on the own, individual data management. This perspective is always broken when, for example, the use of software, data formats, etc. is statutory and therefore in conflict with internal data handling. Although this is initially experienced as impractical in individual cases, it can occasionally direct the perspective towards the problem of long-term data security and authentication. However, this understanding is fundamental for archaeological practice, since its central goal is not only the production of knowledge but also the reproducibility of data, facts and information. This challenge grows with the data and the actors. In terms of organization, these actors can be found in a variety of different departments, institutions and private enterprises: Students stand alongside established lay researchers, specialists alongside generalists.

These full-time, career-qualifying students or amateur researchers / hobby archaeologists try to participate in the opportunities offered by digitization through new tools, software, etc. This happens concretely on the object level in the context of field and evaluation projects, find reports or scientific qualification work based on literature research. On the other hand, the organizational units have to deal with finds, samples and the associated documentation in the form of reports, lists, pictures, etc., but also with data formats, according to their responsibilities, size and status. Today, digital data are firmly established in everyday research. Nevertheless, they and the software solutions that process them represent a permanent, important challenge. Tools here are databases, geographic information systems, but also a variety of technical equipment (cameras, surveying equipment, etc.). Very few people who use e.g. structure-from-motion think about how to archive the large amounts of images required for the calculation of a 3D model. After all, it is the primary data that is used to create the 3D model is the basis for possible verification, not the 3D model itself. Especially short term usage within projects or ad-hoc-solutions make handling difficult or even lead to something that can be called data dark ages. Nevertheless, the possibility of big data and the emergence of new specialist areas, such as Archaeoinformatics, is attractive.

## **Application and use in change**

Similar to the way in which, at the turn from the 19th to the 20th century and then after the First World War, the emergence of photography changed the archaeological perspectives on monuments and their involvement in landscape, new structures and frame conditions had to be developed for using and preserving the newly gained archaeological data in form of film negative, diapositives, slides etc. What was easy to organize using exposed film material and prints via lists as example, proved to be difficult in digital, cross-institutional environments. Who uses which software? How is data collected and prepared for knowledge reproduction? Who owns further qualified source data? Who is responsible for maintaining and protecting this data? How can data be found and retrieved? Which file formats and data models are suitable for archiving? Is the data interoperable, available, and reusable for others? Who is allowed to collect which data and who has to collect which data? Anything that goes beyond individual and personal application proves difficult, since in most cases every institution is looking for its own solutions that are already restricted by institutional, organizational or legal requirements. It becomes more difficult when working on common data in extreme cases in an inter- and transdisciplinary, interdisciplinary and cross-institutional manner. Who has what rights and obligations? Who is responsible? And finally, which directional decision is made when and by whom and with what goal. This does not even include aspects such as the EU's INSPIRE Directive of 2007 or the Online Access Act.

## **Who sets standards?**

Of course, every researcher can initially decide for himself on standards. Looking at this aspect from the point of view of the heritage management authorities, this is more difficult, since one is involved in national, federal and internal digitization strategies as well as in concrete administrative and legal task assignments. For the ALSH, as the upper monument protection authority, this means the standardization of field work and the archive-compatible preparation of digital and analog data and, above all, the acquisition of metadata for the individual entities such as found objects, found samples, etc., which is strongly based on the use of controlled vocabulary. In the case of Schleswig-Holstein, this is done via various databases connected via interfaces. It is therefore important to set standards for digital documentation and archiving and this goal alone is an important driving force for digitization in archaeology. Without structured and homogenized data acquisition, data cannot flow into higher-level specialized information systems, which in turn are the basis for service-based interoperability.

An important goal is to integrate the associated framework conditions into university and non-university research and scientific qualification. This is associated with a certain need for education and training. However, a trend away from university research and state archaeology has been discernible for some years now, which is characterized, for example, by a strong specialization in applications. This specialization in the research sector is now detached from the 'users', 'practitioners', etc. in practical monument conservation, which must also ensure the balancing act of integrating lay researchers (collectors, detectorists etc.) and honorary monument conservators (Vertrauensleute). This polarity has led to accumulating problems.

The creation of digital project documentation in the form of digital data, ranging from a detailed documentation of a single object to a complete excavation to digitally processed literature research, does not seem sustainable if it is not geared towards independent verifiability. In order to enable a fundamental technical reproducibility, the achievement of which has always been in the field of analog data and documentation, the focus in the creation of research foundations must not only be on the superficial achievement of project goals, but also on long-term archiving. This requires a strictly adhered to system and standardization, which naturally applies not only to the field of archaeology. In contrast, the emerging information technologies and tools promote a plurality of application possibilities and software solutions, which meet an environment in which many students teach themselves to work with e.g. geodata databases and generate a multitude of data sets, which may be passed on to others without being checked. However, research lives from secured, i.e. authenticated data that can be reproduced. In addition to this hardly limitable group, the monument protection authorities and institutions, as well as the offices for the protection of historic buildings and monuments and the private and state museums with very different digital approaches and goals, environments, etc., face the great challenge of achieving a high degree of coordination or at least harmonization in different working groups. All in all, the cursory problem of data production, transfer, etc. is growing exponentially and makes an answer according to the "who sets standards" - the state archaeologies, state museums, state archives or even the DFG - quite difficult. In addition, with regard to DFG funding, the question of who owns the data is not always clearly answered. In Schleswig-Holstein the regulation is the following: If the DFG funds field projects for which permission is required under the law on historic monuments, this permission is granted with the aim of transferring the collected data completely and according to our specifications. Any violation of this requirement would have legal consequences for the applicant. This knowledge about application and the context of origin or development should be a fundamental part of the academic qualification.

## **Qualification for digital tasks**

The qualification of employees includes different perspectives. The training of employees in the use of hardware and software is fundamental. This takes place in the form of training activities, for example when operating systems are changed or new software is introduced. This follows as attested compulsory training and can be used for applications after a certificate of participation has been issued. Such a certificate of attendance has advantages in the context of e.g. job applications. Irrespective of this, the training of individual employees takes place within the framework of individual support.

The next level is that of databases. In Schleswig-Holstein, in addition to the web-based geo-database, which is the most important in the ALSH for the registration and administration of archaeological monuments, sites and protected areas. The Archaeological Database of Schleswig-Holstein (ADSH) has been in productive use as a web-based interface between the State Office and the State Museum for about ten years now. It has been continuously further developed. It serves as an inter-house-spanning specialized information system for the registration and administration of all archaeological field activities and in particular for all found objects and samples including the associated procedures. These range from inventorying, conservation and storage to exhibiting, lending, scientific processing and granting publication rights.

The qualification for the professional development took place on the job, i.e. the responsible employee had to get used to the work and open up the necessary fields of qualification. Here it is important to know technical standards in order to ensure the survival of recorded data (migration) and to be able to carry out project management in the implementation of IT projects. Specialists who understand and are able to apply the archaeological-methodological as well as the archival-memorial-legal background and who are also qualified in the field of GIS and other IT-fields are needed here, i.e. they can also prepare tenders and control the fulfilment of the offered services, formulate development goals or set technical standards (e.g. interfaces).

## **Effects of digitization on the tasks of the state archaeology and the resulting requirements**

In the context of the work of the state archaeology, a very heterogeneous environment awaits the young scientists to be qualified. It is about the archaeological production of knowledge, that must be technically correct and reproducible. Further, it must also be legally usable in heritage management administration or in urban land use planning. Therefore, the focus is not only on data quality but also on online access to research, administration and planning. The keyword here is open-data, as long as no special rights or restrictions stand in the way of open access. Data users like to research and use everything that is currently on their own digital doorstep. Therefore, the digital archaeological specialized knowledge is made available target group and/or user group-fairly. These include interested laymen, spatial planners and architects or scientists. The main task of young archaeologists is, in addition to new innovations and applications, to keep the resulting knowledge technically secure and future-proof on the one hand, and researchable and accessible on the other.