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# Prospects for the use of computer applications in Danish archaeology

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### 29.1 introduction

The use of computers in Danish archaeology has until recently been limited to a few large central institutions like the National Museum in Copenhagen and the Institute of Archaeology at Moesgård in Århus, which are mainly tied to central computer installations.

In Århus and in Copenhagen computer centres run by the ministry of education have been available for the Universities since 1971. They have, however, been used very little by the humanities—archaeology no exception, although a few people have used them on a regular basis since 1977–78. Nevertheless, they have been important to us in the way that they constituted a link between the developing computer world and the university departments, and to some of us they had an important educational impact. Yet the return in terms of productive output in practical archaeology were meagre.

Today the importance of the computer centres has diminished. This is partly due to the general development towards desktop computers, but also, and just as important, is the fact that the computer centres today are run on a payment basis that gives us only very limited access to their services. Indeed, the universities have been reduced to minor customers at the centres.

The first archaeological unit to work with their own computers was the Prehistoric Department on the National Museum. Here a registration project commenced in 1980 on a CP/M based micro-computer. It has developed into a regular national registration project based today on a mini computer running with the Unix operating system.

In all other parts of Danish Archaeology the micro-computer took a very long time to show up. Apart from a few odd 16 Kb home computers I believe that the next micro in Danish archaeology was a Digital PC-350 bought by the Institute of archaeology at Moesgård in 1983. It constituted an immense step forward, but unfortunately the step was taken too early and in the wrong direction. It was the year of 1984 when it became obvious that the coming PC standard would be IBM compatible, DOS based machines.

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Very quickly our incredible expensive investment of some £6,000 (1983 prices) turned out to be a venture into total isolation with no prospects at all. To day it lives its own quite life in a corner together with those students who want to write their exam papers on computer, but who do not care if they can move their papers to other machines.

The avalanche of the DOS standard, IBM compatible, personal computers that we have experienced over the last couple of years in Denmark has also had an impact on the museums and thus Danish archaeology as a whole. Finally Danish archaeology is faced with the troublesome and costly world of computers. Within an astonishingly short span of time we have seen PC's of generally a rather high standard (640 Kb RAM and a 20 Mb hard disk) pop up everywhere. This development seems to be speeding up rather than slowing down right now, and the 286 processor is currently being added to the standard in anticipation of the forthcoming OS/2 based programs.

The DOS/IBM standard has so far been the rule, and few other types of machine seem to have reached the field units, although of course there are a few CP/M machines. Apple, however, has recently launched a very aggressive price policy especially aimed at the universities. This means that the Macintosh SE with hard disk can be bought by universities at the same price as an IBM PS/2 50. This has quickly led to a situation where Apple is gaining rapidly in university circles, and we may as a consequence find ourselves with two worlds to deal with, as in fact the situation is in the U.S.A. to day.

Danish archaeology as a whole is not well prepared for the current development. There are only few 'computer nuts' among Danish archaeologists, and a recent survey of computing in Danish museums carried out by the National Board of Danish Museums showed a despairing lack of specific archaeological use of the new equipment (Floryan *et al.* 1987). Everybody had acquired a word processing program with which they were extremely happy. Many had also bought a financial program for their bookkeeping, and a few had bought a database management package. Although the main reason given for the latter purchase was the intention to create an 'archaeological database' nothing or very little had so far come of it. Neither did the survey make any mention of special programs having been developed for archaeological purposes.

The major problem facing Danish archaeology today is thus not to acquire suitable computers for all archaeological units in the country. They already have, or will get, very suitable hardware within the next couple of years. The real problem is one of suitable software for Museum administration and registration, and for the archaeological research process in general.

Naturally, one could wish that Danish archaeology as a whole had been more tuned for the new development, but on the other hand the lack of 'do it yourself computer specialists' all over Danish archaeology is not without advantages. There is a possibility that we can avoid a situation where every archaeological unit use their own home made systems, and further that central authorities will have time to set up rules for registrations before too many museums make their own rules concerning what and how archaeological data should be filed.

I do not believe that we can entirely bypass a phase of chaotic 'everybody do it their own way' computer archaeology, nor am I convinced that it would be a benefit if we did, but I think that much can be achieved with respect to common rules of registration. This is mainly due to the tradition of central registration that exists in Danish archaeology, where it is closely associated with the Danish National Museum. Today the central registration of grid referenced monuments and finds are firmly law-

based in the Antiquities Act, and further enhancements on this Act is currently being proposed for the next revision.

Another way in which to avoid too much heterogeneity in the use of computers in Danish archaeology is through large centrally organised software development schemes. It is expected that, given the existence of high-quality public domain software for specific archaeological purposes, the museums will tend to choose this software instead of using more inferior solutions, even if it is their own. In this way it is hoped that a sort of standard can be created.

Three projects should be mentioned in this connection:

## 29.2 DKC

DKC—The central register of Danish culture history—at the National Museum in Copenhagen has for some years been working on a national data base for all grid referenced archaeological finds. The background of this data base is the so-called 'Parish Description'—a geographically organised filing system established over a hundred years ago, and updated ever since, in the last 20 years on a regular national scale. Since 1982 all accession has been computerised, and the old handwritten files are currently being transferred, a job that is expected to be completed around 1994 (Høy 1988).

Another recent initiative from the National Museum is to accomplish a computerised registration of the museums complete collection of artifacts. A description system with all data fields defined has been decided upon (Larsen *et al.* 1987), and registration has commenced in the department of ethnography. A selection of key data fields from this registration project has been defined as a starting point for a future national artifact data base to be organised by DKC.

As a service to the museums, and as a mean to create a homogeneous registration practice in Danish museums, it is planned to make and distribute PC versions of these data bases in which each museum can have the part of the central data base that applies to their area, and in which they can also add their own information.

## 29.3 Administration of Danish Museums

The National Board of Danish Museums is currently working on the development of an administrative system for the Danish museums. In addition to more general administrative issues this system is intended foremost to cover the special needs of the museums for administration of the antiquarian work: proper filing in the museum archives and reporting to central authorities and registers as well as proper stock handling of museum collections.

The basic feature in this administrative system is the subject file created every time a museum is approached with information of culture historical interest or itself instigate a culture historical investigation. The system is intended to take care of all the administrative proceedings around this subject file. However, it is not intended to deal with the research defined and administrative procedures relating to field work, and the writing up of reports in connection with field work, although of course it handles the reports and materials that are the result of field work.

## 29.4 KARK

The Institute of Archaeology, University of Århus, has recently initiated a project called KARK (Komputerstøttet ARKæologi = computer supported archaeology). Its purpose is to further the distribution and use of software for specific use in the archaeological research process. The remainder of this paper will focus on the KARK project.

The background for the project is a worried concern with the recent explosive development. Based on our own experiences, we have followed the extremely rapid spread of powerful computers to the museums with mixed feelings. We fear that the complete lack of dedicated software for archaeological purposes and the non-existent educational background among archaeologists at the museums concerning computers can easily result in a set back, the computer becoming the tool of the secretary—substituting the typewriter—and not an innovative tool for the archaeologist.

We found this to be a rather depressing prospect, and therefore decided to formulate a project, the basic goal of which, is to further the use of computers as an integrated tool in archaeological research. We intend to pursue this goal through three main activities:

1. An international search for programs dedicated to archaeological research, which can be applied to Danish archaeological practice.

It is quite obvious that the first thing to do is to look abroad. While very little has happened in Denmark, things have been moving very fast in other countries: Britain, The Netherlands and Germany to name some of those that we are closely associated with archaeologically, are countries where a lot of archaeological software development has taken place over the last years. Instead of trying to re-invent the wheel it is our intention to seek out this growing new knowledge among our fellow archaeologists in other countries and try to transfer it to Denmark.

It means an effort to trace down literature and get it to Denmark, it also means the creation of a set of international contacts through which news and other information can be gained, and finally it means the import, customization and distribution of software to the Danish archaeological institutions.

2. An independent development of programs to Danish archaeology, and the integration of various modules to user-friendly packages.

There are two areas here where we plan to concentrate our efforts the first couple of years. One is to set up an integrated system for computer registrations in the field, for further registrations in the laboratory, for simple sorting and reorganisation of the data and for semi-automatic generation of excavation reports. Systems of this type exist in Britain among other areas, and certainly we expect to receive many ideas here, but the specifics of field registrations as well as the organisation of excavation reports in Denmark differs to a degree that makes it necessary for us to tailor our own system. Much of the basic work is already done in connection with the large scale excavation project of the Illerup Iron Age bog offerings, and it is the system created here for storing, maintaining and analysing the excavation data, that will constitute the backbone for further developments.

Another area is programs for descriptive statistic analyses. Over the last ten years I have been working intensively with descriptive statistics in archaeology, and

have among other things assembled a set of statistic routines on the mainframe of the computer centre in Århus. The routines cover many aspects of descriptive statistics from simple univariate to complex multivariate routines—among others correspondence analysis. They are gathered in a very machine dependant package held together by a Pascal-programmed shell, which makes them easy to handle (Madsen 1985). It is the intention now to transfer or rather rewrite this package for the IBM PC, using available modules for the statistics, and program the user interface only from scratch.

3. The dissemination of programs, or knowledge of programs, and their usage to archaeological research institutions in Denmark. This, naturally, is more or less an internal problem for us. Probably we will handle it by starting a Danish newsletter, much the same as the *Archaeological Computing Newsletter* here, and by initiating a user group for Danish archaeologists.

In order to create a sound technical basis for the project, a major application was formulated. Subsequently, the Danish Ministry of Education awarded us, via the National Science Foundation £30,000 for 1988. This grant will make it possible for the project to establish a 'work bench' for the development and integration of software, including the use of graphics on quite a sophisticated level.

The equipment that is currently being installed consist of an IBM PS/2 model 80 with 115 Mb hard disk, tape streamer and an optical WORM type of disk drive. The peripheral equipment will consist of a NEC Silentwriter 980 PostScript laser printer, a HP Draftpro plotter handling paper sizes up to A1, a Calcomp 2000 digitiser, and an IBM 3117 Image Scanner. As hand held field equipment our choice has fallen on a machine called the Husky Hunter with 640 Kb of RAM the content of which is stored as long as batteries are kept charged.

The available development software comprises the dBase III+ data management system; C, FORTRAN and Pascal language compilers; an image support facility, graphics development tool kit; and Windows development tool kit.

The technical aspects thus taken care of, our immediate objective is to create an international network of contacts between archaeologists working with computer applications in archaeology. To put it bluntly: we have no intention of inventing the wheel twice. Therefore every bit of handy archaeological software, every piece of hard earned experience, and every bright idea that we can lay our hands on are more than welcome.

Naturally, with this objective we are very interested in contacts with fellow archaeologists in other countries dealing with the use of computers in archaeology, who are urged to contact the author.

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