

8 Arkeoplan: a new tool for the archaeologist

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8.1 INTRODUCTION

New tools in Archaeology usually come from the conjunction of the archaeologist's needs and an already existing machine. Tools, which have been built for special appliances, are used in different ways by the archaeologists for their own purposes. This attitude is widespread in the field of computer applications in archaeology. The conception of the machine called Arkéoplan has followed a different route.

8.2 CONCEPTION OF ARKEOPLAN

8.2.1 Identification of the needs

We started at the excavations, where we have examined the successive phases of work: digging, drawing, recording, etc. Drawing and recording are the slowest and most boring tasks of field-work. More specifically, the measuring of artefacts and of architectural elements takes much time and is the origin of many mistakes. Thus we had to realise a tool which supports these tasks, and gives more time back to the archaeologist for him to contemplate and interpret his discoveries.

The use of laser topographical instruments reduces the mistakes and accelerates the drawing, but the duration of the recording takes almost as long as with traditional methods. Moreover, the drawing software on the market does not solve the problem of the recording of stratigraphical units and artefacts.

To solve this problem, our method can be summed up as follows: We bring an image of the excavated area on to the screen of a computer where we can trace the layers with exact geometry; the program enables us to control the coordinates; with these, we can correct and assemble images automatically, and we can draw and print layers correctly.

8.2.2 Principles of the realisation

When the purpose had been clearly established, the conception of Arkéoplan followed a number of successive stages, where we have delimited the different operations necessary to realise our purpose and the possibilities to transport the tool into the field.

The successive steps of work are:

- the recording of a nearly vertical image of archaeological layers;
- transmission of this image to the computer screen;
- software for tracing the interpretation superimposed on the image;
- translation of the drawing and the data to a printer;
- saving the data on disk.

To create an ergonomic tool, we have to consider the following conditions:

- Evaluation of the environment of the archaeological field;
- Evaluation of the qualification of the futures users of Arkéoplan;
- Solidity of the components of the machine when working outdoor;
- Rapidity and easiness of setting up the system;
- Listing of the successive stages of the creation of an Arkéoplan data base;
- Research into the lowest cost of the configuration;
- Research into pre-existing software and machines like computers, boxes, photo tripods, etc.

After many discussions with engineers and field archaeologists in 1990 we chose the following instruments to realise these functions:

- a big tripod to hold the camera between five and ten meters above the layers;



Figure 8.1: The Arkéoplan system in the field with the tripod and its seven meter long pole to hold the camera.

- A CCD camera to obtain an instantaneous digital image of the excavation. A photo camera would give better images, but the time necessary to develop the film would be too long;
- Remote control of the camera;
- A laser printer to print the image from the camera, and the drawings made by Arkéoplan directly;
- A 300 MB hard disk to store the data.

8.3 DESCRIPTION OF THE ACTUAL SYSTEM

8.3.1 Characteristics of the Arkéoplan system

The principal aim of the program is to enable freehand and corrected drawing of interpretations of layers directly on the image of the excavation. We cannot use a classical Paint program, as it does not offer the possibilities of measurement and definition of identified objects.

CAD programs are also insufficient, because they do not work with images. The nearest existing program is probably Adobe Illustrator™, with its three layers, template, artwork, and preview illustration: but the template of Adobe Illustrator™ has only two levels of grey scale. We need two hundred fifty-six to interpret the image of the excavations correctly.

Secondly, we need a topographical reference system and an automated procedure to correct and assemble the tracing of the images.

The program has also to create a data base from the drawing.

8.3.2 Recording of the images

We have developed a program called Azur that creates the image, which is then transferred to

Adobe photoshop. Arkéoplan is able to read the images of Azur or Photoshop, or any other image in the Pictfile format.

8.3.3 The photo tripod

To put the camera vertically above the excavation, we need a tripod, bigger than a normal camera tripod, that can support a nine meter long pole (Figure 8.1). We have adapted an existing tripod for our purpose. Exposures are made nine meters above the ground, thanks to the pole on the tripod. A head gives the vertical axis and does the centering. It is directed by remote control. The whole set-up is put into place by two people in fifteen minutes.

It is also possible to use a suspended carriage for the camera, when excavating under a shelter. In another version, the computer equipment is placed in a van, and an eleven meter jib is put on top of the vehicle.

8.3.4 Fitting up

The whole equipment, tripod, camera and computers including the laser printer, can be accommodated in a small van or in a car whose rear seats have been pulled down.

Connecting the system is easy, because all the connectors are different.

The camera, the zoom lens, the transmission and the aperture are all set by remote control.

The whole system has been tested on the Celtic sanctuary of Ribemont-sur-Ancre, at Amiens, north of Paris. We have had to draw human long bones, which had been assembled into a little square construction (Figure 8.2). The Azur program handles the two hundred fifty six shades of grey and provides a digitally treated image. The image can be directly printed on a laser printer, in the field.

With a digital, on screen clipboard it is possible to correct the image. The image is renewed every half second.

At Ribemont, we used the printer image to note identification and the registration of the bones. We made the interpreted drawings later. But it's also possible to do the interpretation of the excavation immediately. We can adapt Arkéoplan to the specific conditions of the excavation.

8.4 ORGANISATION OF THE DATA BASE

Arkéoplan combines a mapping of the excavations, and the recording of the artefacts and the layers. The resulting data base is perfectly adapted to spatial analysis.

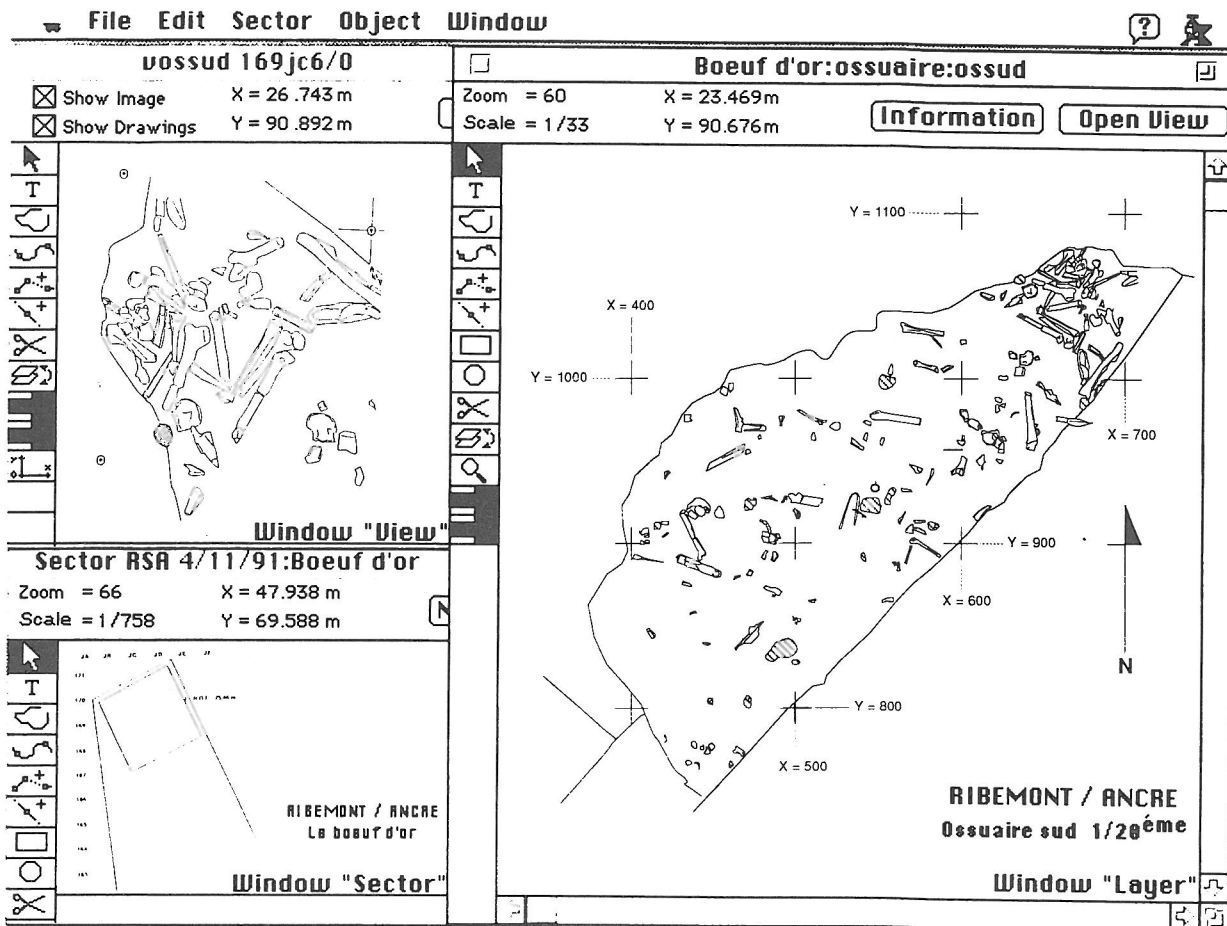


Figure 8.2: Example from Ribemont-sur-Ancre of the on-screen drawing facilities, and the type of drawings they produce.

Arkéoplan itself starts with the definition of a geometric grid for the whole site. The program enables us to manage the co-ordinates. With them, we can correct and assemble the interpretations of the image. The layers of the site, from a scale of 1 to 1 to a scale of one to ten thousand, are also available.

The site is divided mainly as follows:

- The sector, which corresponds to one unit of excavation;
- The area, which corresponds to the context where the drawing of artefacts is made according to traditional methods;
- The view, which represents a part of a layer. It is defined by the surface photographed at any time.

With Arkéoplan, we can trace drawings directly on Azur images.

We only need to choose three reference points on the image. We give these co-ordinates of the points in a dialogue.

Then, we can draw directly on the screen all the elements we wish to have on our drawing. The computer will correct and orientate the successive interpretations of the images and the views. It will also assemble the views to make an area.

The classical tools of vectorised drawing are available: Bezier curves, zoom, geometrical forms, symbols, pattern, etc.

Arkéoplan is also able to transform the outline of an artefact that has been drawn previously into a symbolic representation. This symbol is adapted to a specific scale range.

When we have finished drawing an object, artefact or stratigraphical unit, we can create a descriptive file. Here co-ordinates, descriptive attributes and a distinctive number characterise every artefact and every context. These characteristics will enable us to use the graphic data base and to export data to a data base or a spreadsheet. It is also possible to transfer all the data to a 3 D application.

The use of a zoom lens facilitates the transition from one scale to another.

The original image is stored with its vectorised interpretation. It is thus always possible to return to the original image to correct or complete the interpretations. The archaeologist can supervise and correct the drawing of the operator, or correct his own interpretation.

8.5 CONCLUSION

The aim of Arkeoplan is not to make the best representation of the most exciting discovery of an excavation campaign. On this exceptional occasion, other methods, like photogrammetry or a hand drawn plan, for example, may be more useful. With Arkeoplan we can record images very quickly of one level, and realise the drawing immediately or in the following days, with very fine topographical definition, and without measurement. The system manages the successive drawings of the levels, the areas, and the sector. It's possible to ask the data base to obtain a map of the different artefacts or levels.

In conclusion, we would like to state that after one year of field experiment, this product has shown itself to be effective and satisfying. The use of Arkéoplan is not difficult. A team of students in September 1991 learned to use it in three days.

We do not regret the boring time spent in preparation, reflection, making contacts with five or six companies, and searching for money. New tools, computer, camera, or tripod in further years will be, probably more performant. But we think that the basic principle of Arkéoplan, free-hand drawing traced on the layer's image, opens a new direction.

Note: Arkéoplan is available through B.E.M.E., 118, rue de Lodi, F 13006 MARSEILLE. Tél. (33) 91920599. FAX (33) 91429200. There are two versions: one in French and one in English.

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