

Issues of collection and dissemination of digital data from the Brown University Abydos Project

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Introduction:

Modern archaeological projects collect digital data in an increasingly large number of forms, and manipulate and share those data with growing sophistication. For instance, digital photography has allowed not only better recording of excavations, but also innovative documentation of artifacts and architecture. Techniques such as Reflectance Transformation Imaging and digital infrared photography allow unseeable details of objects to emerge. Readily available software means that photogrammetric recording of walls can be done with relatively little time or expertise. Subsurface survey techniques such as magnetometry and ground penetrating radar allow the location of architectural remains that cannot be seen from above ground. Surveying and the organization of survey data in Geographic Information Systems (GIS) allow not only the making of maps but the analysis of trends over space and time, and artifact databases enable information about finds to be stored and queried. Even the collection of sound and video data is often now used to capture the ambiance of excavation.

The Brown University Abydos Project, an archaeological mission in southern Egypt, has been excavating a series of underground vaults that were used for the burial of animal mummies; this work illustrates both the promises and the pitfalls associated with digital data in a modern excavation. All of the types of data mentioned above have been collected by the project. However, there are serious issues with both the collection and the dissemination of such data, some of which are due to the nature of the specific site and some of which are more general to large archaeological projects. This paper will give an overview of the structure itself before discussing some of the problems and promises of data collection and sharing at Abydos. It is not intended to be a comprehensive presentation of the types of digital data collected and used by this or any other archaeological project, but rather a more anecdotal discussion of some of the issues raised by one case of modern archaeological recording.

The Abydos Animal Galleries:

The animal galleries currently being excavated and recorded by the Brown University Abydos Project (BUAP) were first discovered by a magnetometry survey that was undertaken by the Institute of Fine Arts, New York University in 2002.¹

¹ The Brown University Abydos Project operates under the aegis of the University of Pennsylvania-Yale University-Institute of Fine Arts, New York University, Expedition to Abydos (PYIFA), which is co-directed by David O'Connor and William Kelly

This survey documented subsurface magnetic anomalies in a regular pattern that strongly suggested that a series of parallel walls lay below the surface of the sand. The area in which this was observed is a small plot of unused land within a modern Coptic cemetery. On the basis of the survey a single test trench was dug; this demonstrated the presence but not the nature of the ancient architecture. Negotiations with the local Coptic community allowed this plot of land to be set aside for archaeological exploration, and the BUAP began excavations in this area in 2008.

While the full extent of the animal galleries is not yet known, the past five years of excavation have done much to clarify the general layout of the building as well as its date and use. The entire structure is underground and is built out of mud brick. A staircase to the northeast leads down to a long central corridor, which is vaulted. Small arched doorways at regular intervals on either side of this corridor lead to side vaults that are laid perpendicular to the central corridor and parallel to one another. Each is about 13m long and very solidly built. Eighteen side vaults are known to date and the structure may be much larger than this, though the rest of it is likely to be inaccessible beneath the occupied parts of the modern cemetery. All of the vaults are more or less structurally intact; the only exceptions are places where looters have dug holes either down from the surface or between vaults. Where there are looters holes, sand has filled the vaults, but in other places the structure is still largely clear and it is possible simply to walk around in a space that no one has recently walked, possibly for centuries.

The original contents of most of the vaults were entirely ransacked; however, their nature and function is clear from the broken remains. The vaults housed hundreds, thousands, of ceramic vessels, each containing the remains of animal mummies, and each sealed with a lid and plaster seal. These vessels presumably would have been stacked to great heights within each vault. The vast majority of recovered mummies are those of ibises, a bird sacred to the god Thoth and also related to the worship of Osiris, god of the dead, who was the main deity of Abydos. Ibis eggs were also often interred in these pots. Additional animals found include hawks, a dog, and a snake. This type of cemetery for animal mummies given as votive offerings to the gods is well known from many sites in Egypt. This is the largest such cemetery known to date at Abydos. At various points along the floor of the central corridor were found buried small bronze figurines of Osiris. Three further small sculptures and a cache of Ptolemaic coins were found buried outside the galleries, near the staircase. These

Simpson with Matthew Adams serving as Associate Director. The Brown work would have been impossible without close collaboration with these colleagues. The BUAP has been generously funded by the Department of Egyptology and Ancient Western Asian Studies and the Joukowsky Institute for Archaeology and the Ancient World at Brown University; Mr. Patric Gregory; and a Salomon Foundation award. Thanks are also due to the Ministry of State for Antiquities in Egypt and the American Research Center in Egypt, which support and facilitate the project in innumerable ways.

finds as well as the forms of the ceramics used for the animal mummies have helped date the building and its use to the first half of the Ptolemaic period, c. 332-200 BCE.

The extreme smashing of the pottery and the apparent removal or destruction of most of the animal mummies probably date to the second major phase of use of the galleries. Two of the vaults so far discovered were reused in the Late Roman period, probably in the first five centuries CE, when they were cleared of their contents and remodeled into combined domestic and religious spaces. One of these repurposed vaults, our vault 12, was particularly remarkable. This vault was divided into three sections, the center of which was opened to the sky to serve as a light well. A staircase was built leading down into this open room, and room and staircase were entirely coated with white plaster. The southeast end of the vault was turned into a living space, also white plastered, with two round windows letting in light from the light well and several deep niches carved into the walls. The niches retained circular stains, presumably from the bases of cups or bowls used by the inhabitants of the room much as your desk might have a round stain from a coffee mug. The northwest end of the vault was remodeled into a religious space. In addition to white plaster and windows this room was provided with a larger apsidal niche and a series of remarkable paintings. The apsidal niche was decorated with a polychrome image, only partly preserved, of Christ standing on an elaborate cross. He is flanked by saints Peter and Paul. The niche itself is flanked by painted engaged pilasters that have haloed heads of saints on either side. This is in the middle of the northeast wall. Below the niche were red and black paintings of heraldically posed lions. One is suckling cubs. The northwest wall retained several black and red paintings, including a fairly complicated scene of Abraham preparing to sacrifice Isaac. A long inscription ran around the walls of this room, and several architectural elements, such as the windows, also had short preserved inscriptions. A suite of rooms, including a kitchen with a large oven, was built above ground over the southeastern end of the repurposed vault. The discovery of this adaptive reuse of the ibis galleries was as breathtaking as it was unexpected.

Problems of data collection:

Paradoxically, the excellent state of preservation of the architecture of the animal galleries creates serious problems for the recording of the structure. The principal types of data we need to collect are survey points and photographs. Standard surveying techniques require a line of sight between a point of known coordinates, over which a total station is set up, and the thing being surveyed. This is easy when you are dealing with a destroyed building, only the ground plan of which still exists on the surface. The vaults are intact, and underground, and connected only by small doors: there is no single place from which more than a small minority of the interior can be seen. Simply getting the station set up required placing a long string of temporary datum points along the central corridor. From these, further temporary points could be set up inside individual vaults. The number and closeness of such temporary datums increased the error range of each individual surveyed point considerably. Even with this relay of datums, it was not possible to reach all parts of

the subterranean structure. The adaptively reused vaults caused even greater problems, as their rooms had been subdivided into spaces so small as to make station setup extremely difficult. Problems of light compound the problems caused by lack of lines of sight. We use a reflectorless total station that can be run by a single person, but in the dark the station operator cannot find the points that should be shot. Every point required a second person with a flashlight and a finger highlighting the point to be surveyed. After some trial and error we also began putting pieces of white masking tape in irregular patterns on the walls and vaults of the structure. Each had a marked point at its center, and those points could be surveyed by a single surveyor with sufficient artificial light in the chamber. The time necessary for this type of surveying was much greater than for surveying above ground. Nonetheless, thanks to extreme effort on the parts of our two surveyors, Jonathan Weiland and Ian Brownstein, a huge amount of data was collected and point clouds for several of the vaults were made. There are only a few areas that we are still unsure how to survey; most of the remaining problems are ones of time.

Photography in the vaults presented problems, too. Here the issues were largely ones of light and space. Because very little natural light gets into the underground chambers – virtually none in most of the side chambers – artificial lighting was essential. We have not run electricity down into the galleries and could not easily do so. The best solution turned out to be flash photography. This had the great advantage of consistency, which is impossible above ground given the movement of the sun and changing weather conditions, but also had disadvantages. Flash lighting flattens the appearance of some surfaces, and throws problematic shadows in some places, such as the doors between the central corridor and the side vaults.

Use of the collected data:

While gathering survey and photographic data has certainly presented challenges, we think that our use of these data will allow us both to study this structure and communicate about it to a broader audience in innovative ways. One goal of the most recent season was to fully document as many side vaults as possible using both surveying and photography, and to make the photography so intensive that it could be imported into photogrammetric software (Agisoft) to produce 3D models. These models then would be hung on the surveyed points and thus positioned accurately in the GIS. The irregularly placed masking tape dots facilitated this, allowing the photogrammetry software something clearer than the monotonous repetition of mud brick to build upon, and ensuring that the stitched photographic results had easily recognizable points in common with the survey point cloud.

While the software to create 3D photographic models of this sort is excellent for the purposes of the archaeologist, it does not really allow an interactive experience with the spaces recorded in this way. We decided it would also be desirable to bring these models into gaming software to allow a user to “walk” through the galleries. While the first phase we envisioned was simply a “walkable” model of the structure as it stands, we also envisioned being able to recreate different phases of its use, for

instance showing what it was likely to have looked like at the time of the animal burials, before the Coptic remodeling. The first stage of processing the data in a gaming environment has been undertaken, but we are far from a finished product on this front. One thing we are struggling with is the sheer number of data: one must reduce the detail of the walls dramatically to make a game that can be used in reasonable amounts of time on an ordinary computer. While other projects have undertaken large scale creation of 3D models, we are rare in our commitment to photogrammetric reality and in our miniscule budget: this work has been undertaken entirely by unpaid students.

In addition to its pedagogical use, the gaming model also makes it easier to see places where our recording is inadequate. For instance, the game experience of being in any single space tends to be quite good, but the experience of moving between spaces continues to need refinement. It is clear we tend to have problems with doorways, both in the surveying and in the photographic record.

Problems of data management and dissemination:

The types of survey and photographic data discussed above are far from the only digital data collected by the BUAP, but they serve to illustrate some of the problems of managing and disseminating digital data for a modern excavation. The BUAP is one of many American projects working at Abydos, which is an extremely large site. Brown has an agreement with the PYIFA, which acts as an umbrella expedition and data clearinghouse for much of the work done at Abydos, to share survey data as well as to maintain a common artifact database. This has not always proved easy. The staff of the BUAP is largely students, meaning that there is a great deal of turnover. This has proved especially troublesome with regards to surveying. While each year has had an excellent surveyor, they often organize collected data differently and to a certain extent reinvent the wheel every year. For the continuity of the records of the BUAP this is complicated; for data sharing between missions it is a nightmare. Without the budget to hire a regular surveyor this problem is likely to continue. It is not clear that the great progress we made in gathering 3D data and putting them into gaming software can be built upon in the future, as the students who were working on the project have other commitments. There is more continuity in the photographic record because the project director is the main photographer. However, storing photographs, which are not shared between projects, is not ideal. Our current practice is only to upload the images to a private portion of the Brown Digital Repository. The photographs are named by date, but do not otherwise have data attached to them. This means they are simply stored, not a resource that can be searched by archaeological context or meaningfully shared with an audience that does not know the material. Given constraints of time and money it is not currently expected that we will be able to increase either the data attached to each photograph or the public accessibility of the archive.

Finally, issues of dissemination require special attention for any project working in Egypt. The discovery of coins and small sculptures mentioned above provides an

example of both the legal and moral hurdles to data dissemination for the BUAP. The Ministry of State for Antiquities in Egypt quite properly reserves the right to publicize all new discoveries in Egypt. Publicly sharing photographs of anything that might be counted as a major discovery prior to a press release by the Egyptian government would be in violation of the permit under which our project operates. Furthermore, we have a moral obligation to help protect the site. Discoveries of objects of monetary rather than simply scholastic value are very rare, but they cause problems, particularly in a time of political instability. Many sites in Egypt have seen increased looting since January 2011. To make public images that suggest a site still has treasures beneath the sand is to imperil the site. We must balance the need to publish excavated material with the need to protect an endangered site.