4th April 1939, the first day of excavations at Ano Englionos, was one of the turning points in the study of Greek archaeology. In addition to revealing the Mycenaean Palace of Nestor, the first test trenches were placed immediately above the two-room Archives Complex, where the vast majority of the administrative documents of the palace had been stored when it was destroyed and burned ca. 1180 BC. These documents, mostly clay tablets, were written in the Linear B script. For as long as the script was undeciphered, it was thought by many scholars to record a “Minoan” language from Crete. The preliminary publication of the transcriptions of the Pylos tablets by Emmett L. Bennett, Jr. in 1951 provided the critical mass of data on the script that led to the decipherment of Linear B by Michael Ventris the following year. Ventris showed that Linear B was used to write an early form of the Greek language.

The decipherment of Linear B shed light on virtually all aspects of Mycenaean Greece, from social structure to the organization of the economy, from the naming practices of Bronze Age Greek-speakers to the scribal practices of palatial administrators. The Pylos tablets have played an especially prominent role in reconstructing this Late Bronze Age world, because of the number of the tablets found at the palace, which is second only to those from Knossos, and their length and state of preservation. Whereas three-quarters of the Knossos documents are incomplete, only half at Pylos are, and whereas 5% of the Knossos tablets are of the larger, page-shaped variety, some 15% of the Pylos tablets are page-shaped (fig. 1).

Despite their importance, however, no comprehensive edition of the documents from Pylos – which include not only tablets, but also labels and sealings, inscribed and uninscribed – has yet been published, more than 75 years after the Pylos tablets were first excavated and almost 65 years since Bennett’s preliminary publication that spurred the decipherment. The authors, in collaboration with a small team of scholars, are currently in the process of studying these important documents for publication, using traditional methods as well as newer digital technologies. In this chapter we briefly discuss our ongoing work on the tablets and conclude with a discussion of their importance to Greek archaeology and history.

Full scholarly editions of Linear B tablets traditionally include line drawings, photographs and transliterations, along with basic information about their size, colour, number of fragments, and publication history.

1. We cannot thank enough the National Archaeological Museum, and especially the curators of the Department of Prehistoric, Egyptian, and Anatolian Antiquities, for their enthusiastic support of our research project, which takes place under the auspices of the University of Cincinnati and in affiliation with the American School of Classical Studies at Athens. We gratefully acknowledge the financial support of the Institute for Aegean Prehistory (INSTAP), Loeb Classical Library Foundation, the Andrew W. Mellon Foundation, and the Institute of Classical Studies.


Fig. 1. Page-shaped tablet NAM Tn 316 from Pylos. This tablet records offerings to several divinities, including Zeus, Hera and Hermes.

Fig. 2. Tablet NAM PY Es 657, illustrated by Yannis Nakas. Note the cross-section on the right, as well as the contour shading on the writing surface.

These methods of documentation are all critical to interpretation, and our project will continue this tradition. Yannis Nakas, an archaeologist and illustrator, is currently illustrating the tablets using established standards in the field, as well as introducing some new ways to represent the complexities of these artefacts. We have chosen to include, for example, cross-sections to indicate the shape of the tablets and shading to show the slopes on the sides around the flat writing surface (fig. 2). Illustrations of Linear B texts are generally focused on the incised Linear B signs, to the virtual exclusion of the physical properties of the tablet. Certainly the virtue of line drawings is that they guide the user to view the document through the eyes of an expert, for whom the smallest differences are significant in determining the value of any given sign. Yet we consider it important that our illustrations represent these documents not only as texts, but also as archaeological artefacts.

The Linear B records are archaeological artefacts and need to be studied as such; this is a guiding principle of our work that manifests itself in our project through three modes of analysis.
First, we are studying the physical properties of the Linear B documents from Pylos. Drs. Julie Hruby and Joann Gullizio have been analyzing the clay and fabric of the tablets using standard macroscopic protocols. The result of their analysis will be a typology of the clay fabrics used to make the Pylos tablets, comprised of standardized descriptions of the colour of the clay and the colour, size, composition, and commonness of inclusions, as well as noting whether the tablet was broken before or after firing. This last detail, in combination with new work on the archaeology of the Palace of Nestor, is contributing to our understanding of how the palace was destroyed and the processes that shaped the preservation not only of these texts, but also the entirety of the archaeological record from the site. Although our work is still preliminary, we can already say that the fabrics of the tablets are heterogeneous and over twenty different fabrics have been tentatively identified, although that number will likely be reduced as seemingly distinct fabrics prove to be identical.

Second, we are using X-Ray Fluorescence (XRF) to examine the elemental composition of the clay of the administrative documents from Pylos. This analysis is being conducted by Billy Wilemon under the supervision of Dr. Michael Galaty. This non-destructive scientific technique creates an X-Ray beam that displaces electrons from their orbital shells and, by measuring the energy that is shed in the process, identifies the element of each atom affected by the beam. Although our analysis has just begun, we can already note that there is significant variability among the tablets and sealings. It is unlikely that we will be able to identify specific sources of clay based on these elemental data, especially considering that much of the clay used to manufacture tablets was likely mixed. On the other hand, we may be able to identify outliers—i.e., tablets whose composition varies significantly from the corpus as a whole, or from subsets of that corpus. Of course it will be especially meaningful if outliers are internally consistent in other respects, such as common findspot, subject matter, or scribal hand.

Third, we have been using structured light scanning to produce three-dimensional models of each document from Pylos. This work has been undertaken by Dr. Jim Newhard and Benjamin Rennison. While our 3D process produces a highly accurate digital model of the surface and shape of the tablets, it is not well suited to accurately record the inscriptions. Instead these models help us to understand the manufacture of the documents, subsequent modifications by scribes, and damage to the tablet both during and after the destruction of the palace.

The final aspect of our project involves improving on traditional photography. Linear B tablets do not photograph well. The incisions can be shallow and the tablets are sometimes not well preserved. Consequently raking light is crucially important to viewing the tablets, for both autopsy and photography. However, light from any one angle clarifies some details while obscuring others. Our solution is to make use of Reflectance Transformation Imaging (RTI), also known as Polynomial Texture Mapping.

or PTM). This is a form of computational photography in which multiple photographs of the same artefact are taken, with the direction or angle of the flash modified for each photograph. In our case, we took 54 high-resolution images of each inscribed surface. These images are stitched together into a single file, using a protocol developed by Tom Molzbender in 2001 that is freely available online. This composite file can be manipulated in a digital environment to adjust lighting of the object in an interactive virtual environment.

In addition to manipulating the direction of the light, a number of visualization modes are also possible. For instance, the reflectivity of the surface can be enhanced, reducing surface noise; or, incisions can be made to appear darker and deeper through various image-sharpening techniques, such as unsharp masking. Moreover, because RTI uses the way that the artefact responds to light to calculate its surface normals (a surface normal is a vector perpendicular to tangent plane of the surface at a given point), RTI can display a tablet's topography, stripped of all colour. The rendering mode of "normals visualization" replaces the colour data of the images with blue, green and red to represent the surface normals of the tablet. This rendering mode eliminates several hindrances to legibility, enhancing reading by removing shadows from surface irregularities, removing mottled surface colouring, and clarifying faint or shallow incisions (fig. 3).

Fig. 3. Tablet PY Tn 316, with Normals Visualization rendering.

The goal of our project, which has many parts, is not only to produce a standard edition of the Linear B texts from Pylos, something that is urgently needed, but also to augment the research tools at the disposal of

6. For more information on RTI, see the website of Cultural Heritage Imaging: http://culturalheritageimaging.org/Technologies/RTI/
archaeologists and scholars of Linear B. Standard editions, while they are useful tools, are also limited by the print medium for which they were designed: they turn three-dimensional artefacts into two-dimensional texts and force the user to rely on a variety of editorial decisions for interpretation and reading. Digital editions, on the other hand, allow us to put more data into the hands of users, who can work interactively with the texts in a digital environment that provides accurate renditions of the colour, shape, topography, and texture of the texts. That is, it allows them to work with the Linear B texts at something approximating autopsy. These data, moreover, can be linked to metadata, like findspot, publication histories and scholarly interpretations. We can perhaps begin to think about and plan digital corpora of Aegean documents for a new generation of scholars.

The Linear B texts provide a unique window into early Greek history and archaeology. They provide information at an extraordinary level of specificity in an essentially prehistoric world. We cannot name any Mycenaean kings or narrate the events of their reigns, but we can identify the handwriting of some 26 scribes at Pylos and we know the names and activities of some 900 shepherds, smiths, workers, landowners, and officials. Although the main purpose of the tablets is to track goods and services in and out of the palace, the tablets unintentionally shed light on much more than taxation. For example, we are told that a man named Opheltreus/Oφελτρεύς (Linear B o-pe-te-re-u, also written o-pe-to-re-u; no exact alphabetic Greek equivalent is attested, but cf. Οφελτρας) holds one plot of land “because of manslaughter” (Linear B e-ne-ka a-no-qa-si-ja; the alphabetic equivalent would be ένεξα ανδοκταιας) and another plot of land “having exacted satisfaction” (Linear B qe-ja-me-no; cf. alphabetic τεραδαμος). We may legitimately infer that some member of Opheltreus’ family was murdered and Opheltreus was given (or perhaps took) compensation in the form of access to land. How exactly this decision was made cannot be known, although it seems likely that it was the collective body known as the domos (Linear B da-mo, alphabetic δαμος) that ratified and legitimated it. It is through careful study of such windows into Mycenaean life that we can begin to appreciate some of the social practices that gave texture and meaning to life in Greece during the Late Bronze Age. Without the Linear B tablets, we could imagine such scenarios, perhaps through reference to similar situations the Homeric epics, but we would not have any evidence for them.

On the other hand, the Linear B tablets are silent on a great many issues. They do not tell us how the Mycenaean palaces came into existence, nor about much that lay beyond palatial control, including the lives of most Mycenaeans, nor about the brisk international exchange that we know from archaeology was such an important part of the

7. On the scribes of Pylos, see T. G. Palaima, Scribes, Scribal Hands and Palaeography, in Y. Duhoux
2. Peeters, Leuven 2011, 33-138. On named individuals, see D. Nakassis, Individuals and Society in
8. See S. Lupack, A View from Outside the Palace: The Sanctuary and the Damos in Mycenaean
Late Bronze Age system. It is consequently crucial that Linear B studies maintain its intimate connection to Mycenaean archaeology, for each one complements and illuminates the other. And this is comprehensible nowhere more so than in the Prehistoric Collection of the National Archaeological Museum.

Dimitri Nakassis - Kevin Pluta
