

Office of the Vice President for Research

Winter 2007

SEARCH & DISCOVERY

R E S E A R C H A T M I C H I G A N

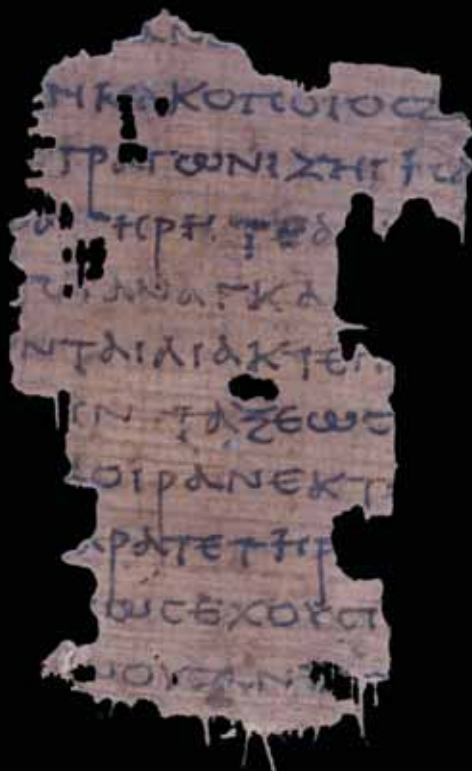
PEERING
into the
PAST



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ON THE COVER

The papyrus fragment on the cover is part of the University of Michigan collection, the largest papyrus collection in the Western Hemisphere and fifth largest in the world. The particular fragment (P. Mich. inv. 3789) contains descriptions in Greek of formulations for medicinal preparations from Egypt in the third century AD. This item was purchased in 1925 to be included in the U-M collection.



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OVER THE SHOULDERS OF THE ANCIENTS

Finding Clues About the Past in Papyri



“It’s like looking over the shoulder of people who lived two thousand years ago,” says Arthur Verhoogt, associate professor of papyrology and Greek, as he characterized one of his current projects. Verhoogt is eavesdropping on the life of a Roman soldier and the soldier’s father, an army veteran, who lived in Egypt in the second century AD. He is able to reach back in time like this by examining the small collection of letters from the soldier to his father. The letters were found in the late 1920s inside a step in a house during a University of Michigan archaeological excavation in Karanis, Egypt.

A book about, among many others, the two *Romans, Soldier and Society in Roman Egypt: A Social History* by Richard Alston of the University of London, was originally published in 1985, and scholars have used this work and the translated letters to learn about life in Karanis and elsewhere in Egypt. However, a few years ago Verhoogt and then-University of Michigan undergraduate student, Robert Stephan, learned that the records for documents found in “House C/B167” were incomplete. Stephan and Verhoogt found in storage at Michigan another dozen unexamined texts from the same cache in the excavated house that had been overlooked during the cataloging of the site.



PROFESSOR ARTHUR VERHOOGT.
PHOTO BY SCOTT R. GALVIN.

PROFESSOR RICHARD JANKO EXAMINES PAPYRUS FRAGMENTS FROM HERCULANEUM IN AN EFFORT TO PIECE TOGETHER THEIR MEANING. PHOTO BY SCOTT R. GALVIN.

“With the recovery of further documents and artifacts,” says Verhoogt, “it’s necessary to reassess the past studies,” which were based only on the original set.

The documents already examined at length indicated that House C/B167 belonged to Tiberianus, a veteran of the Roman army. “The archive of Tiberianus is one of the most important sources for the life of active soldiers and veterans of the Roman army in Egypt,” explains Verhoogt. The letters are from the son, Terentianus, a soldier stationed in the vicinity of Alexandria, to his father, Tiberianus.

The family was well-to-do, Verhoogt continues, a conclusion based on analyzing both the texts and the artifacts from the house. Interestingly, some letters were in Latin and others in Greek, and differences in handwriting among the letters indicate that the sender was able to hire a scribe who recorded what was dictated.

“We know that the father lived in the countryside and the son in Alexandria,” says Verhoogt. The letters also indicated that the father had asked his son to send some fine glassware that was available in Alexandria, while the son requested that his father send him a new pick-

axe, to replace the one his superior officer had taken from him. Good quality glass was indeed found during excavation of the house, as was a papyrus fragment of a book about the Peloponnesian War by Thucydides. Both provided further evidence of the elevated status of the occupants of the house, since these kinds of objects were rare finds in the Karanis excavation.

Karanis offers scholars a special opportunity, adds Verhoogt. “It’s unusual to have both the texts and artifacts from the same site. We have this context and we should use it to better understand the past.”

Verhoogt’s current tasks are clear—analyze the archaeological data (which he is doing in collaboration with Robert Stephan, now a graduate student at Stanford University), edit the new papyri, and re-assess those papyri that were previously published. “Only by evaluating the text, artifacts, and architecture in tandem will we be able to fully reconstruct the life, work, and documents of Tiberianus and Terentianus.” Verhoogt and Stephan plan to publish their new interpretation of this material in 2008.

“Once we finish with this house, we can continue, house by house, to look at the archaeological objects and papyri to get a broader sense of Karanis,” explains Verhoogt. “What makes this investigation all the more remarkable is that nearly all of the material we need to look at is here on campus.”

Thanks to the Karanis expeditions and a consortium of universities that purchased papyrus documents, the University of Michigan today holds the largest collection of papyri in the

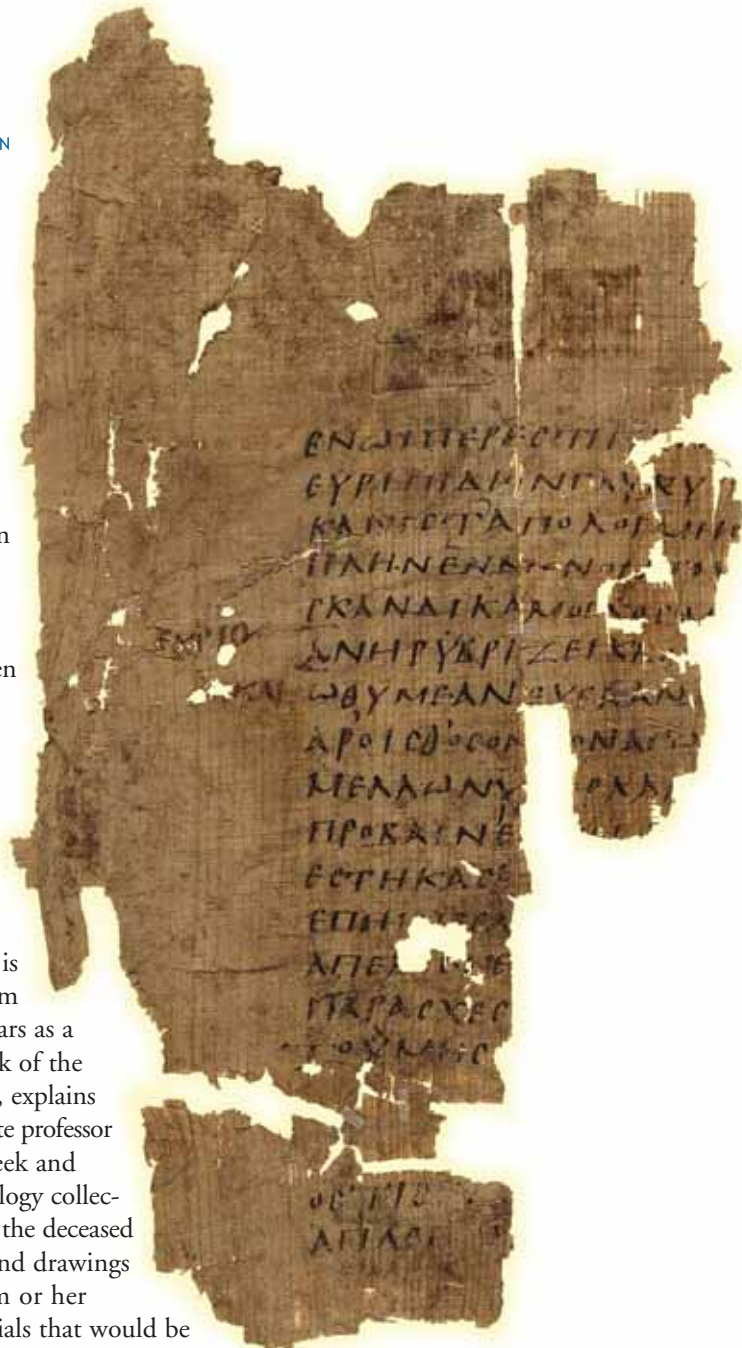
THIS PAPYRUS FRAGMENT FROM THE U-M COLLECTION IS A LITERARY WORK IN GREEK BY ARISTOPHANES FROM THE 4th CENTURY.

Western Hemisphere, and fifth largest in the world. Most of these materials are stored on the eighth floor of the Harlan Hatcher Graduate Library on campus. The collection contains more than 12,000 papyrus fragments—with over 1200 mounted between glass plates—while even more have been digitally imaged and are accessible to users around the world via the web.

The oldest document in the U-M collection is a papyrus fragment from Egypt known to scholars as a funerary text, or “Book of the Dead.” Funerary texts, explains Traianos Gagos, associate professor of papyrology and Greek and archivist of the papyrology collection, were buried with the deceased and contained spells and drawings intended to guide him or her through the various trials that would be encountered before being allowed into the afterlife. The particular funerary text fragment in the U-M collection dates to nearly 1000 BC.

Other papyri in the collection were found as part of the wrapping around mummies—in essence, the “scrap paper” used to encase those who were mummified. Many of these papyrus fragments contain illuminating records of daily life in ancient Egypt.

“We have literary texts, too,” says Gagos, such as substantial fragments of the Homeric epics, and “long lost works by Greek dramatic writers Aristophanes, Euripides, and especially Menander. “These inform us of literary traditions that were often forgotten by the medieval period.” The collection also includes works by Aristotle, the mathematician Euclid, and the earliest known copy of the Epistles of Saint Paul.



PROFESSOR TRIANOS GAGOS (CENTER) AND TWO STUDENTS PREPARE TO EXAMINE PAPYRUS FROM THE UNIVERSITY OF MICHIGAN. PHOTO BY PAUL JARONSKI.



ABOVE PHOTOGRAPH FROM THE UNIVERSITY OF MICHIGAN EXCAVATION AT KARANIS, EGYPT, IN THE 1920s SHOWING PAPYRUS ROLLS FOUND IN A HOLLOW THRESHOLD OF A DOOR BETWEEN ROOMS D AND E OF HOUSE 5026. KELSEY MUSEUM ARCHIVES 5.1801.



LEFT THESE PAPYRUS FRAGMENTS FROM THE U-M COLLECTION WERE RECOVERED FROM THE COVERING ALONG THE SOLES OF THE FEET OF A MUMMY EXCAVATED IN EGYPT.

RIGHT THIS PAPYRUS FRAGMENT FROM THE U-M COLLECTION IS AN EXCERPT OF THE TEN FIRST DEFINITIONS OF THE ELEMENTS OF EUCLID, POSSIBLY PART OF A MEMORANDUM WRITTEN BY A TEACHER TO HIS CLASS.

U-M's first papyri were acquired in 1920 through purchases coordinated with the British Museum and several U.S. universities, such as Columbia, Yale, and others. Purchases continued through about 1940. Add to these the papyri and other archaeological artifacts with writing on them found during U-M-led excavations of Karanis between 1924 to 1935, and the Michigan collection became extraordinary.

For several decades, scholars would travel to Ann Arbor to view items from the collection, many of which are very fragile, as they attempted to understand public and domestic life from the third century BC to the seventh century AD, encompassing the Hellenistic, Roman, and Byzantine periods. The process of determining the content of the papyrus texts is not a simple matter, says Verhoogt. For instance, reading the Greek letters from Karanis begins by trying to figure out where the words start and end because the text is a continuous collection of letters.

"I look for words, sentences, names," he says. Verhoogt also looks at existing dictionaries and other translations for similar constructions. "It's not a straightforward translation, as we constantly come across unknown words or names. For papyrologists, Greek is not a dead

language. It's very much alive as we keep adding to the vocabulary and even revise known words and their usage."

Over the last two decades, advances in photography and then digital imaging has greatly aided the study of papyri. "The first digital scanner that the University Library owned was purchased to begin experimenting with the digital capture of papyri," explains Gagos. This work started shortly after Gagos arrived in Ann Arbor in the early 1990s. By 1994, papyri images became accessible over the World Wide Web, well before internet browsers such as Internet Explorer or Safari came into common use.



LIBRARY IS HOME TO MANY SPECIAL COLLECTIONS

After exploring the Papyrology Collection, *Search & Discovery* became curious about the other specialized libraries and collections found on campus. Here is a quick tour of what we learned.

The **MAP LIBRARY** is the principal collection for cartographic materials at the University of Michigan, with an emphasis on both historic and modern mapping, including digital resources. It supports teaching and research activities of faculty, staff, and students in many disciplines. It is also a campus resource for spatial data, through Numeric and Spatial Data Services, which provides assistance with geographical information systems, statistical software, and relevant data in a laboratory in the Map Library. In addition, the Clements Library has extensive historic maps and atlases, and the Bentley Historical Library also holds works with a focus on Michigan history.

The **SPECIAL COLLECTIONS LIBRARY** holds internationally recognized collections of books, serials, ancient and modern manuscripts, posters, playbills, photographs, pamphlets, artwork, and other materials. Tracing their roots back to one of the earliest rare book rooms in the United States, these collections are the primary basis of research for many scholars, both from the University of Michigan and from around the world. One of the prominent subsets in this library is the Labadie Collection, established in 1911 when Joseph Labadie, a prominent Detroit anarchist, donated his library to the University. Although the Collection was originally concerned mainly with anarchist materials (the field in which it remains strongest), its scope was later widened considerably to include a great

variety of social protest literature with political views from both the extreme left and the extreme right. Other special groupings administered by this library include Literary and Dramatic Collections, Science and Technology Collections, the Transportation History Collection, and the Power Collection for the Study of Scholarly Communication and Information Transfer.

The **DOCUMENTS CENTER** is a central reference and referral point for government information, whether local, state, federal, foreign, or international. Its web pages are a reference and instructional tool for government, political science, statistical data, and news. Last fall, you could find materials such as the Iraq Study Group (Baker-Hamilton Commission) Report; a link to all electronic versions of U.S. Census publications at the University of Michigan Library; a reference, called “Legistorm,” to the salaries paid to all congressional staff members; and the myriad official reports and documents that are published daily.

The **AREA PROGRAMS LIBRARIES** consist of the Near East Division, the Slavic and East European Division, the South Asia Division, and the Southeast Asia Division. These libraries exist within the Graduate Library, with each division an independent unit which selects and acquires library materials, solicits and accepts purchase recommendations, catalogues the collection, provides assistance to library users in the use of the unit’s collection, and offers formal instruction in the bibliographic resources in the unit’s area of expertise.

A complete list of the libraries and collections on campus can be found at www.lib.umich.edu/libinfo/alphalist.html.
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In 1994, the U-M also joined with five other universities—Duke, Berkeley, Columbia, Princeton, and Yale—to establish a national consortium for the construction of the Advanced Papyrological Information System (APIS). Today, some 20 institutions are active contributors of papyrus scans with another eight soon to join the consortium.

Items catalogued in the APIS database now number 35,000, with more than 20,000 individual images of papyri contributed by the member institutions. The consortium has also developed standards for scanning, so that digital images provide the quality needed to support successful scholarship.



PROFESSOR RICHARD JANKO.
PHOTO BY SCOTT R. GALVIN.

“For papyrologists, Greek is not a dead language. It’s very much alive as we keep adding to the vocabulary and even revise known words and their usage.”

Funding for scanning and cataloging papyri at the U-M and the other partners has been provided by the National Endowment for the Humanities. In 2005, APIS became a nonprofit entity and the members are building an endowment to make sure the project will survive indefinitely, says Gagos.

Papyri exist today because conditions were right in some parts of the ancient world to allow the reed-based paper to survive over centuries. “There are two basic ways for papyri to survive — by being kept dry, as occurs in places like Egypt, or by being burned incompletely, as happened in Herculaneum,” says Richard Janko, professor and chair of Classical Studies.

Herculaneum was an Italian city that was buried under some 30 meters of lava, mud, and ash following the eruption of Mt. Vesuvius in 79 AD. The texts found during the excavation of this site had been “carbonized,” which preserved them, but in an extremely hard-to-read condition compared to papyri from places like Karanis. For the most part, texts from Herculaneum are black. However, notes Janko, “Over the last 20 years, new tech-

ENLARGEMENT OF THE SPINE FROM A 15th CENTURY LEATHER-BOUND BOOK THAT WAS EXAMINED USING PROFESSOR BRENT SEALES’ SPECIALIZED CT SCANNING TO SEE THE WRITING ON INNER LAYERS OF PARCHMENT THAT WERE USED TO REINFORCE THE SPINE. THE SECTION SHOWN IS A PASSAGE FROM THE HEBREW BIBLE. COURTESY OF U-M CLASSICAL STUDIES.



HANDLING PYPYRUS, WHICH IS USUALLY FRAGILE, TAKES GREAT CARE AND PATIENCE. PHOTO BY PAUL JARONSKI.

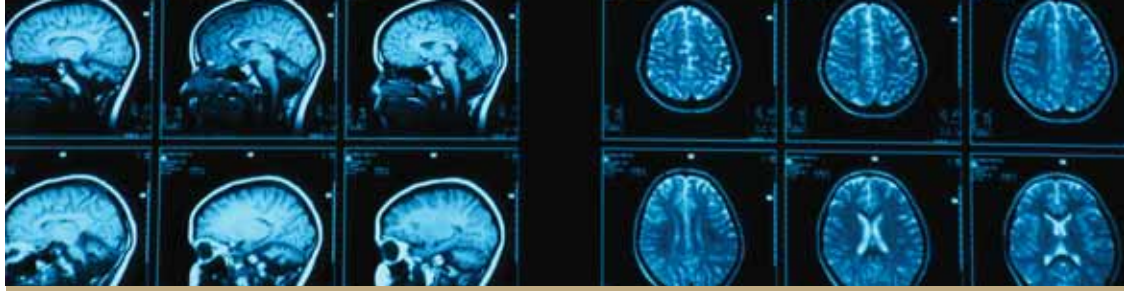
nologies have been brought into use to help scholars who examine pieces of papyri. The development of multi-spectral imaging and even Photoshop (software for image processing commonly used by graphic artists and photographers) have made it possible to read many of these documents.”

There is a further barrier to study in the case of some preserved materials. For example, the Herculaneum texts that Janko is studying include hundreds of charred papyrus rolls that are too fragile to unroll for examination or even to move from the glass cases where they are current stored in the National Library in Naples, Italy.

Then, about a year ago, Janko had a discussion with Professor Brent Seales of the Department of Computer Science at the University of Kentucky. Seales has developed specialized software for the interpretation of CT scans in order to view the images on pages of ancient texts that are either stuck together or rolled up and cannot be separated without destroying the objects. “[Seales] had successfully tested it on model papyri that he had made and inscribed with ink,” says Janko. But to apply this technology to the Herculaneum scrolls in Naples would require a portable scanner that doesn’t yet exist.

Before taking that step, Janko suggested that Seale test his system on actual papyri. “I suggested that we should look in the collection of the University of Michigan to see what pieces were sufficiently sturdy to travel to the existing equipment, which is at the Center for Non-Destructive Analysis at Iowa State University in Ames, Iowa.”





Two pieces were selected for the experiment—a fragment of a papyrus roll and the spine of a parchment codex (book) from the 15th century, which consisted of several layers of parchment glued tightly together. “As always happens with medieval codices,” says Janko, “the spine of the book was made up of unwanted written matter, and it would be useful to know what writing was on the interior layers.”

Seales has scanned the U-M items and sent several images to Janko for examination. The first image, an underlying layer from the book spine, contains a short section from the book of Ecclesiastes in the Hebrew Bible. Professor Yaron Eliav from the U-M Department of Near Eastern Studies provided the analysis and further concluded that the fragment came from a scroll and not another codex.

“This may seem like a small beginning, but it can lead to great things,” says Janko. “One problem with unrolling even sturdy scrolls is that cracks and breaks can be mistaken for certain characters. One advantage of digital unrolling, beyond gaining access to extremely fragile materials, is that we won’t have to decipher what is a crack and what is a letter.”

Janko hopes to continue the collaboration with Seales and, with some luck, travel to Italy with him and a portable scanner so that they can begin to look at the many, many texts that have never been opened. Janko suggests that this project may prove to be “extraordinary in the history of classical scholarship.”

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HI-TECH IMAGING IS EVERYWHERE

Imaging technology has spread to many uses in science, medicine, and even the humanities, as evidenced by the development of CT scanning to “read” the inside layers of a papyrus scroll. There are so many different methods being used or studied, that a quick Google of campus activity turned up many more examples that we can cite here. The Department of Electrical Engineering and Computer Science (EECS) in the College of Engineering (COE) is home to the Image Computing Laboratory. This lab is involved in several types of medical imaging—positron emission tomography (PET) and magnetic resonance imaging (MRI), to name just two—plus the development of ways to combine several imaging techniques to improve their ability to tease out details from the tissues that might be examined.

Another COE lab where faculty “like to make pictures” is the Biomedical Ultrasonics Laboratory in the Department of Biomedical Engineering. Many of the research projects there combine ultrasound with other technologies to produce images. The union of ultrafast optics with high-frequency ultrasound imaging is being used to make images of molecules or for use in therapeutic applications. “Elasticity microscopy” is another area of work, which is based on interactions between microwave energy and high-frequency ultrasound for imaging fatty molecules.

Remote sensing is an area of research in several departments. In COE’s Department of Atmospheric, Oceanic and Space Sciences, a number of projects involve the design, development, fabrication, and testing of advanced microwave remote sensing instruments for earth and space science applications. The Radiation

Laboratory in EECS has faculty involved in many aspects of applied electromagnetics, including the development of technology for active and passive microwave remote sensing and the interpretation of the images obtained from ground-, air- or space-based detectors.

Electron microscopy is another important research tool, and you can find a number on campus. In particular, the Electron Microbeam Analysis Laboratory (EMAL) is a University-wide user facility for the microstructural and microchemical characterization of materials through the production of images for study. Being a user facility with electron microscopes (as well as other instruments) on both North Campus and Central Campus, EMAL is open to anyone in the University research community.

The U-M Health System has many imaging technologies both in use and under study. For example, the Comprehensive Cancer Center has a Molecular Imaging Program in which modern tools of cell and molecular biology are combined with state-of-the-art, non-invasive imaging technologies to monitor biological processes in living organisms. Current clinical studies include investigating the use of diffusion weighted MRI as an early predictor of tumor response to the timing and dosing of therapy.

The U-M Cardiovascular Center has now upgraded its facilities to include “64-slice CT scanners,” one of the most advanced heart-imaging technologies available. Such CT machines allow physicians and researchers to capture a detailed image of the heart and coronary arteries in just a few seconds. **S&D**