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*The secret of happiness is freedom, and the secret of
freedom, courage*
(Thucydides)

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ΣΥΝΕΔΡΙΑ - CONFERENCES/WORKSHOPS

WORKSHOPS: SOLVING MIXING PROBLEMS USING THE BAYESIAN MODEL FRUITS - DIETARY AND NON-DIETARY APPLICATIONS, UNIVERSITY OF CAMBRIDGE (17-18 DECEMBER, 2015) AND AT THE UNIVERSITY OF KIEL (14-15 JANUARY, 2016)

Mixing models are increasingly used to quantify source contributions, but users often fail to realize the models' limitations or full potentials. In this workshop we address the many challenges and possibilities of mixing models. We invite you to attend one of two workshops devoted to the theme “**Solving mixing problems using the Bayesian model FRUITS - dietary and non-dietary applications**”. The workshops will be held at the **University of Cambridge (17-18 December, 2015)** and at the **University of Kiel (14-15 January, 2016)**.

The programme of the workshops is organised as follows:

Day 1 (10h30-17h00): Using FRUITS (topics listed below) plus two talks by Ricardo Fernandes (“Applications to Archaeological research”) and by Thomas Larsen (“Applications to Ecological research”).

Day 2 (10h30-17h00): Hands-on training with FRUITS: discussing mixing problems proposed by workshop participants.

There is no participation fee, however, those interested in participating must email **Ricardo Fernandes (rf385@cam.ac.uk)** within the set deadline (**10 December of 2015 to attend the Cambridge workshop and 5 January of 2016 to attend the Kiel workshop**). In their email the submitters must specify which workshop they would like to attend and if they want to present a case study for discussion (participation is limited). Before the workshop, attendees should download the newest version of FRUITS 2.0 (uploaded 24/11/2015) and familiarize themselves with some easy-to-follow examples and tutorials (check links below).

To download FRUITS 2.0: <https://sourceforge.net/projects/fruits/>

FRUITS 2.0 manual:

<https://sourceforge.net/projects/fruits/files/FRUITS%202.0%20manual.pdf/download>

YouTube channel with tutorials on the use of FRUITS:

<https://www.youtube.com/channel/UCxNWBKevwf4QprY7orl0q1Q>

Discussion group: https://groups.google.com/forum/#!forum/fruits_fernandes

Facebook page: <https://www.facebook.com/groups/589328911099893/>

Workshop topics

FRUITS is a highly flexible model allowing the user to easily design, through a graphical interface, model instances that are well-fitted to specific mixing problems. FRUITS allows the user to define uncertainties for all model parameters, it can handle routed and scrambled models, and it provides almost unlimited possibilities in the choice of priors.

Below, the list of topics to be discussed:

- Installing FRUITS in different platforms (Windows, Mac, and Linux)
- Designing a model instance to fit a specific problem (dietary and non-dietary applications)
- Model feasibility tests prior to implementation
- Importing data from datasheets. Saving, loading, and sharing FRUITS models
- Defining model uncertainties for all parameters (including target/consumer uncertainty)
- Non-dietary examples (e.g. geology or environmental research)
- Dietary examples (simple C & N models, models with multiple proxies, concentration vs. non-concentration dependent models, routed vs. scrambled models)
- Interpreting multiple model outputs (source contribution, fraction contribution, signal contribution from source)
- Adding prior information (assigning prior to different model estimates or parameters)
- Assigning prior relationships of equality or inequality among model parameters and defining prior strength
- Advanced dietary modelling (e.g. constraints on nutrient intakes, handling weighted contributions from protein and other nutrients, diet-to-consumer isotopic offsets dependent on protein quality or levels of protein intake)
- Handling FRUITS graphical outputs (raster and vector images, file types, exporting data points)
- Model robustness and convergence tests
- FRUITS and R
- FRUITS and OpenBUGS

Organisers:

Ricardo Fernandes (Kiel & Cambridge Universities) Thomas Larsen (University of Kiel)

ARCHAEOLOGY OF LANDSCAPE, JERUSALEM, 19-20 OCTOBER 2016

We are pleased to open a call for papers for a two-day conference dedicated to the Archaeology of Landscape, to be held under the joint sponsorship of the German Protestant Institute of Archaeology in the Holy Land and the Institute of Archeology of the Hebrew University of Jerusalem at the Mount Scopus campus of HUJI, 19-20 October 2016.

Archaeological research in the countries of the eastern Mediterranean basin now encompasses the most advanced methods of acquiring and processing archaeological data, enabling us to study many aspects of ancient Near Eastern cultures, social processes and environmental change that were previously out of the reach of scholars. Among these, a new field of archaeology dedicated to the study of the landscape and armed with a theoretical background and technological means has developed rapidly during the last few decades.

Settlements and monuments do not exist in a void. Settlements exist due to their water sources, road networks, natural resources and agricultural surroundings. Monuments gain their importance from their special location, orientation, conspicuous visibility and accessibility. These features can be recognized and studied in the field and laboratory, and analyzed by statistical tools, computer models and GIS systems, helping us to understand their function and meaning as an integral part of the surrounding landscape. Moreover, there is a full range of social and environmental paradigms that can be better understood through study of settlements/monuments in the context of their landscapes: military campaigns, agricultural ecosystems, trade networks and even ritual ideology.

The main goal of this conference is to strengthen landscape archaeology in the region by giving an opportunity for scholars who study this discipline to present the results of their projects, share their theories and discuss their implementation in the field.

Four sessions will be presented at the conference:

1. Theory and practice of the landscape.
2. The sacred landscape.
3. Ecology of landscape.
4. Archaeology of agriculture.

In the closing session of the conference the participants will take part in a workshop. In this workshop we will have an active group discussion of the topics delivered during the lectures. We hope to create an ongoing discourse among the participants, an exchange of ideas and the establishment of foundations for future networking and communal projects in the field of landscape archaeology.

An abstract of 200–300 words describing your lecture topic can be sent electronically to michel.freikman@mail.huji.ac.il, or as a hard copy to the following address:

Mike Freikman
Institute of Archaeology

Hebrew University of Jerusalem
Mount Scopus

The deadline for submission is 31 January 2016.

IRUG 12 CONFERENCE, ORMYLIA
FOUNDATION - ART DIAGNOSIS CENTRE,
ORMYLIA CHALKIDIKI, GREECE, MAY 23-
25, 2016, 3RD ANNOUNCEMENT AND
SUBMISSION DEADLINE REMINDER

www.ormyliafoundation.gr

This is a reminder for submitting a paper to the IRUG 12 Conference to be held in Ormylia Chalkidiki, Greece, May 23-25, 2016. The deadline for abstract submissions is in one month, on December 15th 2015.

The conference will include oral and poster presentations addressing all aspects of the application of IR and Raman spectroscopies for the study, documentation and protection of the world's cultural heritage.

A special topic that will be addressed within the conference sessions is the **Advancements in Infrared and Raman Spectroscopies Applied in Archaeological Science**.

Important dates:

Abstract Submission (500 words): September 20 – December 15, 2015

Notification of Acceptance: January 15, 2016

Final Program: February 15, 2016

Registration: September 20, 2015 – April 30, 2016 (Normal 250 €, Student 150 €)

Conference: May 23-25, 2016

Further information for abstract submission and online registration procedures, social events, accommodations and transportation is published at the Conference Website: IRUG12-ormylia.gr

The official conference language is English.

Looking forward to your abstract submission and to seeing you in May 2016.

Welcome to Ormylia, Greece!

On behalf of the Organizing Committee, Sophia Sotiropoulou, Chair of the IRUG 12

IRUG is a not-for-profit 501(C)3 organization that encourages the development and sharing of IR and Raman reference data and information for cultural heritage studies: www.irug.org

Please forward this email to any colleagues that might be interested ...

CALL FOR PAPERS AND EXPRESSIONS OF INTEREST CONFERENCE "ANCIENT EGYPTIAN COFFINS: PAST, PRESENT, FUTURE", CAMBRIDGE, 7-9 APRIL 2016

The Fitzwilliam Museum, University of Cambridge is pleased to announce a conference on ancient Egyptian coffins, to be held at the Judge Business School from 7-9 April 2016. The themes of the conference focus on three areas:

Past: the development of coffins in antiquity, including

Technological, iconographic and text-based studies

Present: the post-antiquity history of coffins

Future: developments in the technical examination and analysis of coffins

The conference will coincide with the exhibition *Death on the Nile: Uncovering the Afterlife of Ancient Egypt*, which forms part of the Museum's bicentenary celebrations.

The conference language will be English. Papers will last no more than 20 minutes, and will be grouped together in ten sessions. There will also be a poster session. The conference will conclude with the Glanville Lecture, to be given by Dr John H. Taylor, Assistant Keeper, The British Museum on Saturday 9 April, 2016 at 5 pm.

Please submit abstracts for papers and posters to fitzmuseum-coffins@lists.cam.ac.uk by 11 December 2015 using the form available at:

[URL:https://drive.google.com/file/d/0B8Upm1gPC8mwNW5BdUowNkVJNzA/view?usp=sharing](https://drive.google.com/file/d/0B8Upm1gPC8mwNW5BdUowNkVJNzA/view?usp=sharing)

Abstracts should be no more than 500 words and should include the title of the submission, names and affiliations of all authors and contact details (email and postal address) of one corresponding author. Authors of accepted submissions will be notified by 5 January 2016.

Conference registration opens in January but expressions of interest are welcomed immediately. Please use the form above.

The full registration fee is UKP90; it includes tea and coffee and a buffet lunch each day, book of abstracts, an evening reception and private view of the *Death on the Nile* exhibition, plus a private evening visit to the chapel of King's College.

The fee will be waived for one speaker per paper. A concessionary rate of UKP55 will be available to registered students, retired or unwaged participants and one author per poster. Fees may be paid through the University of Cambridge Online Store: [URL:http://onlinesales.admin.cam.ac.uk](http://onlinesales.admin.cam.ac.uk) from 5 January 2016 onwards.

Workshop

Fitzwilliam Museum
4-6 April 2016

The Coffin Workshop, a practical seminar looking in detail at some of the key features of coffin construction and techniques of decoration, will be held in the Fitzwilliam Museum from 4-6 April 2016. Details will be announced shortly.

Jennifer Marchant
Conservator of Antiquities
Fitzwilliam Museum

CALL FOR PAPERS - THE 6TH
INTERNATIONAL ARCHITECTURAL PAINT
RESEARCH CONFERENCE, COLUMBIA
UNIVERSITY, NEW YORK, NY, MARCH 15-
17, 2017

Language: English

See: [URL:http://www.apr2017.org](http://www.apr2017.org)

Like the Charles and Ray Eames 1977 short film, Powers of Ten, Architectural Paint Research (APR) deals with magnitudes of scale, from a single pigment particle, to a painted house, to the decorative tastes of an entire region. In the spirit of the film, the 2017 APR conference aims to take a closer look at how we carry out our research at every level, from the micro to the macroscopic.

The 6th International Architectural Paint Research Conference organizing committee is sending out a call for papers and posters for its next meeting in New York City, March 15-17, 2017.

Submissions are invited from APR specialists and advanced students, as well as members of related disciplines including art conservators, preservation architects, decorative painters, heritage managers and materials scientists.

There will be a session on APR standards led by the standards committee, as put into motion at the 2014 Stockholm APR conference.

Topics should ideally include but are not limited to:

Non-traditional or Overlooked Finishes

Projects where finishes identified through APR included unexpected color combinations

Non-traditional use of traditional materials

Finishes rarely discussed at previous APR conferences

Finishes that may be unique to a single geographic region.

Case studies with a Focus on Cross-section Microscopy: As always, APR case studies are welcome topics at the conference. We request that papers be well supported by cross-section photomicrographs and other analytical data that illustrate your interpretive process.

Research into paint materials and technologies: This can include archival research or research of a technical nature that sheds a new light on paint materials or finishes.

Topics may focus on a particular studio or decorative painter/artist's working methods, colourman's practices, pigment manufacture, and/or the evolution of paint/pigment/varnish technology.

Replication of Historic Finishes: Spotlight on the challenges and solutions involved with replicating finishes identified through APR.

Topics can include methods for removing overpaint, collaborating with decorative painters to replicate schemes, and/or the sharing of information that could only have been gleaned through the preparation/replication process.

Projects Revisited: Have you had the opportunity to re-visit an old project? If so, how have these projects fared over time? How has your work been received by the public? What lessons did you learn that carried over into future projects?

Submitting an Abstract The language of the conference will be English. To submit an abstract for a paper or poster, please submit a provisional title with a summary (500 word maximum) at [URL:http://www.apr2017.org/call-for-abstracts/](http://www.apr2017.org/call-for-abstracts/)

Please use the name of one author. The names of any co-authors can be submitted in the body of the abstract.

This year we encourage submissions from advanced students working on APR related projects for a dedicated "Student Research Session".

Select papers will be included in the final publication. When submitting your abstract, please indicate if this is a student submission. Abstracts must be submitted by February 15, 2016.

Selected speakers and poster authors will be notified by April 16, 2016. Details regarding guidelines for the conference presentations and articles will be provided at the time of notification. Speakers will also be requested to submit their work in the form of a full-text, illustrated article for publication in the conference post-prints. This article will be peer-reviewed and due on November 15, 2016.

Poster authors may be asked to give a 5-minute presentation at the conference, but will not be responsible for an article. If you have any questions, please contact Mary Jablonski mjablonski@jbconservation.com

Claudia Kavenagh
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44 East 32nd Street, 12th floor
New York, NY 10016
212-777-1300 ext 22
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41ST INTERNATIONAL SYMPOSIUM ON ARCHAEOLOGY (ISA), MAY 15-21, 2016, KALAMATA, GREECE

Dear Colleagues,

This a friendly reminder about the 41st International Symposium on Archaeology (ISA), which will take place in May 15-21, 2016 in Kalamata, Greece.

SESSIONS: The scientific programme of ISA includes the following sessions:

- Remote sensing, geophysical prospection and field archaeology
 - Archaeo-chronometry
 - Human-environment interactions and biomaterials - Bioarchaeology
 - Stone, plaster and pigments
 - Ceramics, glazes, glass and vitreous materials
 - Metals and metallurgical ceramics
 - Special Theme Session-1: Environmental remote monitoring for archaeology and cultural heritage
 - Special Theme Session-2: The beginning of the Bronze Age in Eastern Mediterranean
- Additionally, a panel discussion will be held on the topic of "History, archaeology and archaeometry: Defining a relationship".

PROCEEDINGS: The ISA2016 Proceedings will be published in a special issue of Science and Technology of Archaeological Research (STAR), an open access journal by Maney Publishing's.

ABSTRACTS & GRANTS: Abstract submission and grant application are now open through the conference website (isa2016.uop.gr). The submission deadline for both abstracts and student grants is December 15, 2015.

Early registration will be available until February 15, 2016. The discount fee is 170 € (90 € for students).

ACCOMMODATION: We encourage conferees to take advantage of the special prices provided by a number of hotels in Kalamata. More detailed information is available on our website.

For further information please contact us at isa2016@uop.gr

Looking forward to welcoming you in Kalamata, The ISA2016 Organising Committee

ΑΝΑΚΟΙΝΩΣΕΙΣ - ANNOUNCEMENTS

INSTAP ON JSTOR

Dear all,

INSTAP Academic Press has made a concerted effort to make all of our publications available online as digital downloads for sale through Casemate Academic (<http://www.oxbowbooks.com/dbbc/>) and Oxbow Books (<http://www.oxbowbooks.com/oxbow/>) as well as free PDFs through JSTOR (<http://www.jstor.org/action/showPublisher?publisherCode=instapress>).

Would you kindly bring INSTAP on JSTOR to the attention of your institutional librarians? Please ask them to subscribe to the INSTAP part of the book platform (as opposed to the journals). For more details:

<http://about.jstor.org/content/promoting-books-jstor-your-library>

I'll be interested to know how your librarians respond.

A sample email to your librarian might be:

Dear (library liaison),

As you know, I request that the library purchase everything produced by INSTAP Academic Press--this is the publication branch of the Institute for Aegean Prehistory, which supports the excavation, research, and publication of primary data in Aegean Prehistory and occasionally classical and Mediterranean archaeology. These books are essential--even more so today, as trade publishers and university presses refuse to publish primary archaeological data because of cost, complexity, illustrations, and relatively specialized readerships. The bottom line is that INSTAP books are high quality, low cost, and absolutely vital to our field.

The Director of Publications, Susan Ferrence, has recently made me aware of JSTOR subscription access to INSTAP books. The availability of PDFs for use in the field would be indispensable for research. Could we subscribe to this part of JSTOR? Could you investigate cost and feasibility?

<http://www.jstor.org/action/showPublisher?publisherCode=instapress>

Many thanks and kindest regards,

Susan

Susan Ferrence, PhD
Director of Publications

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APPLICATIONS FOR HOSTING ISA2018

Dear colleagues,

We would like to remind you that those interested in hosting the 42nd International Symposium on Archaeometry (ISA) in 2018 should submit their proposal by the end of December, 2015.

Please note that proposals for venues in the Americas, Europe or any other continent are accepted and will be considered for 2018.

For information and submission of proposals please contact:

Dr. Yannis Maniatis
Chairman ISA
y.maniatis@inn.demokritos.gr

EΙΔΗΣΕΙΣ - NEWS RELEASE

MISSING LAND MENTIONED IN ANCIENT BOOKS DISCOVERED BY ARCHEOLOGISTS IN İZMİR

Archeologists have discovered an island mentioned in ancient books on which the ancient city of "Kane" was built, during surface explorations conducted near the Bademli neighborhood of Dikili, İzmir .

After examining geological samples taken from layers of underground rock from a small peninsula near Bademli, the archeologists discovered that the peninsula was once an island in ancient times, and that the strait separating the island from the land had filled with silt over time.

The newly discovered island is the third of the "Arginus" islands mentioned in ancient books. The location of the Arginus islands had been debated for some long time among archeologists, historians and geographers.

Archeologists from the German Archeology Institute and the University of Köln along with historians, geographers and geophysicists from the universities of Manisa, Köln, Rostock and Southampton, started an archeological excavation to find the location of the Arginus islands near Bademli.

Dr. Felix Pirson said: "It was not clear that these lands were actually the Arginus islands that we were looking for until our research. By examining the geological samples obtained through the core-drill method, we recognized that the gap between the third Arginus island and the mainland was indeed filled with loose soil and rock, creating the existing peninsula."

Through the examination of architectural remnants and ceramic artifacts on the peninsula, the archeologists discovered that the city of Kane was actually situated on the island.

Please visit the site: http://www.todayszaman.com/national_missing-land-mentioned-in-ancient-books-discovered-by-archeologists-in-i-zmir_404012.html

THE INVISIBLE LIBRARY - CAN DIGITAL TECHNOLOGY MAKE THE HERCULANEUM SCROLLS LEGIBLE AFTER TWO THOUSAND YEARS? BY JOHN SEABROOK

It was a warm day in Paris, and the library of the Institut de France was stuffy and hot. Daniel Delattre, a distinguished French papyrologist, did not remove his suit jacket. The institute, which includes the Académie Française, is a jacket-and-tie sort of place.

Delattre, who is sixty-eight years old and has a dreamy, lost-in-the-vale-of-academe manner, was contemplating a small wooden box on the table in front of him which was labelled “Objet Un.” There are thousands of rare objects in the institute’s library; the fact that whatever was inside the box was Object One suggested that it was of some importance. An ornately hand-lettered card was taped to the outside. It said, in French, “Box containing the remains of papyrus from Herculaneum”—the Roman town destroyed, along with its larger neighbor, Pompeii, in the eruption of Mt. Vesuvius in A.D. 79.

The papyrus scrolls of Herculaneum, which were discovered in 1752, have long fascinated and frustrated lovers of antiquity. They were found in an elaborate villa buried almost ninety feet deep by the volcano—this archeological wonder has been known ever since as the Villa dei Papiri. At least eight hundred scrolls were uncovered; they constitute the only sizable library from the ancient world known to have survived intact. Some were found stacked on shelves in a small room; others were elsewhere in the villa, packed in capsae, travelling boxes for the scrolls, presumably in preparation for flight.

Given the splendor of the villa, and the masterly bronze sculptures found in its ruins, the learned world assumed that the library would contain vanished classics. One could dare hope for one or two of the lost histories of Livy, of whose hundred and forty-two books on the history of Rome only thirty-five survive. Or perhaps one of the nine volumes of verse written by Sappho, the Greek poet; only one complete poem remains. By some estimates, ninety-nine per cent of ancient Greek literature has been lost, and Latin has not fared much better. Among those works we know are missing are Aristotle’s second volume of the Poetics, which was on comedy; Gorgias’ philosophical work “On Non-Existence”; the four missing books of the Roman historian Tacitus’ Annals, covering Caligula’s reign and the beginning of Claudius’; Ovid’s version of “Medea”; and Suetonius on the Greek athletic games. (His “Lives of Famous Whores” also, sadly, has not survived.) Greek tragedy has been decimated. According to the Suda, the tenth-century Byzantine encyclopedia of classical culture, Euripides wrote as many as ninety-two plays; eighteen survive. We have seven each from Aeschylus and Sophocles, who wrote about ninety and a hundred and twenty, respectively. “And that’s just the big three of tragedy,” the writer and classics professor Daniel Mendelsohn told me. “Of the thousand that were likely written and performed during the hundred-year heyday of tragedy, we have only thirty-three extant plays—that’s about a three-per-cent survival rate.”

Delattre's dream has been to recover something of the lost works of Epicurus (341-270 B.C.), the Greek philosopher whose thought has been the focus of his life's study, and whose writings are known only through secondary sources.

"Basically, whatever your specialty is, that's what you want to find in the scrolls," David Sider, a professor of classics at N.Y.U. and the author of "The Library of the Villa dei Papiri at Herculaneum" (2005), told me.

But that's the problem. In trying to read the scrolls, scholars and curators have invariably damaged or destroyed them. The Herculaneum papyri survived only because all the moisture was seared out of them—uncharred papyrus scrolls in non-desert climates have long since rotted away. In each scroll, the tightly wrapped layers of the fibrous pith of the papyrus plant are welded together, like a burrito left in the back seat of a car for two thousand years. But, because the sheets are so dry, when they are unfurled they risk crumbling into dust.

During the past two hundred and fifty years, an array of methods and materials have been used on the easier-to-unwrap scrolls, including rose water, mercury, "vegetable gas," sulfuric compounds, and papyrus juice—most of which have caused grievous harm to the delicate plant material on which the text is inscribed. Scores of scrolls have been badly damaged or destroyed, ruined by the same uniquely human impulse that went into making them—the desire to read.

Before addressing *Objet Un*, Delattre opened another box, containing pieces of two scrolls (the institute has six altogether) that had suffered a misguided attempt to read them in 1985. There were hundreds of fragments, organized within a set of smaller boxes. They resembled scraps of dried mud. But if you looked closely you could see tiny Greek letters on the warped surfaces, made by a scribe two thousand years ago—an electrifying jolt of handwritten human communication from the ancient world.

Delattre explained that the two ill-fated scrolls had been transported to Naples, where they were treated with a mixture of ethanol, glycerin, and warm water, which was supposed to loosen the folds. One scroll was peeled apart into many fragments; the other dried up and then, like a disaster in slow motion, split apart into more than three hundred pieces. "Well," Delattre murmured, "it simply exploded." He shook his head sadly.

How did the institute come by six scrolls in the first place? Delattre explained that, by 1800, the Herculaneum scrolls had become instruments of diplomatic and political power. In 1802, Ferdinand, the Bourbon king of Naples and Sicily, "gave" six of the scrolls to Napoleon, who was threatening to invade Naples. Napoleon housed them in the Institut de France, which he reorganized in 1803 into what would later become the five academies that form the institute today. The collection grew around the scrolls; that's why the box Delattre showed me was labelled "*Objet Un*." But the scrolls did not satisfy Napoleon for long; capitalizing on victory in the Battle of Austerlitz, France invaded Naples in 1806, forcing Ferdinand and his court to flee to Sicily, leaving the scrolls in nearby Portici, where they were housed in a royal museum. When Britain helped restore Ferdinand to the throne, in 1815, he was so grateful that he is rumored to have bestowed eighteen scrolls on the British Prince Regent, later George IV, who in turn gave the Neapolitan court eighteen live kangaroos from the British colony of New South Wales.

Some of these scrolls ended up in Oxford, but a few are still unaccounted for. The fate of the kangaroos is even less clear.

Delattre placed his hands on the box containing *Objet Un*. But he did not open it. He prepared his guests for the worst—the shock of seeing the body in the morgue. When he finally lifted the lid, you saw why. Swaddled in thick cotton was what appeared to be a human turd.

One glance at the scroll was enough to be sure there was no hope it could ever be unwrapped physically. But what about virtually?

Herculaneum was situated on the southwestern flank of Vesuvius, closer to the volcano than Pompeii, to the southeast, and it was destroyed in a different way. Pompeii was slowly buried under falling pumice and ash, carried by the prevailing wind for several days, while Herculaneum was flash-seared by volcanic phenomena called pyroclastic flows and surges—successive waves of superheated gas and rock that overtook the city rapidly, eventually sealing everything under a deep layer. In a famous letter to Tacitus, Pliny the Younger, who witnessed the eruption from across the bay, at Misenum (his uncle, the naturalist and philosopher Pliny the Elder, died in the catastrophe), described seeing “a horrifying dark cloud, ripped by sudden bursts of fire, writhing back and forth.”

For centuries, it was believed that most of the residents of Herculaneum had escaped. It was not until 1980 that a grisly discovery was made: gathered together by the harbor, in what had been boat sheds, were some three hundred skeletons, of people who had apparently been waiting for rescue. The pyroclastic flow carbonized organic matter such as wood, food, sewer contents, and scrolls; little trace of these things was found at Pompeii, where almost everything organic eventually decayed. Joseph Jay Deiss, in his evocative book “Herculaneum: Italy’s Buried Treasure,” describes an urban tableau that is frozen in time: “Luncheon still waits on tables. . . . The sick boy in the shop of the gem-cutter lies in his bed, his lunch of chicken uneaten. The baby remains in the cradle, a pathetic little heap of carbonized bones.”

The Villa dei Papiri is thought to have been built by Julius Caesar’s father-in-law, Lucius Calpurnius Piso Caesoninus, a wealthy statesman who was a consul of the Roman Republic in 58 B.C. The huge house, at least three stories tall, sat beside the Bay of Naples, which at that time reached five hundred feet farther inland than it does today. The villa’s central feature was a long peristyle—a colonnaded walkway that surrounded the pool and gardens and sitting areas, with views of the islands of Ischia and Capri, where the Emperor Tiberius had his pleasure palace. The Getty Villa, in Los Angeles, which was built by J. Paul Getty to house his classical-art collection, and opened to the public in 1974, was modelled on the villa and offers visitors the opportunity to stroll along the peristyle themselves, as it was on that day in 79.

Buried four times deeper than Pompeii, Herculaneum was forgotten. Its name disappeared from history. In 1709, more than sixteen centuries after the eruption, workmen digging a well in the town of Resina hit the upper tier of Herculaneum’s ancient theatre, a structure that once seated twenty-five hundred. The excavations that followed, which were closer to treasure hunts than to archeological digs, were mostly carried out under the auspices of the royal House of Bourbon, members of which ruled France and much of southern Europe, including Spain and parts of present-day Italy. The

Villa dei Papiri was discovered in 1750, and its excavation was supervised by a Swiss architect and engineer named Karl Weber, who dug a network of tunnels through the subterranean structure and eventually drew up a map of the villa's layout. The architects of the Getty Villa based their design on Weber's plan.

The discovery of the first cache of scrolls, in October, 1752, was reported the following month in a letter sent by Camillo Paderni to Dr. Richard Mead. Paderni was a painter and copyist from Rome, who had come to Herculaneum to reproduce some of the villa's wall paintings. Somehow he managed to get Charles, Ferdinand's father, to appoint him "keeper" of the royal museum at Portici, where the sculptures and the scrolls were kept. Mead was a distinguished British physician, a fellow of the Royal Society, and a noted book collector, with a library of more than a hundred thousand volumes in his house in Bloomsbury, which was dispersed in an epic, fifty-six-day auction after his death, in 1754. In corresponding with Paderni, Mead may have hoped to obtain the ultimate prize before he died—a newly discovered great work of classical literature, of which there existed but a single copy.

Paderni's letter was read to the Royal Society, which met monthly in Crane Court, off Fleet Street, in February of 1753, and was published in the society's "Philosophical Transactions" for that year. The news of a recently discovered ancient library captivated Europe. The scrolls, together with the bronze statues, and the opportunity to descend into the theatre of Herculaneum, were the reason that Naples became a stop on the eighteenth-century gentleman's Grand Tour. ("See Naples and die.") Who could resist the chance to peer into a lost masterpiece from antiquity? The scrolls must have enhanced Charles's stature; in 1759 he assumed the throne of Spain, leaving his son Ferdinand to rule Naples and Sicily.

Charles told Paderni to see about opening the scrolls, and the keeper, whom the historian Charles Seltman described as "a lazy sycophant of a man," saw to it. In his letter to Mead, Paderni noted that the papyrus had "turn'd to a sort of charcoal, so brittle, that, being touched, it falls readily into ashes." He continued, "Nevertheless, by his Majesty's orders, I have made many trials to open them, but all to no purpose; excepting some words." As David Blank, of U.C.L.A., a prominent American papyrologist, told me, Paderni at first simply cut the scrolls in half lengthwise. He removed the less charred midollo, or marrow, and then scraped away at the outer layers—the scorza, or bark, as it was called—until writing could be seen. (Only later did he realize that the midollo was, in fact, the most legible part.) Blank said, "Charles wanted visible writing that he could show to his important visitors."

In 1753, Charles brought in Father Antonio Piaggio, from the Vatican Library, who built a machine to unwrap the scrolls, very slowly, at the rate of a centimetre an hour—the so-called Piaggio Machine. Johann Winckelmann, the German archeologist and art historian, described Piaggio's work in his "Letter on the Herculaneum Discoveries," published in 1762:

It is incredible to imagine what this man [Piaggio] contrived and executed. He made a machine, with which, (by the means of certain threads, which, being gummed, stuck to the back part of the papyrus, where there was no writing), he begins, by degrees, to pull, while with a sort of ingraver's instrument he loosens one leaf from the other, (which is the most difficult part of all).

It was four years before the first scrolls were successfully unwrapped, but eventually Piaggio managed to unwrap fifty more, some dozens of feet long, with his machine. And what lost masterpieces did he reveal? Not Livy, or Sappho, or Simonides, the Greek lyric poet whom William Wordsworth invoked in his poem “September, 1819”:

O ye, who patiently explore
The wreck of Herculaneum lore,
What rapture! could ye seize
Some Theban fragment, or unroll
One precious, tender-hearted scroll
Of pure Simonides.

Most of the scrolls, including the first one unwrapped by Piaggio, “On Music, Book 4,” were written by the same person—a minor Greek poet and philosopher named Philodemus. Who was he? A nineteenth-century commentator called him “an obscure, verbose, inauthentic Epicurean from Cicero’s time.” Thanks to decades of painstaking work by Father Piaggio and his successors, we have the final book of Philodemus’ multivolume “On Music,” large parts of his “Rhetoric,” and his “On the Stoics,” “On the Good King According to Homer,” “On Flattery,” “On Wealth,” and “On Anger,” among many others. In some cases, there are multiple copies of the same book.

Philodemus was born about two hundred and thirty years after Epicurus, and was a member of the Athens school of Epicurean thought. He also wrote epigrams, of which Cicero speaks archly (he calls him a “Greekling”). Several of these are dedicated to Piso, Caesar’s father-in-law. Like many late-Republic Roman aristocrats, Piso was a follower of Epicurus, and he seems to have been Philodemus’ patron. At some point during the Roman takeover of Athens, Philodemus is believed to have moved to Herculaneum, bringing his library with him. The villa thought to have been built by Piso could have held Philodemus’ library. (The reasoning for both these theories is circular: because Philodemus was connected to Piso, and because the works were found in a villa that few Romans other than Piso were rich enough to build, the house probably belonged to Piso, and Piso’s villa could have held Philodemus’ library.)

Still, among the hundreds of unopened scrolls, there might be great works that Philodemus was describing; namely, complete copies of Epicurus’ original writings. Among the Villa dei Papiri scrolls are many that were written in Latin; these were mostly found in the capsae, presumably because someone was trying to save them, but they are more likely to contain literary works by Roman writers. And the Latin papyri are in even worse condition than the Greek ones. Sarah Hendriks, a young Australian papyrologist whom I met in the National Library in Naples, who works on the Latin scrolls, said, “While it is relatively easy to find individual letters, finding whole words can be only a weekly or monthly occurrence at most. Whole lines of text are extremely rare. I often look with envy at the Greek papyri!”

In 2005, Delattre attended a meeting in Oxford of the Friends of Herculaneum Society, a group of professional papyrologists and amateur Herculaneum enthusiasts. The keynote speaker was Brent Seales, a software engineer who is the head of the computer-science department at the University of Kentucky. He gave a talk about the possibility of “virtually unwrapping” the scrolls, using a combination of molecular-level X-ray

technology, spectral-imaging techniques, and software designed by him and his students at the university.

Digital restoration—the application of modern imaging technology to the reading of ancient manuscripts—is not exactly Seales’s idea, but it has become his mission. His work has brought him renown in papyrological circles, and has made him something of a celebrity on campus in Lexington, where the school newspaper regularly reports on his progress. Seales does much of his manuscript work at the university’s Center for Visualization and Virtual Environments, where he is the director.

“The idea is that you’re not just conserving the image digitally—you can actually restore it digitally,” Seales explained, in his earnest, go-getter way. The potential struck him in 1995, when he was assisting Kevin Kiernan, an English professor, on a digital-imaging project involving the only extant copy of “Beowulf,” the medieval masterwork, which is in the British Library. The manuscript was damaged in a fire in 1731. The Kentucky team used a variety of techniques, including one called multispectral imaging, or MSI—developed by NASA for use in mapping mineral deposits during planetary flyovers—to make the letters stand out from the charred background. The basic principle is that different surfaces reflect light differently, especially in the infrared part of the spectrum. Inked letters will therefore reflect at different wavelengths from those of the parchment or vellum or papyrus they are written on.

As Seales worked on more manuscripts, he realized that what he had thought of as a two-dimensional problem was really three-dimensional. As a writing surface ages, it crinkles and buckles. If Seales could design software that reverse-engineered that aging process with an algorithm—“something like the stuff that lets you see the flag waving in reverse,” as he put it—he might be able to virtually flatten the manuscript. Back in Kentucky, Seales and his team put their concept to the test with King Alfred the Great’s Old English translation of “The Consolation of Philosophy,” by Boethius, which is also in the British Library. They studied the material science of the vellum that the medieval scribe had used, and, by modelling that on the computer, Seales was able to virtually smooth out the manuscript, making some letters visible for the first time.

Seales’s name got around to the curators of collections containing badly damaged manuscripts; he was the guy who could read the unreadable. “I came to think of it as the ‘impossible scenario,’ ” he said. “Every time we’d go to a collection, people would pull out stuff they couldn’t do anything with, and say, ‘O.K., you can do something with that, but what about this?’ ”

Richard Janko, a classical scholar at the University of Michigan and a leading papyrologist, heard of Seales’s work and talked to him about the Herculaneum papyri—the ultimate impossible scenario, because reading them meant not only flattening deformed surfaces but also seeing inside scrolls that had never been unwrapped at all. In 1999 and 2000, a team from Brigham Young University had, in fact, conducted an MSI study on some of the scrolls that had already been opened. They achieved spectacular results on the surfaces. But they could do nothing with the hundreds of scrolls that hadn’t been unrolled.

Seales, in his Oxford talk, proposed putting an unopened scroll inside a CT scanner. CT—computed tomography—is the X-ray technology used to create 3-D images of

human bones and organs. More recently, CT has been applied to mummies and a variety of other archeological artifacts, as well as to fossils. Because X rays pick up the presence of metals, they have worked well on medieval manuscripts, whose ink contains iron. To dramatize what might be possible, Seales had made his own scroll, using a fresh sheet of papyrus on which he had written symbols with iron-gall ink, and which he then rolled up three times. He scanned it, and the result was an arresting simulation of images that depicted the scroll unrolling and the symbols showing clearly on the surface.

But no one had ever done a 3-D scan on an ancient Herculaneum papyrus scroll before. “And I’m this naïve American,” Seales told me. “I think all I have to do is ask if I can scan one and they’ll say yes.” The National Library in Naples, where the vast majority of the scrolls are kept, eventually rejected his proposal.

After the talk, Delattre introduced himself to Seales, and explained that there were six scrolls in Paris. Seales had not known about them. “Mais oui,” Delattre said. And he, Daniel Delattre, was the primary scholar.

Daniel Delattre learned Latin by the age of eleven and ancient Greek a few years after that. “Those were the two subjects I preferred,” he told me. He met his wife, Joëlle Delattre-Biencourt, in high school, and they fell in love with antiquity and with each other. After attending the University of Lille, Delattre taught high-school classics and began working on his doctoral thesis, on the theology of Epicurus, who is best known for the doctrine that the goal of life is pleasure.

Epicurus also posited that the world is made of atoms—the atomos (indivisible) elements of matter. “Epicurus says we are in an atomistic system,” Delattre explained. “Everything that occurs is the result of the atoms colliding, rebounding, and becoming entangled with one another, with no purpose or plan behind their motions.” For Delattre, Epicureanism encompasses physics and ethics, a complete world view that he both studies and emulates. As he gets older, he told me, he finds it comforting to think that “when we die there is a dissolution of the aggregate, and the atoms come together to make a new thing. And so we have nothing to fear from death; there is no punishment, no Hell—we simply cease to exist.” There are gods, “but they are very quiet and very happy and don’t interfere with human activities.” Epicurus influenced the first-century-B.C. Roman poet and philosopher Lucretius, who wrote “On the Nature of Things,” the epic poem that was rediscovered in a monastic library in 1417 by Poggio Bracciolini, a find that Stephen Greenblatt, in his 2011 Pulitzer Prize-winning book, “The Swerve: How the World Became Modern,” credits as being a founding document of the Renaissance.

Not a single one of Epicurus’ philosophical texts has survived; aside from a few fragments, his only preserved words come from two collections of sayings and three letters known only from secondary sources. One letter, as reproduced by Diogenes Laertius, an early biographer of the Greek philosophers, reads, “I have written this letter to you on a happy day to me, which is also the last day of my life. For I have been attacked by a painful inability to urinate, and also dysentery, so violent that nothing can be added to the violence of my sufferings. But the cheerfulness of my mind, which comes from the recollection of all my philosophical contemplation, counterbalances all these afflictions.”

Delattre didn't plan to become a papyrologist, but one of the Philodemus scrolls unwrapped by Father Piaggio in the eighteenth century was on the subject of Epicurus and the gods, and he wanted to read it. He went to the National Library in Naples. "When I saw the opened sheets of carbonized papyrus for the first time, it was very impressive. For me, the writing was very vivid. I felt I was in direct contact with that time. And when I read the name Plato for the first time in the text it made me very emotional. I became a papyrologist at that moment."

Papyrology is a study that combines aspects of textual scholarship, philology, and archeology. It requires Olympian patience to find letters and words amid such badly damaged material, and immense learning to divine the meaning within. It's unusual to get three words in a row without lacunae. Compounding the difficulty is the fact that scribes wrote Greek without spaces between words. A single line can easily take six months to decipher. Sometimes educated guesses about missing bits are wrong, causing the reader to arrive at different meanings from what was intended. One of the revelations following the Brigham Young MSI studies was how wrong many of the earlier readings of the scrolls were. Some editors were essentially making up their own texts.

"Papyrologists are a special breed," Anthony Grafton, a professor of Renaissance and Reformation history at Princeton, says. "They work with really badly damaged manuscripts. But they live with the promise of finding something really new—which is very rare in most classical scholarship." There, marginalia is the only hope.

Delattre spent a year in the National Library, where, in addition to his thesis research, he started working on a new edition of part of Philodemus' "On Music, Book 4," the first of the scrolls opened with Piaggio's machine. That was in 1985. He finished two decades later. Along the way, he made a stunning discovery: previous editions of "On Music" had the sequence of some of the detached leaves of the scroll backward. Delattre's edition, published in 2007, corrected the problem and has caused papyrologists to reevaluate the entire Philodemus canon. Richard Janko, in a review in the *Journal of Hellenic Studies*, called it "pioneering work of the first order."

Delattre became the official editor of the six scrolls in the Institut de France in 2003, a year after the two damaged scrolls returned from Naples. Working at the Sorbonne and at the Institut de France, he has been preparing an edition of one of them, assisted by various students and colleagues; his wife, a retired philosophy professor, is also part of the team. Delattre has been trying to figure out the correct order of the pieces, read them, and publish an edition before he dies, a goal that he says is impossible, because the project "takes an infinite time. Our human scale is not the scale of the scrolls." He is far enough along in the book to be sure that it is yet another work by Philodemus: "On Slander."

In the course of obtaining permission to scan the Paris scrolls, Seales had to give a presentation, in French, to the Académie des Inscriptions et Belles-Lettres, an academy within the Institut de France. "I just wanted to run and hide before that talk, I was so nervous," he said. His request was approved. In 2009, with a grant from the National Science Foundation, Seales had a portable CT scanner brought to the institute, and he spent four weeks scanning two unopened scrolls.

In the resulting images, the folds in the papyrus look cellular, almost biological. Here and there, grains of sand, perhaps trapped in the scrolls when a sandy bather had finished reading, are clearly visible. Seales proposed using these as orientation points for navigating within the labyrinthine volumes.

But the CT scans did not show any letters. There was lead in the ink, but only trace amounts. Though the ink did contain carbon, it did not stand out against the carbon in the blackened papyrus. Seales said, “We hoped that we could look for calcium or other trace compounds in the ink that might help us tease out the writing, but that didn’t work out.”

In 2010, at a digital-restoration conference in Helsinki, Seales met Uwe Bergmann, a physicist at Stanford. Seales was familiar with Bergmann’s work on the Archimedes Palimpsest. In the early nineteen-hundreds, scholars had discovered that two lost works of Archimedes, the third-century-B.C. Greek mathematician and inventor, lay beneath a medieval religious text; a third work, which was also found, had survived in Latin translation. The palimpsest was probably made in Jerusalem, in the thirteenth century. Parchment was in short supply there, and a scribe had scraped away at a tenth-century copy and written over it. Using MSI, researchers could see the titles—“Stomachion,” “The Method of Mechanical Theorems,” and “On Floating Bodies”—but they couldn’t decipher much of the text beyond what was visible to the naked eye.

When Bergmann read about the palimpsest, in an article in GEO that his mother had given him, he immediately thought of employing a synchrotron, a type of particle accelerator—a machine that uses magnets and microwaves to move subatomic particles at almost the speed of light. Some accelerators are linear, others are ring-shaped; Stanford has both kinds. In a synchrotron, the particles’ trajectory is altered to produce powerful X rays, which can be focussed into a beam about the width of a strand of hair. With this beam, it is possible to produce images of molecular structure; the synchrotron has become an immensely useful tool for the drug and electronics industries in developing and studying new compounds.

The beam can be “tuned” to look for particular elements. “The article said that the ink the scribes had used contained iron,” Bergmann said. “That’s one thing we do at the Stanford synchrotron. We measure iron and other metals in proteins—extremely small concentrations of iron.”

Once he obtained access to the palimpsest, Bergmann used X-ray fluorescence imaging, or XRF, in the synchrotron to get pictures of the iron-based molecules in the ink. Unlike MSI, XRF is sensitive to individual elements. Different elements emit characteristic wavelengths of light when the X rays hit them; by zeroing in on iron, Bergmann was able to see the letters. “What had been invisible for centuries was made, right before our eyes, visible,” he said, in an interview published by the Department of Energy. “Line by line, Archimedes’ original writings began to come to life, literally glowing on our screens. It was the most amazing thing.”

At the Helsinki conference, Seales pointed out to Bergmann that XRF wouldn’t work on the unopened scrolls, because it doesn’t penetrate deep enough; it would scan only the outer layers. “And Uwe didn’t bat an eye,” Seales told me. “He said, ‘Phase contrast, man.’ ”

Phase contrast, or XPCT, is another microscopic-imaging tool made possible by synchrotrons. Because XPCT can penetrate surfaces much more deeply, it is used to measure density. A detector behind the sample being imaged captures the changing intensity of the beam as it passes through different atomic densities, which would allow the scroll researchers to map the indentations left by the stroke of the pen.

Bergmann and Seales were considering using Stanford's synchrotron, but the Institut de France would not allow the scrolls to leave the country. There was a synchrotron just outside Paris, but "beam time" there cost about twenty-five thousand dollars a day, and Seales was unable to get a grant to pay for it.

By now, seeing inside an unopened scroll had become something of a quest for Seales. "We'll read the scrolls," he told me in an e-mail. "It's been ten years and look at all we have achieved. From impossible to plausible, even probable. From the wreck of Herculaneum lore, we've created a body of systematic, scientific work." It was only a question of getting the beam time.

Then comes the swerve—a central concept in Epicurean physics. If all matter is made of atoms, and if atoms move through the void according to their own fixed laws, then everything that happens to us is predestined. But, Delattre explained, "There would be no freedom, and for Epicurus we are free, so he wanted to introduce the possibility of this slight deviation." Sometimes the atoms swerve slightly out of their natural trajectory, causing unplanned collisions with unpredictable consequences—not unlike what particles actually do in a synchrotron. (The particle accelerator is an Epicurean invention.) "Lucretius calls this the *clinamen*, which means 'deviation' in Latin—the atoms' tendency to change direction slightly," Delattre added. On a vast scale, this creates an inherently unpredictable universe in which man freely chooses his own path.

The swerve in Seales's plans was Vito Mocella, a physicist at the Institute for Microelectronics and Microsystems, in Naples, who also happened to be interested in the scrolls. In 2007, he was on a family holiday in Capri at the same time that a conference of Herculaneum papyrologists was being held at his hotel. He overheard one of them talking about the problems with reading the scrolls and, he told me, he thought of phase contrast, which he uses regularly in his work on new drug compounds. "I thought that would perhaps solve the problem," he said.

Mocella is a native Neapolitan; he looks a bit like John Lennon might have if he'd had an Italian wife who kept him well fed. He remembers seeing the scrolls for the first time in the National Library when he was ten. "I thought it was strange that the Piaggio Machine was still the best method of opening the scrolls," he told me. "That machine was two hundred years old!"

Mocella had no problem getting beam time in a synchrotron. An old friend from his graduate-school days, Claudio Ferrero, was the head of the Data Analysis Unit at the European Synchrotron Radiation Facility, in Grenoble. Ferrero thought that he could get the E.S.R.F. to donate some beam time if Mocella could get his hands on a scroll. Ferrero described the amazing results that paleontologists were getting with fossilized eggs—the X-rays showed the shape and the density of the embryos inside. He thought that phase contrast might be able to pick up the writing. Papyrus is nonabsorbent, so the ink is slightly raised on the surface.

Mocella inquired at the National Library in Naples about the possibility of putting a scroll inside the synchrotron at Grenoble, and was told that it was out of the question. On learning of the scrolls at the Institut de France, he contacted Delattre in the summer of 2013, and secured his help in getting the institute to agree to lend one scroll and fragments of one of the damaged ones. Late that fall, Delattre brought two fragments and a complete scroll, packed in a cylindrical foam case that Seales had designed for the CT scans, to Grenoble on the T.G.V. train from Paris. Seales, however, would not be travelling there with him.

The E.S.R.F. is situated in an expansive research park, just above the confluence of two rivers, the Isère and the Drac, at the northern end of Grenoble, the small, mountain-ringed city that was the site of the 1968 Winter Olympics. The accelerator there is a ring, a kilometre in circumference. It is densely packed with “hutches,” where the experiments take place. Inside each hutch is an experiment room, where the beam collides with the sample, and a control room, where the scientists monitor the resulting scan on computers. The whole accelerator is enclosed in its own building, with grounds surrounding it and a guesthouse for visiting scientists.

Delattre, as the conservator, was responsible for handling the fragments and the scroll, which had to be scanned individually. In the experiment room, he mounted each piece, one at a time, in a sample holder, where the beam would strike it. The two fragments were tilted; the scroll was placed vertically. Then he joined Mocella, Emmanuel Brun, a French physicist also with the E.S.R.F., and Ferrero in the control room and started the experiment. The sample was exposed to the beam. By turns, the beam passed through the two fragments and the scroll and its many layers, and struck the detector behind, which recorded the information about contrast densities. The beam is invisible, and exposure to it is dangerous; the researchers had to remain in the control room during the scans, which generally lasted for a few hours. The sample holder rapidly rotated the scroll and the fragments in microfractions of three hundred and sixty degrees as the beam flashed. Because the beam is so small, millions of exposures are needed to get a 3-D picture of a scroll. Although the letters are only two or three millimetres high, hundreds of scans are required to get enough information to make out a single letter.

The team waited nervously while the machines compiled the results. (Rendering the scans into images takes tremendous computer power.) On the second day, they began to see images. At first, the landscape looked bleak, barren of readable surfaces. The carbon in the crosshatched papyrus fibres (the sheets were made by pressing two pieces of papyrus together) stood out as dark streaks. But later that day the team had “an impression,” as Mocella puts it, of letters in one spot on the intact scroll, on an exposed edge about two-thirds of the way in. After two weeks of work, Delattre confirmed the impression. Altogether, the team found writing scattered throughout the scroll, and in one fragment they found a series of letters next to each other—pi, iota, pi, tau, omicron, iota—which means “would fall.”

The article in which the team reported their findings, “Revealing Letters in Rolled Herculaneum Papyri by X-Ray Phase-Contrast Imaging,” published in *Nature Communications*, in January, 2015, brought almost as much attention to the scrolls as had Paderni’s letter to Mead. As proof that the concept of virtual unwrapping could work, it was a milestone. “It’s the first hope of real progress we’ve had in a long time,”

David Sider, of N.Y.U., told me. But, so far, the rate at which the team is reading the text makes Piaggio's machine seem positively to hum by comparison.

More than three-quarters of the Villa dei Papiri has never been excavated at all. It wasn't until the nineteen-nineties that archeologists realized that there are two lower floors—a vast potential warehouse of artistic treasures, awaiting discovery. A dream held by papyrologists and amateur Herculaneum enthusiasts alike is that the Bourbon tunnellers did not find the main library, that they found only an antechamber containing Philodemus' works. The mother lode of missing masterpieces may still be there somewhere, tantalizingly close.

Mocella accompanied me on my visit to the Villa dei Papiri. Giuseppe Farella, who works for the Soprintendenza, the regional archeological agency, which oversees the site, took us inside the locked gates and led us into some of the old tunnels made by the Bourbon cavamonti in the seventeen-fifties. We used the lights on our phones to guide us through a smooth, low passageway. An occasional face emerged from the faint wall frescoes. Then we came to the end.

“Just beyond is the library,” Farella assured us, the room where Philodemus' books were found. Presumably, the main library, if one exists, would be near that, within easy reach.

But for the foreseeable future there will be no more excavations of the villa or the town. Politically, the age of excavation ended in the nineties. Leslie Rainer, a wall-painting conservator and a senior project specialist with the Getty Conservation Institute, who met me in the Casa del Bicentenario, one of the best-preserved structures in Herculaneum, said, “I am not sure excavations will ever be opened again. Not in our lifetime.” She pointed to the paintings on the walls, which the G.C.I.'s team is in the process of recording digitally. The colors, originally vibrant yellows, had turned red as a result of the heat from the volcano's eruption. Since being uncovered, the painted architectural details have been deteriorating—the paint is flaking and powdering from exposure to the fluctuating temperature and humidity. Rainer's project analyzes how this happens.

Richard Janko, of the University of Michigan, argues that books are a special case, archeologically, and should be excavated regardless. “Books are a different kind of artifact,” he said. “You can gain knowledge of a whole way of life through a single book. They are designed to carry information across the centuries.” If we wait until the volcano erupts again, he warns, they could be lost forever. Vesuvius, which has erupted scores of times since A.D. 79 and is still one of the most dangerous volcanoes on earth, has been quiet since 1944.

Brent Seales, denied the scientific glory of being the first to see inside the rolled scrolls, has been focussing on the software side of the problem. If large portions of wrapped scrolls are ever going to be read virtually, the process will have to be automated. You'd need a scroll reader that skims along the surface of each successive fold, looking for characteristic shapes and densities of letters. Seales has been designing a prototype for such software, and he showed it to Delattre recently. “Impressive” was the Frenchman's opinion. Janko thinks that “clearly the way forward from here is to combine the work Seales is doing with Mocella's data.”

Such a convergence seemed poised to occur this spring, when Seales, Delattre, and Mocella were set to meet in Grenoble, for another synchrotron session: the software engineer, the papyrologist, the physicist, and a whole week of beam time. (Seales still wasn't part of the team, but he was coming anyway, to present his virtual-unwrapping software.) At the last minute, though, the team didn't get the scroll. Only days before the experiment was set to begin, the Institut de France indicated that it could not grant Mocella's request. No official reason was offered, but the recent publicity about the virtual unwrapping was thought to have caused the institute to reevaluate the scrolls in terms of intellectual property. Controlling access to the scrolls has always been a form of power.

The institute's decision was a blow to Delattre. When I saw him not long afterward, in the institute's library, he still seemed shaken.

While the box containing *Objet Un* was open, I asked Delattre whether he thought the scroll would ever be virtually unwrapped. He considered the question while gazing at the black, shrivelled lump of carbon. On the one hand, it was just an old burned-up word turd left behind by a minor Greek poet and unoriginal thinker. But, on the other hand, it was an invisible stream through which knowledge and pleasure and advancement flowed—if only you could get the access.

"I do not expect this scroll will be read during my lifetime," Delattre said, finally. He closed the lid of the small box with both hands, his shoulders slumped in defeat.

Please visit the site: <http://www.newyorker.com/magazine/2015/11/16/the-invisible-library>

PREHISTORIC "STONEHENGE" **MONUMENT IN GOLAN HEIGHTS FUELS** **MYSTERY,** **BY ARI RABINOVITCH**

Driving past it, one of the most mysterious structures in the Middle East is easy to miss. The prehistoric stone monument went unnoticed for centuries in a bare expanse of field on the Golan Heights.

After Israel captured the territory from Syria in a 1967 war, archaeologists studying an aerial survey spotted a pattern of stone circles not visible from the ground. Subsequent excavations revealed it was one of the oldest and largest structures in the region.

Known as Rujm el-Hiri in Arabic, meaning the "stone heap of the wild cat", the complex has five concentric circles, the largest more than 500 feet (152 m) wide, and a massive burial chamber in the middle. Its Hebrew name Gilgal Refaim, or "wheel of giants", refers to an ancient race of giants mentioned in the Bible.

It is up to 5,000 years old, according to most estimates, making it a contemporary of England's Stonehenge. Unlike the more famous monument built with about 100 huge stones topped by lintels, the Golan structure is made of piles of thousands of smaller basalt rocks that together weigh over 40,000 tons.

"It's an enigmatic site. We have bits of information, but not the whole picture," said Uri Berger, an expert on megalithic tombs with the Israel Antiquities Authority.

"Scientists come and are amazed by the site and think up their own theories."

No one knows who built it, he said. Some think it might have been a nomadic civilisation that settled the area, but it would have required a tremendous support network that itinerants might not have had.

There could be an astrological significance. On the shortest and longest days of the year - the June and December solstices - the sunrise lines up with openings in the rocks, he said.

Standing on the ground inside the complex, it looks like a labyrinth of crumbling stone walls overgrown with weeds. From on top of the five-meter-high burial mound, it is possible to make out a circular pattern. Only from the air does the impressive shape of a massive bull's-eye clearly emerge.

Shards of pottery and flint tools were found in various excavations to help date the site, Berger said. Scholars generally agree that construction started as early as 3,500 BC and other parts may have been added to over the next two thousand years.

The complex is in an area now used for training by Israel's military, but visitors can explore the walls and crawl into the 20-foot-long burial chamber on weekends and holidays.

Please visit the site: <http://www.reuters.com/article/2015/11/11/archaeology-golanheights-idUSL8N1361Q820151111> [Video at <http://bcove.me/wpc8ej9d>]

INFRARED THERMOGRAPHY STUDY SUGGESTS OTHER CHAMBERS EXIST INSIDE TUTANKHAMUN'S TOMB

Infrared thermography could support Nicholas Reeves' theory suggesting the existence of another burial chamber inside King Tutankhamun's tomb that could belong to Queen Nefertiti Nevine El-Aref , Saturday 7 Nov 2015

Twenty-four hours after beginning the first experiment using infrared thermography to scan the walls of Tutankhamun's tomb, preliminary result from the northern wall of the chamber show the presence of temperature differentials that could indicate the existence of additional hidden chambers, Minister of Antiquities Mamdouh Eldamaty told Ahram Online.

In order to certify the results, Eldamaty said, a number of experiments are to be carried out to determine more accurately the area concerned. "A study of the acquired results will be analysed as well," he pointed out.

Eldamaty went on saying that a longer scan, of no less than a week, is required in order to confirm the results.

"Using other methods is possible, to help identify the area different in temperature from the other parts of the northern wall," Eldamaty pointed out.

The scanning process was carried out by a joint scientific mission from the Ministry of Antiquities in collaboration with the Faculty of Engineering of Cairo University and the Heritage, Innovation and Preservation (HIP) Institute, Paris.

Please visit the site:

<http://english.ahram.org.eg/NewsContent/9/40/162906/Heritage/Ancient-Egypt/Infrared-thermography-study-suggests-other-chamber.aspx>

EGYPT DETECTS 'IMPRESSIVE' ANOMALY **IN GIZA PYRAMIDS,** **BY MARAM MAZEN**

Two weeks of new thermal scanning in Egypt's Giza pyramids have identified anomalies in the 4,500 year-old burial structures, including a major one in the largest pyramid, the Antiquities Ministry announced Monday.

Antiquities Minister Mamdouh el-Damaty and technical experts working on the project showed the higher temperature being detected in three specific adjacent stones at the bottom of the pyramid in a live thermal camera presentation to journalists.

The scanning showed "a particularly impressive one (anomaly) located on the Eastern side of the Khufu pyramid at ground level," the ministry said in a statement. The largest of the three Giza pyramids is known locally as Khufu and internationally as Cheops.

The thermal scanning was carried out at all times of the day, including during sunrise, as the sun heats the structures from the outside, and then during sunset as the pyramids are cooling down. The speed of the heating and cooling phases is being used to uncover "hypotheses" such as empty areas in the pyramids, internal air currents, or different building materials used.

"The first row of the pyramid's stones are all uniform, then we come here and find that there's a difference in the formation," said el-Damaty, pointing at the three stones showing higher temperatures.

While inspecting the area, el-Damaty said they found "that there is something like a small passage in the ground that you can see, leading up to the pyramids ground, reaching an area with a different temperature. What will be behind it?"

Other heat anomalies were detected in the upper half of the pyramid that the experts said need to be investigated further.

El-Damaty invited all Egyptologists, especially those interested in ancient Egyptian architecture, to join in the research and help come up with ideas on what could be behind the anomalies.

The pyramids, located on the outskirts of Cairo, are one of the major tourist attractions in the country. The pyramids, which were used as sacred burial structures, were built in the fourth Pharaonic dynasty. The great pyramid is the oldest and only surviving monument of the seven wonders of the ancient world.

Please visit the site: <http://abcnews.go.com/Technology/wireStory/egypt-detects-impressive-anomaly-giza-pyramids-35075580>

ARCHAEOLOGIST WILL INVESTIGATE STRANGERS IN ANCIENT EGYPT

In the mid-eighth century BC they conquered Egypt and ruled it for nearly one hundred years. They came from Kush. To date, little is known about this episode in the history of ancient Egypt. Polish researcher intends to shed light on this issue.

The reign of the twenty-fifth dynasty (c. 747-656 BC), also known as the Nubian Dynasty or the Kushite Empire because they were invaders from Nubia (now northern Sudan), is a matter to which the scientific literature devotes little space. This situation results from the fact that not many monuments of this period have been described by scientists, and researchers have difficulties with their dating.

"The aim of my research project is to examine and organize the knowledge of manifestations of activities of the Kushites in Thebes - the main centre of acculturation of the Kushite population, who came with the rulers of the 25th dynasty to Egypt" - explained Marta Kaczanowicz, last year student at the Institute of Prehistory of Adam Mickiewicz University in Poznań, who received Diamond Grant from the Ministry of Science for her research.

The reign of kings of the 25th Dynasty chronologically belongs to the Third Intermediate Period of Ancient Egypt. The rulers of this dynasty, called "Kushite" or "Nubian", unlike earlier pharaohs of the Old or the New Kingdom, did not originate from Egypt, but from Kush. From there, approximately in the mid-eighth century, they conquered Egypt. Nearly 100 years of the rule of Ethiopians in Egypt ended with the Assyrian invasion, which forced the "black pharaohs" to withdraw to Ethiopia, where they ruled for the next ten centuries.

Young archaeologist pay particular attention to the tombs of officials from the circles of the "God's Wife of Amun" - high priestess of Karnak, who in those days had an extremely high position, which researchers attribute to the special status of women in the Kushite court. The researcher will compare archaeological data with written texts. This way, she will seek to understand, as she puts it, the "extraordinary phenomenon", which was the meeting of pharaonic and Kushite cultures. During the first visit to Egypt, Kaczanowicz visit the majority of known Kushite tombs in Thebes, which are mostly off the beaten tourist paths. Later she will document some of them - not all known tombs in Thebes have a complete scientific documentation, including copies of hieroglyphs that are crucial for the interpretation and reconstruction of the history of the 25th dynasty.

"Kushite tombs are very difficult to distinguish from those in which the Egyptians were buried. Kushites took Egyptian names, took over the Egyptian funeral customs and funerary equipment. Therefore, we need a detailed analysis of the burials from this period" - added Kaczanowicz.

Scientists estimate that the migration from the south to Thebes was large at that time, yet there are very few tombs, which have been clearly identified as belonging to the Nubians - and the total number of burials from the time of Kushite domination in Thebes is substantial.

"My project is also aimed at popularising the little perceived phenomenon of the presence of Kushites in Egypt. Therefore, a special website will soon be created, which in addition to spreading knowledge of Thebes during this period, will also focus on a detailed presentation of digital methods of documentation and analysis of results - the workshop of contemporary archaeologist" - announced Kaczanowicz.

Please visit the site:

<http://scienceinpoland.pap.pl/en/news/news,407179,archaeologist-will-investigate-strangers-in-ancient-egypt.html>

GREEK FORTRESS, KEY TO ANCIENT JERUSALEM, UNCOVERED, RESEARCHERS SAY, BY ARI PABINOVITCH

After a century of searching, archaeologists say they have found the remnants of an ancient Greek fortress once a center of power in Jerusalem and a stronghold used to hold off a Jewish rebellion celebrated in the scriptural Book of the Maccabees.

Researchers have long debated over the location of the Acra, built more than 2,000 years ago by Antiochus Epiphanes, king of the Hellenised Seleucid empire. Many asserted it stood in what is now Jerusalem's walled Old City, at spots like the Church of the Holy Sepulchre or by the hilltop where two Jewish temples once towered and which now houses the Al Aqsa mosque compound.

But the remains unearthed by the Israel Antiquities Authority and made public on Tuesday are outside the walls, overlooking a valley to the south, an area where archaeologists say Jerusalem construction was concentrated under the biblical King David.

Antiochus, who lived from 215-164 BC, chose the spot for the Acra in order to control the city and monitor activity in the Jewish temple, said Doron Ben-Ami, who led the excavation.

With an estimated length of up to 250 meters (yards) and 60 meters in width, it would have dominated the countryside.

Beneath what a decade ago was a paved parking lot, Ben-Ami's team sifted through an artificial hill made of layers of earth left behind by successive cultures.

In one area they uncovered stones from a section of a massive wall, the base of a tower and a sloping defensive embankment that nearby artifacts like coins and wine jug handles suggest date to the period of Antiochus.

Lead sling stones and bronze arrowheads from the period were also found, perhaps left over from battles between pro-Greek forces and Jewish rebels trying to take over the fortress.

"This is a rare example of how rocks, coins and dirt can come together in a single archaeological story that addresses specific historical realities from the city of Jerusalem," Ben-Ami said.

The Acra's location was referred to vaguely in at least two ancient texts - the Book of Maccabees, which tells of the rebellion, and a written record by historian Josephus Flavius.

Historians tell how the rebels, lead by Judas Maccabeus, took back Jerusalem from the Greeks, a victory marked in the Jewish festival Hannukah. But the Acra held out until rebels under Judas' brother, Simon, later lay siege and forced its surrender.

Please visit the site: <http://www.reuters.com/article/2015/11/03/us-archaeology-jerusalem-idUSKCN0SS1GD20151103?feedType=RSS&feedName=lifestyleMolt>

GLADIATOR COLOSSEUM FOUND IN TUSCANY, BY ROSSELLA LORENZI

Italian archaeologists have unearthed remains of an oval structure that might represent the most important Roman amphitheater finding over the last century.

The foundations of the colosseum, which is oval-shaped like the much larger arena in the heart of Rome, were found in the town of Volterra and might date back to the 1st century A.D. Amphitheaters like these were used during Roman times to feature events including gladiator combats and wild animal fights.

The archaeologists estimate this structure measured some 262 by 196 feet, although only a small part of it has been unearthed.

"This amphitheater was quite large. Our survey dig revealed three orders of seats that could accommodate about 10,000 people. They were entertained by gladiators fights and wild beast baiting," Elena Sorge, the archaeologist of the Tuscan Superintendency in charge of the excavation, told Discovery News.

By comparison, the Colosseum in Rome could seat more than 50,000 spectators during public games.

"The finding sheds a new light on the history of Volterra, which is most famous for its Etruscan legacy. It shows that during the emperor Augustus's rule, it was an important Roman center," she added.

One of the most powerful Etruscan cities, Volterra fell under Roman rule in the 1st century B.C.

The most striking monument dating to the Roman period is a theater built in the Augustan age, which is one of the finest and best preserved Roman theaters in Italy. It stands about a mile from the newly discovered arena.

With the help of ground penetrating radar and a digital survey by Carlo Battini, of the University of Genoa, Dicca Department, the archaeologists were able to estimate that much of the amphitheater lies at a depth of 20 to 32 feet. So far the survey dig has been funded by the Cassa di Risparmio bank of Volterra.

"We are hoping to find more sponsors and funding to excavate this wonder. We believe that within three years it could be fully brought to light," Sorge said.

The amphitheater was made from stone and decorated in "panchino," a typical Volterra stone used since Etruscan time to build the town's walls. It features the same construction technique used to raise the nearby theater.

The archaeologists have so far brought to light a large sculpted stone and the vaulted entrance to a cryptoporticus, or covered passageway. Such corridor would have possibly housed the gladiators just before they entered the arena

"It's puzzling that no historical account records the existence of such an imposing amphitheater. Possibly, it was abandoned at a certain time and gradually covered by vegetation," Sorge said.

Please visit the site: <http://news.discovery.com/history/archaeology/gladiator-colosseum-found-in-tuscany-151111.htm> [Go there for pix]

AGRICULTURE LINKED TO DNA CHANGES IN ANCIENT EUROPE

A burial site of a neolithic culture found near Saxony-Anhalt, Germany. A rapidly growing supply of DNA from ancient skeletons is changing evolutionary history. Credit LDA Sachsen- Carl Zimmer

The agricultural revolution was one of the most profound events in human history, leading to the rise of modern civilization. Now, in the first study of its kind, an international team of scientists has found that after agriculture arrived in Europe 8,500 years ago, people's DNA underwent widespread changes, altering their height, digestion, immune system and skin color.

Researchers had found indirect clues of some of these alterations by studying the genomes of living Europeans. But the new study, they said, makes it possible to see the changes as they occurred over thousands of years.

"For decades we've been trying to figure out what happened in the past," said Rasmus Nielsen, a geneticist at the University of California, Berkeley, who was not involved in the new study. "And now we have a time machine."

Before the advent of studies of ancient DNA, scientists had relied mainly on bones and other physical remains to understand European history. The earliest bones of modern humans in Europe date to about 45,000 years ago, researchers have found.

Early Europeans lived as hunter-gatherers for over 35,000 years. About 8,500 years ago, farmers left their first mark in the archaeological record of the continent.

By studying living Europeans, scientists had already found evidence suggesting that their ancestors adapted to agriculture through natural selection. As tools to sequence DNA became more readily available, researchers even discovered some of the molecular underpinnings of these traits.

But these studies couldn't help determine exactly when the changes occurred, or whether they resulted from natural selection or the migrations of people into Europe from other regions. Scientists are now tackling these questions in a much more direct way, thanks to a rapidly growing supply of DNA from ancient skeletons. These studies have revealed that the DNA of Europeans today comes from three main sources.

Before the rise of agriculture, Europe was home to a population of hunter-gatherers. Then a wave of people arrived whose DNA resembles that of people in the Near East. It's likely that they brought agriculture with them.

Please visit the site: <http://www.nytimes.com/2015/11/24/science/agriculture-linked-to-dna-changes-in-ancient-europe.html>

LOST ISLAND OF ANCIENT GREECE **DISCOVERED IN AEGEAN SEA -** **ARCHAEOLOGISTS THINK THEY MAY** **HAVE FOUND THE CITY OF KANE, SITE OF** **A MAJOR BATTLE BETWEEN ATHENS AND** **SPARTA DURING THE PELOPONNESIAN** **WAR, BY NICK ROMEO**

An international team of archaeologists and geophysicists believe they have discovered a lost island in the eastern Aegean that was once home to the ancient city of Kane.

The island, mentioned by the ancient Greek historian Xenophon, is famous for its proximity to the 406 B.C. sea battle of Arginusae, at which the Athenians defeated the Spartans near the end of the Peloponnesian war.

The Arginusae islands, now called the Garip islands, lie only a few hundred yards off the coast of Turkey. Ancient historical sources refer to three Arginusae islands, but the exact location of the third has long been unclear.

Researchers drilled into the ground and used geological evidence to reveal that what is now a peninsula was once an island. At some point before the late Middle Ages, a land bridge formed between island and shore. An Ottoman map from the 16th century shows the island had already become a peninsula by that point.

It appears the island may have been connected to the mainland by deposits that formed in a narrow natural channel, possibly as a result of earthquakes or the erosion of mainland agricultural fields.

The scientists plan to determine the ages of the geological layers using radiocarbon dating, which will help them better understand how this happened, says Felix Pirson, director of the German Archaeological Institute in Istanbul.

Archaeologists also found the submerged remains of an ancient harbor from the Hellenistic period (323 B.C. to 31 B.C.) nearby, another indication that the peninsula was once an island.

Stormy History

Though Kane was only a small city in antiquity, it held a place along a strategic maritime trade route running from the Black Sea along the southern coast of Turkey, with a large harbor where ships could shelter from storms.

Previous research uncovered pottery on the island that suggested trade routes; now certain microorganisms native to the Black Sea that were likely carried in by boats to the nearby port of Elaia offer additional evidence of trade networks.

"Classical archaeology has become much more complex than, say, 20 years ago," Pirson says. "We can now incorporate many more subtle techniques of studying environmental influences."

Historic Battle

The battle of Arginusae was a bittersweet victory for the Athenians. Though they defeated the Spartans, soon afterward a storm made it impossible to rescue the Athenians whose ships had been destroyed. When the victorious Athenian generals returned home, the citizens voted to execute them for failing to rescue these soldiers.

"It destroyed the morale of Athenian commanders and led indirectly to total defeat a year later," says Barry Strauss, who studies ancient history at Cornell University.

The Athenians' vengeance ultimately contributed to their downfall, agrees Cambridge University's Paul Cartledge. "Democratic Athens managed to snatch defeat from victory's jaws-by putting on trial all eight of the admirals who had won the battle, and then illegally condemning them all to death."

It's unlikely that any of the wooden shipwrecks from the battle of Arginusae would have survived, but future research will aim to establish a timeline from the drilled cores and combine this data with historical sources to better understand the maritime networks of the broader region.

Please visit the site: <http://news.nationalgeographic.com/2015/11/151119-lost-island-aegean-kane-sparta-athens-archaeology/> [Go there for pix]

1,500-YEAR-OLD WINE PRESSES FOUND IN NETIVOT

The excavation revealed the remains of a late Byzantine period village dating to the 6th and 7th centuries. One of the most impressive finds of the excavation is a sophisticated wine press that was used to mass-produce wine.

In the course of preparations for the construction of a new residential neighborhood in the town of Netivot in the Negev, the Israel Antiquities Authority conducted a salvage excavation of the site. Youths from Netivot and Ashkelon were encouraged to volunteer in the dig, along with a group of future IDF recruits currently performing a year of community service in the area.

The excavation revealed the remains of a late Byzantine period village dating to the 6th and 7th centuries C.E., including a workshop, various buildings and two wine presses. Fragments of marble latticework in the form of a cross and flowers indicate the existence of a public building. Other findings include tools used in daily life, such as clay cups, oil candles and seals.

Ilan Peretz, who supervised the dig for the IAA, noted that one of the most impressive finds of the excavation is a sophisticated wine press that was used to commercially produce wine. He described the process: "First, the grapes were pressed. Then the juice was funneled through canals to a pit where the sediment settled. From there, the wine was piped into vats lined with stone and marble, where it would ferment until it was stored in clay bottles called 'Gaza jugs'" - hundreds of which have been found on the site.

On the basis of a cross etched into seashells adorning one of the vats of the wine press, the researchers determined that the site served the Christian community living there 1400-1500 years ago.

Please visit the site: <http://mfa.gov.il/MFA/IsraelExperience/History/Pages/1500-year-old-wine-presses-found-in-Netivot-15-Nov-2015.aspx> [Go there for pix]

CATCH THE BUZZ - HUMANS HAVE KEPT HONEYBEES FOR AT LEAST 9,000 YEARS, ARCHAEOLOGICAL EVIDENCE SUGGESTS **FIONA MACDONALD**

It's long been suspected that humans began working with bees thousands of years ago, but despite Egyptian drawings and rock art depicting ancient beekeeping, there's been no solid evidence of our long-standing and ongoing relationship with bees - until now.

Researchers from the University of Bristol in the UK have analysed pottery from more than 6,400 prehistoric vessels, and found evidence of early farmers in what is now Turkey using beeswax as far back as 7000 BCE. And it turns out that agriculture may have actually paved the way for bee colonies to expand.

With the collapse of many bee colonies around the world, understanding the relationship between humans, farming, and bees is more important than ever.

"Now we know that beeswax was used continuously from the seventh millennium BCE, probably as an integral part in different tools, in rituals, cosmetics, medicine, as a fuel or to make receptacles waterproof," said one of the researchers, Alfonso Alday.

Previous research had found remnants of beeswax in large vessels, believed to be early beehives. The product is collected from honeycombs, and it was targeted in the study not only for its variety of uses, but because its lipids are incredibly resistant to degradation, which means that traces of beeswax can be found in archaeological sites thousands of years later.

By looking for traces of beeswax on a range of pottery from different regions and time periods, the team was able to recreate a rough timeline of the use of beeswax throughout Europe, east Asia, and north Africa.

After its first use in Turkey - in a region known as Anatolia - the use of beeswax appears to have spread northwest, showing up in Mediterranean pottery around 1,500 years later in 5000 BCE, often mixed together with the fat of ruminants.

Bees didn't appear to be used in the rest of Europe until a little later - the researchers found evidence of beeswax in Greece dating back to 4900 to 4500 BCE, in Romania from 5500 and 5200 BCE onwards, and Serbia 5300 to 4600 BCE.

There's also evidence of the product being used in northern Africa, England, Denmark, Germany, and Austria around the same time. But the most prolific use appears to have been by early farmers in the Balkan Peninsula, with much of the pottery between 5800 and 3000 BCE containing traces of beeswax.

Interestingly, this rough timeline would suggest that the spread of modern farming, which involved the clearing of forests for pastures, paved the way for bee colonies to expand their habitat, as the team explains:

"The opening up of forests to gain land and pastures encouraged the development of landscapes in which bushes and flowers provided environments suited to bees. In some way, the bees were the 'pursuers of agriculture', spreading their habitat as more farmland was being prepared."

The team is yet to find traces of wax residue in northern Scotland, and the Scandinavian Peninsula north of Denmark, leading them to believe that these locations may have been above the limit for where honeybees could survive.

We think it's awesome that our millennia-old relationship with bees is now a little more peer-review official, but we'd love to know more about what honey looked like 9,000 years ago. Because if this case of the mysterious blue honey in France is anything to go by, different environments can produce some weird variations.

The research has been published in Nature.

Please visit the site: <http://www.beeeculture.com/catch-the-buzz-humans-have-kept-honeybees-for-at-least-9000-years-archaeological-evidence-suggests/>

IMPRESSIVE NEW MOSAIC UNCOVERED IN LOD

While building the visitor center for the Lod Mosaic, which was discovered previously and is considered one of the most spectacular in the country, another impressive mosaic was discovered at the site.

(Communicated by the Israel Antiquities Authority spokesperson)

An impressive mosaic revealed in archaeological excavations by the Israel Antiquities Authority in Lod will be open for the first time this week, specifically for visits by the public, in cooperation with the Lod municipality.

In June–November 2014 a team of archaeologists from the Israel Antiquities Authority directed a large excavation in the Neve Yerek neighborhood of Lod, in an area where a breathtaking mosaic that served as the living room floor in a villa some 1,700 years ago was previously exposed. The aim of the excavation was to prepare the ground for construction of a visitor center, to which the beautiful mosaic will be returned when it completes a series of exhibitions in museums around the world. Important artifacts were discovered in the new excavation, the most notable of which is another colorful mosaic (11 × 13 m) that was the courtyard pavement of the magnificent villa that had the famous mosaic in its living room.

According to Dr. Amir Gorzalczany, excavation director on behalf of the Israel Antiquities Authority, "The villa we found was part of a neighborhood of affluent houses that stood here during the Roman and Byzantine periods. At that time Lod was called Diospolis and was the district capital, until it was replaced by Ramla after the Muslim conquest. The building was used for a very long time".

The northern part of the complex, where the "Shelby White and Leon Levy Lod Mosaic Center" will be constructed, was exposed when the Israel Antiquities Authority was inspecting development work being carried out in the early 1990s prior to the construction of Highway 90. The mosaic, which was discovered and excavated at that time by the late Miriam Avissar, is among the most beautiful in the country, and has been exhibited in recent years in some of the world's leading museums, including the Metropolitan, the Louvre and the State Hermitage etc. It is currently on display at the Cini Gallery in Venice, Italy, and in the future it will be housed in the main building to be erected in Lod.

The southern part of the complex was exposed in the current excavations. Among other things, it includes a large magnificent courtyard that is paved with a mosaic and surrounded by porticos (stoas-covered galleries open to the courtyard) whose ceiling was supported by columns. According to Dr. Gorzalczany, "The eastern part of the complex could not be completely exposed because it extends beneath modern buildings in the neighborhood".

The scenes in this mosaic depict hunting and hunted animals, fish, flowers in baskets, vases and birds.

Dr. Gorzalczyk added, “The quality of the images portrayed in the mosaic indicates a highly developed artistic ability”.

Numerous fragments of frescoes (wall paintings prepared on wet plaster) reflect the decoration and the meticulous and luxurious design, which are in the best tradition of the well-born of the period. In light of the new discoveries, this part of the villa will also be incorporated in the visitor center.

Please visit the site: <http://mfa.gov.il/mfa/israelexperience/history/pages/new-impressive-mosaic-uncovered-in-lod-16-november-2015.aspx>

GLASS PRODUCTION AT AMARNA

Dazzling things for akhenaten & nefertiti: glass production at amarna in a guest blog, dr anna hodgkinson, of the freie universität and the egyptian museum, berlin, discusses some interesting pieces from amarna, the capital city of 'heretic' king akhenaten

I recently spent two days working in the stores of manchester museum, studying objects related to glass-working from the sites of tell el-amarna, in middle egypt, and guro, in the egyptian fayum. Both sites were partially excavated by w.m.f. petrie in the 1890s, which is the reason for the large numbers of objects from these sites at manchester and other uk collections.

My research project, which is based at the freie universität and the egyptian museum, berlin, focusses on the manufacture of glass- and faience items in late bronze age egypt and mesopotamia, in conjunction with the production of foodstuffs. While this largely took place at a domestic level, much evidence of institutionalised industries exists. This particularly applies to the palatial, or royal settlements of the ancient egyptian new kingdom.

Amarna_map

Much evidence of glass-working and, possibly, raw glass production exists from amarna. However, while extremely high quantities of objects have been found in the course of recent, thorough, excavations, such as those led by barry kemp since 1977, the early excavations by petrie (1891-2) also yielded vast quantities of such items. Petrie had a special interest in the manufacture of glass in ancient egypt, and, for this reason, he brought back a huge quantity of items, which were presented to various museum collections. Unfortunately, since the precise find locations were not recorded, we are only aware of the general area in which the objects were found: the north-western main city and also the central city "palace wasteheaps" at amarna.

During my time at manchester, i studied almost 160 objects related to glass-working from petrie's work at amarna. While finished glass artefacts, particularly intricately decorated vessels, can be considered elite objects, simple items of jewellery would have still been accessible to people who were less well-off. The distribution of finished goods is thus equally important a case study as that of the manufacturing materials. I am, however, concentrating on the latter group, since this can tell us much more about the methods used and the skills involved in the working of glass.

The large number of items was rather unexpected, and some items had been grouped under a common accession number and needed to be given individual numbers. Items i studied encompass fragments of glass ingots of various sizes and colours, i.e. Blocks of raw glass used for the production of finished objects. Furthermore, there were numerous glass rods that had been drawn from the molten ingots, and used for the manufacture and decoration of core-formed vessels and items of jewellery. They had occasionally been flattened into bars and chipped in order to be used as inlays for hieroglyphic inscriptions or to decorate pieces of sculpture. Two large fragments of cylindrical pottery vessels are coated in run-off glass, indicating that they were probably used as moulds for normed glass-ingots.

Petrie even produced his own reconstruction of the manufacturing processes and the ovens used for melting the glass. He states in his publication from 1894 that "fortunately the sites of three or four glass factories, and two large glazing works, were discovered; and though the actual work-rooms had almost vanished, the waste heaps were full of fragments which shewed the methods employed: moreover the waste heaps of the palace, as we have mentioned in chap. II, contained hundreds of pieces of glass vases which illustrate the finished objects." Petrie used the cylindrical vessels and the oven debris to reconstruct the glass factories in the main city north. However, excavations by Paul Nicholson in the area in the 1990s have created a slightly different picture: site O45.1 was found to contain two large and thick-walled kilns, capable of reaching temperatures high enough to produce raw glass from scratch.

In 2014 I was able to undertake a season of excavations at buildings M50.14-16 in Amarna's southern main city. This site did not contain any large ovens or kilns, but evidence of pit firing was found, indicating glass-working at lower temperatures. The site also yielded numerous fragments, rods and bars of glass, together with c.90 unfinished and waste glass beads. Similar items were also found by Petrie, probably also in the northern main city.

While the cataloguing of the glass objects from Amarna in museums worldwide continues, the Manchester collection has already demonstrated that the materials recovered by Petrie are far more numerous than previously assumed. The evaluation of the materials in Manchester Museum will contribute to our knowledge of New Kingdom Egyptian glass-working techniques and the skills of the craftsmen who, in around 1350 BC created large amounts of colourful glass objects in their houses and in larger workshops, catering to the elite, to Pharaoh as well as producing objects for their own use.

Read further:

Petrie, William Matthew Flinders, 1894. Tell el-Amarna, London: Methuen.

Nicholson, Paul T., 2007. Brilliant things for Akhenaten: the production of glass, vitreous materials and pottery at Amarna site O45.1, EES 80, London.

Please visit the site: <https://egyptmanchester.wordpress.com/2015/11/11/dazzling-things-for-akhenaten-nefertiti-glass-production-at-amarna/>

ISRAELI ARCHAEOLOGISTS UNEARTH WORLD'S OLDEST DOMESTICATED 'FUL' - ANCIENT FAVA BEANS SHED NEW LIGHT ON HOW NEOLITHIC MAN ATE - AND FARMED, BY ARI SOFFER

Archaeologists in Israel have discovered ancient deposits of seeds which they believe includes the world's oldest domesticated fava seeds (known as ful in Hebrew).

A joint study by researchers of the Weizmann Institute and the Israel Antiquities Authority, which examined fava seeds exposed in archaeological excavations in recent years at Neolithic sites in the Galilee, sheds light on the nutritional habits of the people that lived in the area 10,000 years ago. Seeds found at the prehistoric sites show that the inhabitants' diet at the time consisted mainly of fava beans, as well as lentils, various types of peas and chickpeas.

According to researchers of the Weizmann Institute and Israel Antiquities Authority (IAA), ancient man living in the Galilee specialized in cultivating legumes in general and fava beans (ful) in particular. The discovery enables "a deeper understanding of the agricultural revolution in the southern Near East," according to the IAA.

The study was conducted by archaeobotanist Valentina Caracuta of the Weizmann Institute, together with Dr. Elisabetta Boaretto and Dr. Lior Regev, in cooperation with archaeologists Dr. Kobi Vardi, Dr. Yitzhak Paz, Dr. Hamoudi Khalaily, Dr. Ianir Milevski and Dr. Omri Barzilai of the Israel Antiquities Authority.

The multitude of fava seeds found at the Neolithic sites excavated in the Galilee during the past few years indicates the preference placed on growing fava beans, the researchers said.

Dating of the seeds, conducted at the Kimmel Center in the Weizmann Institute, indicated they were well over 9,000 years old. They were found husked in storage pits apparently used as Neolithic granaries.

The seeds' dimensions are a uniform size, indicating that they were methodically cultivated and harvested at the same period of time, when the legumes had ripened. According to the researchers, keeping the seeds in storage pits is also reflective of long-term agricultural planning, whereby the stored seeds were intended not only for food, but also to ensure future crops in the coming years.

"The identification of the places where plant species that are today an integral part of our diet were first domesticated is of great significance to research," the researchers said in a joint statement. "Despite the importance of cereals in nutrition that continues to this day, it seems that in the region we examined (west of the Jordan River), it was the legumes, full of flavor and protein, which were actually the first species to be domesticated.

"A phenomenon known as the agricultural revolution took place throughout the region at this time: different species of animals and plants were domesticated across the Levant, and it is now clear that the area that is today the Galilee was the main producer of legumes in prehistoric times.

"This is a process that lasted thousands of years, during which certain characteristics of wild species changed, and domesticated plant species were created. To this day, most of the chickpeas grown in the country are cultivated in the Galilee region."

According to the archaeologists, among their finds were the world's oldest domesticated fava seeds, dating to 10,125-10,200 according to advanced dating techniques.

Please visit the site:

<http://www.israelnationalnews.com/News/News.aspx/203811#.VluJNXarS1I> [Go there for pix]

NEW DISCOVERY IN EGYPT HIGHLIGHTS THE HISTORY OF THE HYKSOS CAPITAL OF AVARIS

A gigantic Middle Kingdom sandstone wall has been uncovered in Tel Al-Dabaa town in Sharqiya governorate.

An Austrian archaeological mission uncovered a 500-meter-long sandstone wall from the late Middle Kingdom era during excavation work carried out in Tel Al-Dabaa town (Avaris) in Sharqiya governorate in the Delta, the antiquities minister announced on Tuesday.

Mamdouh El-Damaty described the discovery as important because it highlights the second intermediate period and the Hyksos invasion to Egypt that is considered as a crucial era in ancient Egyptian history. Tel Al-Dabaa, or Avaris in ancient times, was also Egypt's capital and it has still not yet been totally explored and studied because most of its ancient ruins are still hidden within the town's agricultural land.

Mahmoud Affifi, the head of the ancient Egyptian antiquities department, said that the location of the newly discovered wall suggests that it once enclosed a port because it stretches along a depression very deep on the eastern side.

He suggests that the wall could be related to an old town that controlled all the entrances to the depression and the town's provinces located on the western side of the wall.

Please visit the site: <http://english.ahram.org.eg/News/171636.aspx> [Go there for pix]

**WELL-PRESERVED' SARCOPHAGUS OF
22ND DYNASTY NOBLEMAN UNEARTHED
IN EGYPT'S LUXOR - AN ANTHROPOID
SARCOPHAGUS OF A 22ND DYNASTY
NOBLEMAN WAS DISCOVERED IN EL-
ASSASSIF NECROPOLIS ON LUXOR'S WEST
BANK, BY NEVINE EL-AREF**

During today's inspection tour in Luxor's West Bank around the tomb of the 22nd dynasty's Amenhotep-Hwi (TT28), Minister of Antiquities Mamdouh Eldamaty announced the discovery of the sarcophagus of a 22nd dynasty nobleman named Ankh-If-Khonsu.

Eldamaty explained that the sarcophagus was found to be well preserved and in excellent condition after being unearthed from a niche carved in the tomb's rock. The find was made early this week by a Spanish mission from the Institute of Ancient Egyptian studies in collaboration with an Egyptian mission from the ministry of antiquities.

Head of the Ancient Egyptian Antiquities department Mahmoud Afifi said that the sarcophagus is in the very distinct style of the 22nd dynasty and it is carved from wood that is covered in a layer of plaster.

The sarcophagus depicts the facial features of the deceased wearing a wig and a crown made of flowers. His chest is decorated with a necklace and he is holding papyrus flowers. Afifi added that the sarcophagus is decorated with hieroglyphic texts and scenes depicting the deceased in different positions before deities Osiris, Nefertem, Anubis, and Hathor.

Sultan Eid, head of the central administration of Upper Egypt, told Ahram Online that the sarcophagus contains a mummy, but it has not been yet studied.

Please visit the site:

<http://english.ahram.org.eg/NewsContent/9/40/171837/Heritage/Ancient-Egypt/%E2%80%98Wellpreserved%E2%80%99-sarcophagus-of-nd-dynasty-nobleman.aspx>

MOSAIC WITH BIBLE INSCRIPTION FOUND IN ADANA

A 120-square-meter mosaic with a quotation from the Bible in Greek has been recently found in Turkey's Adana province. It reads, 'The wolf and the lamb will feed together, the lion will eat straw like the ox and dust will be the serpent's food. They will neither harm nor destroy on my holy mountain, says the Lord'. A new mosaic inscribed with quotes from the Bible has been discovered in the southern city of Adana during excavations jointly undertaken by the Culture and Tourism Ministry's Cultural Heritage Department and the Provincial Directorate of Museums. The 120-square-meter mosaic was found on private property located in the Karlık neighborhood of Adana's Sarıçam district. According to archaeologists, the Eastern Roman-era mosaic dates back to between the fifth and sixth centuries A.D.

It features 16 different animal figures, including a snake, lion, sheep, leopard, wolf, goat and bull. Wild and domestic animals are portrayed as sleeping and being fed together or eating each other's food. A related ancient Greek text describing how wild and domestic animals lived together and shared the same pasture was translated by a group of researchers commissioned by the museum directorate. The translated text quotes the Biblical chapter of Isaiah (65:25), including: "The wolf and the lamb will feed together, the lion will eat straw like the ox and dust will be the serpent's food. They will neither harm nor destroy on my holy mountain, says the Lord." Scientific research continues on the mosaic, and it has been brought to the laboratory of a new museum complex under construction at the historical National Textile Factory in Adana. Sabri Tari, the head of the Provincial Culture and Tourism Directorate, said they are conducting important projects to improve the city's tourism potential with the support of Culture and Tourism Minister Ömer Çelik.

The ministry supports excavation projects around the city, and the artifacts will be displayed under ideal conditions at a new museum. Tari said excavations continue at 15 different locations, including the city center, and districts under the supervision of the provincial museum directorate. "We were excited to discover the artifact. It will be one of the rare pieces in our museum. Following restoration and renovation projects at the laboratory, the new museum will display all discovered artifacts," he said. Spread across a 68,000-square-meter area, the museum will include different parts, such as sections dedicated to agricultural, industrial and ethnographic findings.

Nedim Dervişoğlu, deputy head of the Adana Museum, said they are conducting 15 ongoing excavations with the support of the ministry. Pointing to the small number of existing mosaics in Turkey, Dervişoğlu said: "We found the mosaic in an area that is presumably a building's floor. It is 15 meters long and eighteen meters wide. It is one of the mosaics featuring quotes from the Bible, and is an important piece for our museum."

Please visit the site: <http://www.dailysabah.com/arts-culture/2015/07/15/mosaic-with-bible-inscription-found-in-adana> [Go there for pix]

PALEOLITHIC ELEPHANT BUTCHERING **SITE FOUND IN GREECE** **PALEOANTHROPOLOGISTS EXCAVATE** **PREHISTORIC BONES CUT BY STONE** **TOOLS**

Date: November 25, 2015

Source: Universitaet Tübingen

Summary: A new Lower Paleolithic elephant butchering site has been discovered in Megalopolis, Greece. The site has yielded stratified stone artifacts in association with a nearly complete skeleton of *Elephas antiquus*.

A new Lower Paleolithic elephant butchering site, Marathousa 1, has been discovered in Megalopolis, Greece, by a joint team of researchers from the Ephorate of Paleoanthropology and Speleology (Greek Ministry of Culture) and the Paleoanthropology group, University of Tübingen.

Marathousa 1 is located in an open-cast coal mine, on what was once the shore of a shallow lake. It has yielded stratified stone artifacts in association with a nearly complete skeleton of *Elephas antiquus*, as well as the exceptionally well-preserved remains of fauna (rodents, birds, amphibians, reptiles, mollusks and insects) and plants (wood, seeds, fruit). The association of lithic artifacts with the elephant remains, as well as the discovery of cutmarks on elephant bones, indicate that Marathousa 1 is an elephant butchering site. Preliminary results suggest a Middle Pleistocene age (roughly between 300 and 600 thousand years before present). The researchers found stone tools, which the early hunters are likely to have used to cut the meat from the bones. "That makes Megalopolis the only site in the Balkans where we have evidence of an elephant being butchered in the early Paleolithic," says Professor Katerina Harvati of the Senckenberg Center for Human Evolution and Palaeoenvironment (HEP) at the University of Tübingen.

Marathousa 1 is one of the oldest archaeological sites in Greece. The region is one of the most likely routes for human migration into Europe and also likely acted as a refugium for fauna, flora and human populations during glacial periods.

"Despite this crucial geographic position, Paleoanthropological and Paleolithic research has been under-represented in the region due to a traditional focus on later prehistory and Classical times. As a result, very little information exists on the Lower Paleolithic of Greece. Marathousa 1 is of paramount importance for the understanding of human dispersal patterns into Europe, as well as the adaptations and behavior of early humans in the region," says Harvati.

The Marathousa 1 excavation is conducted by Dr. E. Panagopoulou (Ephorate of Paleoanthropology and Speleology) in collaboration with Professor K. Harvati (Paleoanthropology, University of Tübingen) within the framework of the ERC StG project 'PaGE' ('Paleoanthropology at the Gates of Europe: Human Evolution in the

Southern Balkans') awarded to Professor Harvati. PaGE aims to help close the research gap in southeastern European Paleoanthropology.

Story Source:

The above post is reprinted from materials provided by Universitaet Tübingen. Note: Materials may be edited for content and length.

Journal Reference:

Eleni Panagopoulou, Vangelis Turloukis, Nicholas Thompson, Athanassios Athanassiou, Georgia Tsartsidou, George E. Konidakis, Domenico Giusti, Panagiotis Karkanis, Katerina Harvati. Marathousa 1: a new Middle Pleistocene archaeological site from Greece. *Antiquity*, February 2015, Issue 343 [link]

Please visit the site:

<http://www.sciencedaily.com/releases/2015/11/151125083934.htm>
