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Πληροφοριακό Δελτίο της Ελληνικής Αρχαιομετρικής Εταιρείας

- Νοέμβριος 2018 -

Nature does nothing in vain.

(Aristotle)

Newsletter of the Hellenic Society of Archaeometry

- November 2018 -

Nr. 212

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ΣΥΝΕΔΡΙΑ - CONFERENCES/WORKSHOPS

SYMPOSIUM ANNOUNCEMENT AND CALL FOR PAPERS AND POSTERS, LIVING MATTER/ LA MATERIA VIVA, THE PRESERVATION OF BIOLOGICAL MATERIALS USED IN CONTEMPORARY ART, JUNE 3-4, 2019, MUAC AND ENCRYM, MEXICO CITY

Organized by the Getty Conservation Institute, the Museo Universitario Arte Contemporáneo (MUAC) of the Universidad Nacional Autónoma de México and ENCRyM (Escuela Nacional de Conservación, Restauración y Museografía "Manuel del Castillo Negrete") of the National Institute of Anthropology and History.

Symposium

Countless artists from Marcel Duchamps, Dieter Roth, Andy Warhol, Piero Manzoni to Ed Ruscha, Anya Gallaccio, Teresa Margolles, Adrian Villar Rojas, Marta Palau and Damien Hirst have used biological materials (food, bodily fluids, plant material, etc.) in their art.

Living Matter/ La Materia Viva will discuss the broad implications and challenges (conceptual, ethical, and practical) associated with collecting, displaying, and preserving contemporary works that include biological materials. It will explore how the initial intention for the work might conflict with museum policies and the ways this might impact both the nature and lifespan of the work, present a range of possible solutions through case studies, and give an overview of current thinking and practices on this topic.

The two-day event includes invited keynote lectures and paper submissions as well as panel discussions, visits, and an accompanying exhibition. The symposium languages will be English and Spanish.

Registration

Detailed program and registration information will be available in January 2019.

Call for Abstract Submissions for Papers and Posters Abstracts will be accepted in English and Spanish; however, the symposium proceedings will be English language.

Deadline for submission: November 15, 2018.

For more information please see:

http://www.getty.edu/conservation/living_matter.html

For questions please contact:

livingmatter@getty.edu**<**<mailto:livingmatter@getty.edu>**>**

TECHNART 2019, 7-10 MAY, 2019 BRUGES, BELGIUM

Dear Colleagues,

The University of Antwerp and the Municipal Museums of Bruges have the pleasure of inviting you to the 6th edition of **TECHNART**, the conference dedicated to the promotion of analytical techniques in the field of cultural heritage.

TECHNART 2019 will take place from 7-10 May 2019 in the historic city of Bruges, Belgium, a UNESCO heritage site that derives its identity from its Gothic architecture and scenic canals.

In the 15th century, Bruges was the cradle of the Flemish primitives. Many of the works of Hans Memling, Jan Van Eyck and others have remained in the city until today and can be admired in several of the municipal museums.

The TECHNART conference venue is situated in the very centre of Bruges, at the medieval Saint John's Hospital, one of Europe's oldest infirmaries.

For more info on the meeting, abstract submission and registration, please visit:

<https://www.uantwerpen.be/technart2019>

Some important dates:

- deadline for submission of abstracts: Monday 28 January 2019
- deadline for early registration: Friday 1 March 2019

We hope to see you in Bruges in early May 2019 !

Koen Janssens, University of Antwerp
Geert Van der Snickt, University of Antwerp
Luc Van 't dack, University of Antwerp
Till-Holger Borchert, Municipal Museums Brugge

RESEARCH IN PROGRESS 2018 –
UNIVERSITY OF YORK, TUESDAY 6TH
NOVEMBER 2018

The Department of Archaeology is delighted to host this year's Research in Progress at **The Huntington Room, Kings Manor, York on Tuesday 6th November 2018.**

This meeting is aimed at a wide variety of contributors, from historical and archaeological metallurgists to excavators, historians, and economists. If you are working, or have just finished working, on a project related to archaeological or historical metallurgy, we would like to hear from you. We are particularly interested in bringing together contract and public-sector archaeologists with academic researchers, and in fostering links between the different disciplines studying metallurgy and related activities. Whether you are a student, a researcher, an interested non-specialist, or a professional excavator, we invite you to meet others working in this field and present your research to an interested community.

Online booking and the provisional programme are available on our website <http://hist-met.org/meetings/research-in-progress-meeting-2018.html>

For further information, please email Vanessa Castagnino (vrc505@york.ac.uk)

9TH INTERNATIONAL SYMPOSIUM
RADIOCARBON AND ARCHAEOLOGY, MAY
20TH-24TH, 2019, ATHENS, GEORGIA, USA

Dear colleagues,

Below is the newsletter from the organizers of the 2019 Radiocarbon and Archaeology meeting in Athens, Georgia, USA. If you would like to sign up for their newsletter go to Radiocarbonandarchaeology2019.com for more information.

Best regards,

Kim Elliott
Managing editor, Radiocarbon journal

Radiocarbon and Archaeology 2019 – October 2018 Symposium Newsletter

Meeting Update

Hello Colleagues,

We are thrilled to bring you a number of announcements regarding the 2019 Radiocarbon and Archaeology meeting in Athens, Georgia, USA! Mark your calendars, for the 9th International Symposium set for May 20th-24th, 2019.

Mailing list

We created this list to keep all interested parties updated with up-to-date news about the meeting. If you do not wish to receive our emails, please unsubscribe below.

We also encourage you to share the web address with colleagues that are not on the mailing list. They can subscribe by filling out the form at the bottom of the Radiocarbonandarchaeology2019.com website.

Website and Social Media

If you have not yet had a chance, please visit Radiocarbonandarchaeology2019.com to check out our new website. This site will act as our primary means of interacting with those interested in joining us in Athens. Through the website, you can learn more about the meeting, submit session abstracts, and soon you will be able to register to attend the meeting. More features such as online abstract submissions, an interactive meeting program, and more will be made available in the coming months.

www.RadiocarbonandArchaeology2019.com

If you use facebook, please checkout our facebook group, Radiocarbon and Archaeology 2019

Radiocarbon and Archaeology 2019 Facebook Group

Online Session Abstract Submission Now Open!

The Scientific Committee encourages the grouping of papers in pre-organized thematic sessions. A thematic session proposal requires one lead person to submit a session abstract for review prior to the open call for paper and poster abstracts. Please note that the Scientific Committee reserves the right to reject thematic session proposals, as well as the right to reject or realign individual papers submitted for thematic sessions once all of the abstracts are received.

The deadline for Session Abstract Submission is November 9th, 2018.

Submit Your Session Abstract Here

Online Meeting Registration Coming Soon!

Online meeting registration will be open soon!

Sincerely,

2019 Radiocarbon and Archaeology Meeting Organizers

Radiocarbon and Archaeology 2019
University of Georgia
Athens, GA
USA



INQUA2019, SESSION 'ROLE OF THE INTCAL RADIOCARBON CALIBRATION CURVES IN QUATERNARY SCIENCE' IN THE SPECIAL SESSIONS UNDER INQUA COMMISSION: STRATIGRAPHY AND CHRONOLOGY

Dear all

Please note that the deadline for abstract submissions for INQUA2019 is 9 January 2019.

If you utilize the IntCal radiocarbon calibration curves in your research or have new analyses that may provide information for future calibration curves please consider submitting an abstract to the session 'Role of the IntCal radiocarbon calibration curves in Quaternary Science' in the special sessions under INQUA Commission: Stratigraphy and Chronology

Further information is available at
<http://www.inqua2019.org/call-for-abstracts/>

Session description:

Radiocarbon ages need to be converted into calibrated or calendar year equivalents in order to compare to records on other timescales or calculate rates of change. The key requirement for this conversion are the calibration curves which are updated and refined by the IntCal Working Group and ratified by the international radiocarbon community. These curves are based on the latest research focused on understanding the past ^{14}C content of the atmosphere and the ocean, and on the development of new statistical techniques.

The utility of the IntCal radiocarbon calibration curves goes far beyond conversion of radiocarbon ages to calendar year equivalents. The curves provide a means to integrate palaeoclimate records on other timescales, such as ice core or U-Th dated speleothems, with marine or terrestrial sediments dated by radiocarbon or archaeological records with additional chronological information. In addition the curves for the North and South Hemisphere provide past atmospheric ^{14}C levels for input into models of solar activity and ocean general circulation models.

This session will highlight new analyses that provide information for future calibration curves or that utilize the IntCal calibration curves to improve understanding of earth systems science.

Paula J. Reimer and Christopher Bronk Ramsey

Prof. Paula J. Reimer, MRIA

Director, Centre for Climate, the Environment & Chronology (14CHRONO) School of
Natural and Built Environment Queen's University Belfast Belfast BT7 1NN UK

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42-66 Fitzwilliam Street

Belfast BT9 6AX

UK

EUROPEAN MEETING ON ANCIENT CERAMICS, BARCELONA, SEPTEMBER 2019

REGISTRATION AND CALL FOR PAPERS IS OPEN NOW!

Please visit the site: www.ub.edu/emac2019

**ΘΕΣΕΙΣ ΕΡΓΑΣΙΑΣ/ΥΠΟΤΡΟΦΙΕΣ –
JOB VACANCIES/FELLOWSHIPS**

**C14 JOB OPPORTUNITY, CENTRE FOR
ACCELERATOR SCIENCE, AT ANSTO,
SYDNEY, AUSTRALIA**

Position summary

As the Leader of ANSTO's Centre for Accelerator Science (CAS), you will provide overall leadership across teams of scientific and technical staff that operate within the Accelerator Systems and Development Group, Science Group and Chemlab Group.

will be responsible for managing, developing, implementing and operating CAS's scientific assets, infrastructure and capabilities. Partnering with the Leadership team, you will facilitate and drive outcomes that meet the needs of ANSTO research, a collaborative user community and industry partners. This role will provide you an opportunity to contribute to NSTLI's research infrastructure strategy and policy, and actively initiate and enhance the CAS research and development activities to produce research outcomes for ANSTO.

We are seeking an inspirational leader who is able to:

- Demonstrate significant research and operational expertise, be a strong driver and advocate for enabling excellent research through the application of accelerator science to a wide range of scientific fields.
- Support ANSTO in the delivery of high-impact, strategic national interest research.
- Lead and manage scientific and technical teams across multiple disciplines.
- Foster a culture of high-performance that encourages innovation, improves productivity and promotes teamwork and collaboration to deliver a world-class user experience.
- Employ strong engagement skills and manage strategic relationships with a wide range of stakeholders including ANSTO researchers, a diverse external user community including industry, government agencies and universities.
- Promote and develop a highly innovative and business orientated approach to both the technical and commercial aspects of facility operations and management.
- Attract, retain, empower and develop world-class talent, to promote wellbeing and drive cross organisational capability.
- Demonstrate a track record in research infrastructure planning and capability development planning for science infrastructure to meet short and long term needs.
- Guide CAS through cultural and structural change.
- Successfully develop and implement business plans which stem from a consistent and encompassing organisational strategy and preparing for the future.
- Demonstrate values and behaviours that are exemplary, actively promote positive behaviours, collaboration and high performance.

The position offers an opportunity to apply relevant experience and professional skills in a leadership role, inspire and lead in an operational environment that utilises well networked and connected groups using communication, ideas and projects to enhance research, innovation and development.

The position will be appointed as ongoing, full-time. A competitive salary package will be offered commensurate with qualifications and experience.

Key accountabilities

Leadership

- Lead and manage the highly skilled research and technical staff team within CAS to achieve ANSTO's strategic objectives, including full utilisation of our landmark and national infrastructure, scientific capabilities, to deliver scientific excellence and a world-class user experience.
- Deliver national research infrastructure capabilities to a national and international user community.
- Develop, lead and deliver a range of high-quality, cost-effective platform operations and research projects that meet ANSTO objectives, build research capacity and achieve increased research performance and impact.
- Ensure the continued development of world-class national research infrastructure and capabilities.
- Develop and maintain a range of collaborative networks across ANSTO to deliver excellent research services, support and programs, share knowledge and deliver outcomes from partnered research which is mutually beneficial and has impact.
- Ensure the delivery of operational and research excellence within CAS by fostering a culture of high-performance that encourages innovation, improves productivity and promotes teamwork and collaboration.
- Broker scientific knowledge and maintain the highest standards of open communication, collaboration, data and knowledge management.

Strategic Planning

- Partner with the NSTLI Senior Leadership Team to identify and act upon transformation opportunities in a way that will maximize benefits presented by change. Implement and maintain a people focussed business strategy that supports ANSTO's current and future strategic goals.
- Develop and implement objectives, plans, targets and activities to deliver outcomes that achieve ANSTO's research infrastructure and research strategy.
- Develop and implement strategies for diversifying and increasing income, identify external funding opportunities to support enhanced delivery of outcomes and to leverage additional value through collaboration with external stakeholders.
- Provide expert and authoritative scientific advice and support to the Head of Research Infrastructure and NSTLI Senior Leadership Team on the development, implementation, management and reporting of program, ensuring they are fully briefed on the status of science and that technical and/or scientific priorities and innovations are properly considered.

Management and Resourcing

- Overall leadership of CAS human resources through selection, training, development, performance management and review, recognition and guidance of managers and staff

and ensuring the sustainability of the platform through succession planning, workforce planning, talent management and employee development.

- Deliver best-practice facility management and utilisation, ensure availability of facilities, equipment and expertise, partner with researchers from across industries and research sectors to provide expert advice and platform access to facilitate their research.
- Management of scientific infrastructure, facilities and equipment through an asset management framework and improvement program to ensure reliability of assets, productivity and availability to users.
- Ensure operational safety, security, sustainability and compliance with applicable standards, legislative and regulatory requirements.
- Encourage and support a project management approach to the management of research infrastructure and research projects, provide oversight and direction with the ongoing monitoring, reviewing and timely completion of projects, consistent with project deliverables.
- Manage and oversee all aspects of CAS operations and research programs, including endorsing plans, identifying and allocating resources, developing budgets and control and management of financial performance.
- Overall leadership of CAS human resources through selection, training, development, performance management and review, recognition and guidance of managers and staff and ensuring the sustainability of the platform through succession planning, workforce planning, talent management and employee development.

Selection criteria

- Doctorate or equivalent level tertiary qualification in a relevant scientific field with an excellent research track record developed in the context of operating and managing open-access, user-focussed scientific or research infrastructure, facilities, equipment and capability.
- Proven experience, at a senior level, leading and managing multiple teams to achieve scientific excellence, desired organisational outcomes and achieving optimal work performance.
- Experience guiding, developing and mentoring staff to deliver optimal operational and research outcomes.
- Demonstrated experience in developing and implementing innovative, targeted, cost effective operational programs and research projects to optimise facility capacity and capabilities and achieve increased performance and outcomes.
- Demonstrated capacity to attract new and additional funding for programs and/or maximising returns on investment.
- Proven track record of financial management, forecasting, planning (both financial and workforce/succession) and cost control.
- Demonstrated ability to initiate and manage change, allocate resources effectively and identify and manage risks.
- Demonstrated experience in managing effective relationship with key stakeholders.
- Excellent communication, interpersonal skills, negotiation and influencing skills.
- Demonstrated strategic thinking and planning skills, experience and the capacity to develop innovative solutions to complex, multi-faceted issues and problems.

Application process

A selection committee has been appointed to assess candidates against the requirements of the role and identify the widest possible field of qualified candidates.

Applications should consist of a full **curriculum vitae** detailing academic and professional qualifications, full employment history and relevant achievements.

This should be accompanied by a **cover letter** summarising how candidates meet the selection criteria outlined in the full position description, why the appointment is of interest and what they believe they can bring to the role.

To apply please use **ANSTO's online application portal** (<https://www.ansto.gov.au/careers>). A full position description is also available through this link.

As part of this process, candidates may be invited to communicate with ANSTO representatives in person or by video conference. Candidates whose skills and experience are considered suitable to progress may be required to undertake additional assessment of skills, knowledge, abilities and aptitude. It is expected final shortlisted candidates will be invited for final interviews at ANSTO in December 2018.

All applications must be submitted online.

To be eligible for appointment, applicants will be required to undertake a security and medical assessment.

The closing date for applications is **Monday 26 November 2018 at 11:30pm AEST**.

For queries in relation to the recruitment and selection process

Contact

ANSTO's talent acquisition team:

PHONE +61 2 9717 3359

Note: For international phone calls please be aware of the **local time in Sydney** to ensure your calls are answered.

Contact

Dr Miles Apperley:

PHONE +61 2 9717 9975

EMAIL miles.apperley@ansto.gov.au

ΑΝΑΚΟΙΝΩΣΕΙΣ - ANNOUNCEMENTS

APPLICATIONS FOR THE ADVANCED MASTERS IN STRUCTURAL ANALYSIS OF MONUMENTS AND HISTORICAL CONSTRUCTIONS

After 10 years of European funding, 375 students and 65 countries, applications for the **Advanced Masters in Structural Analysis of Monuments and Historical Constructions** are opened up to January 20, 2019. This is the leading international course on conservation of heritage structures, **winner of the 2017 European Union Prize for Cultural Heritage "Europa Nostra"**, and a unique opportunity to meet people from all over the world.

This Master Course, which is running its 12th Edition, is organized by a Consortium of leading European Universities/Research Institutions in the field, composed by **University of Minho** (coordinating institution, Portugal), the **Technical University of Catalonia** (Spain), the **Czech Technical University in Prague** (Czech Republic), the **University of Padua** (Italy) and the **Institute of Theoretical and Applied Mechanics of the Czech Academy of Sciences** (Czech Republic).

The course combines the most recent advances in research and development with practical applications.

A significant number of **scholarships**, ranging from 4,000 to 13,000 Euro, are available to students of any nationality.

Please find full details on the MSc programme, as well as electronic application procedure, on the website www.msc-sahc.org

Yours sincerely,

Paulo B. Lourenco

Course Coordinator

Editor of the International Journal of Architectural Heritage: Conservation, Analysis, and Restoration

ASCSA SUMMER SESSION

DEADLINE: January 15, 2019

The Summer Session program of the American School of Classical Studies at Athens is a six-week session designed for those who wish to become acquainted with Greece and its major monuments, and to improve their understanding of the country's landscape, history, material culture, literature, and culture from antiquity to the present. The Director for the 2019 Summer Session (June 10 to July 24, 2019) is Professor Matthew Sears, University of New Brunswick.

Eligibility: Enrollment is open to graduate and advanced undergraduate students and to high school and college instructors of classics and related subjects. Enrollment is limited to twenty participants. The language of instruction is English. Applicants who are not enrolled or teaching at English-speaking colleges, universities, or schools, are required to supply evidence of proficiency in English.

Format: The ASCSA Summer Session has provided the most extensive exposure to Greece, ancient and modern, for generations of students of Classics and related fields. It has a strong academic component with participants researching and presenting topics on site and offers unique opportunities to interact with eminent archaeologists in the field. Roughly half of the session is spent in travel throughout Greece. Three trips of varying duration give the participant an introduction to the major archaeological sites and museum collections. The remainder of the session is devoted to study of the museums and monuments of Athens and the surrounding area with day trips to such sites as Marathon, Sounion, and Eleusis. The Summer Session's commitment to presenting a comprehensive view of Greece's rich history leads to long days and extensive walking in the hot Mediterranean climate. Participants should be prepared for a rigorous program of study.

Cost: Fees for the 2019 program are \$4,900. This includes tuition, room for the entire six-week period, partial board in Athens, travel within Greece, and museum and site fees. International airfare, some meals, and incidental expenses are the participant's responsibility. Financial aid is available in the form of ASCSA scholarships, awarded on the basis of academic merit, and many classical professional organizations have funding opportunities. More information at <http://www.ascsa.edu.gr/index.php/programs/ss-scholarships>.

Application: More information and online application forms are available through the website at <http://www.ascsa.edu.gr/index.php/admission-membership/application-to-summer-sessions>. Applicants will complete an online application. Applicants are required to submit legible pdf scans of academic transcripts as part of the online application, and arrange for the online submission of two letters of recommendation by January 15, 2019. Application fee: \$25.

Link to application: <https://ascsa.submittable.com/submit/115817/ascsa-summer-session-application>

Web site: www.ascsa.edu.gr

E-mail: ssapplication@ascsa.org

All applicants will be notified by March 20, 2019.

The American School of Classical Studies at Athens does not discriminate on the basis of race, age, sex, sexual orientation, color, religion, ethnic origin, or disability when considering admission to any form of membership or application for employment

Alicia M. Dissinger, PhD
Programs Administrator
American School of Classical Studies at Athens



ΝΕΕΣ ΕΚΔΟΣΕΙΣ – NEW PUBLICATIONS

IRON OXIDE ROCK ARTEFACTS IN MESOPOTAMIA C. 2600-1200 BC AN INTERDISCIPLINARY STUDY OF HEMATITE, GOETHITE AND MAGNETITE OBJECTS, BY MARTINE MARIEKE MELEIN

Iron Oxide Rock Artefacts in Mesopotamia c. 2600-1200 BC An interdisciplinary study of hematite, goethite and magnetite objects by Martine Marieke Melein. Paperback; 205x290mm; vi+258 pages; 49 figures; 52 tables (85 plates in colour). 453 2018. Available both in printed and e-versions. Printed ISBN 9781784919641. Epublication ISBN 9781784919658.

The flourishing civilisations of Mesopotamia, nowadays Iraq and Syria, imported all kinds of materials from the surrounding regions. Iron oxide rock (hematite, goethite and magnetite) was very popular for weight stones and cylinder seals around 2000 BC. This research aims to determine the region of origin for the raw material, what made people start using iron oxide rock, and what led them to stop using it. To answer these questions, a multidisciplinary approach was applied.

Geology and archaeology were combined to identify Northern Syria as the region of origin. Archaeometric research of the production process showed that technological change concurred with the start and end of the use of iron oxide rock. Cuneiform texts yielded, among other information, the earliest description of magnetism known to mankind.

Furthermore, element and mineral composition of 50 artefacts from three Dutch collections were determined with modern, non-destructive analysis techniques.

About the Author

Martine Melein grew up in the most southern part of the Netherlands. Her interest in archaeology began when she was very young, and her grandfather told her stories about ancient cultures. When she was 17, she left Maastricht to study archaeology in Leiden. She is the first of her family to have completed an academic education. After finishing her doctoral education in Mesopotamian archaeology, and obtaining a post-academic teaching degree in social science, she lectured on various Ancient Near Eastern subjects at Leiden University, as well as for the general public. During her PhD-research she raised a family and earned money as a housekeeper, lunch lady, educational co-ordinator of Geo- and Bioarchaeology at Vrije Universiteit Amsterdam and finally assistant to the director of the academic teacher education, also at Vrije Universiteit. She presented her research at several ICAANE and RAI conferences and participated in the international METROLOGIA-research group, as well as in scientific workshops on themes such as metrology and pigments. One of Martine's major strengths lies in

combining scientific disciplines, thus allowing to tell a more complete and balanced story of our past.

Please visit the site:

<http://www.archaeopress.com/ArchaeopressShop/Public/displayProductDetail.asp?id={5A7B22BA-0279-4373-A03C-FDD07CE3595D}> [Go there for pricing options]

ARCHAEOLOGY

Among the publications in the latest Archaeology are:

In-situ Sourcing of Hematite Paints on the Surface of Hohokam Red-on-Buff Ceramics Using Laser Ablation – Inductively Coupled Plasma – Mass Spectrometry (LA-ICP-MS) and Instrumental Neutron Activation Analysis B. S. Eiselt, J. Dudgeon, J. A. Darling, E. N. Paucar, M. D. Glascock, M. K. Woodson Version of Record online: 15 October 2018

Long-distance interaction in Urartu?: Provenance and composition of copper alloys from Ayanis, Turkey A. Batmaz, J. W. Lehner, G. Dardeniz Version of Record online: 15 October 2018

Please visit the site: <https://onlinelibrary.wiley.com/toc/14754754/0/0>

EVIDENCE FOR MAGMATIC CARBON BIAS IN ¹⁴C DATING OF THE TAUPO AND OTHER MAJOR ERUPTIONS

Richard N. Holdaway, Brendan Duffy & Ben Kennedy

Prehistoric timescales, volcanic hazard assessment, and understanding of volcanogenic climate events rely on accurate dating of prehistoric eruptions. Most late Quaternary eruptions are dated by ¹⁴C measurements on material from close to the volcano that may be contaminated by geologic-sourced in finite-age carbon. Here we show that ¹⁴C ages for the Taupo (New Zealand) First Millennium eruption are geographically arrayed, with oldest ages closer to the vent. The current eruption wiggle match date of 232 ± 5 years CE is amongst the oldest. We present evidence that the older, vent-proximal ¹⁴C ages were biased by magmatic CO₂ degassed from groundwater, and that the Taupo eruption occurred decades to two centuries after 232 CE. Our reinterpretation implies that ages for other proximally-dated, unobserved, eruptions may also be too old. Plateauing or declining tree ring cellulose δ¹³C and Δ¹⁴C values near a volcano indicate magmatic influence and may allow forecasting of super-eruptions.

(2018) 9:4110 | DOI: 10.1038/s41467-018-06357-0 |
www.nature.com/naturecommunications

PROCEEDINGS OF THE 2014 SYMPOSIUM ON MEDIEVAL COPPER AND BRASS, NAMUR/DINANT

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This volume contains the proceedings of the International Conference on Medieval Copper Alloys Production, held at Dinant and Namur on 15, 16 and 17 May 2014. The conference was organised by the Service public de Wallonie (Belgium) and the Institut national de recherches archéologiques préventives (France). The proceedings include 34 original contributions presented by archaeologists, historians, conservators, art historians, and other specialists, including metallurgists and chemists.

Collectively, they show the great diversity of approaches being taken to elaborate the multiple themes associated with copper and its alloys in the material culture of medieval and post-medieval Europe. In the late Middle Ages, there was a gradual increase in the use of copper and its alloys for making everyday objects, whether for dress accessories, such as belt buckles or small decorative studs, or in kitchens and houses where the metal became a cauldron, ewer, basin, or lavabo. In contrast to these common objects fabricated in serial or mass production, were the exceptional, discrete objects satisfying the needs of the aristocracy and liturgy. Such made-to-order masterpieces might include aquamanilia, candelabra, or lecterns. Additionally, copper alloys were used for more colossal works of art such as columns, doors, baptisteries, fountains, funeral monuments and, of course, bells. Copper was equally sought in artisanal contexts, for artillery, for musical instruments, and for coinage. In exploring such a vast subject from multiple points of view, this volume will be of interest not only to archaeologist, but also to those involved in the history of techniques, art history, economic history, and social history. It is aimed both at an informed public and to those simply curious about the history of the Middle Ages in Europe.

ΕΙΔΗΣΕΙΣ - NEWS RELEASE

ZOOMING IN ON PETRA - HOW DIGITAL ARCHAEOLOGISTS ARE USING DRONES AND CUTTING-EDGE CAMERAS TO RECREATE THE SPECTACULAR 2,000- YEAR-OLD RUINS IN JORDAN, BY SUSAN ORLEAN, PHOTOGRAPHS BY CHRISTINA RIZK

Once you've been to Petra, it stays with you. Long after you've left you will find grit from Petra's red sandstone in the tread of your shoes; your fingernails will have a faint rosy tinge; a fine pinkish dust will cling to your clothing. For some time you will close your eyes and still be able to relive the startling moment you first saw this ancient stone city rising out of the desert floor; you will savor the memory of this place, its grandeur and strangeness, even after you manage to wash away the traces of its red rocks.

Driving southwest across the dull plateau from Amman for a few hours, you suddenly tip into the dry basin of Jordan's Arabah Valley and tumble down through mountain passes. The landscape is cracked and sandy, seared and unpromising. It is hardly the setting in which you expect to find a city of any sort, let alone one this rich and extravagant and refined. There seems to be no water, no possibility of agriculture, no means of livelihood or sustenance. The fact that the Nabatean people, the nomadic Arabs who crisscrossed the region until they grew wealthy from trade, made Petra the capital of their empire by the fourth century B.C. is baffling. Yet here, at the valley's center, are the remains of this once-lavish city, watered by hidden aqueducts that run for miles from an underground spring. It looks like no other place I've ever seen. The "buildings" are punched into the rock cliffs—in other words, they are elaborate caves, recessed in the sandstone and fronted with miraculously carved ornate facades. It is probably one of the world's only cities that was made by subtraction rather than addition, a city you literally enter into, penetrate, rather than approach.

Petra will draw you in, but at the same time, it is always threatening to disappear. The sandstone is fragile. The wind through the mountains, the pounding of feet, the universe's bent toward disintegration—all conspire to grind it away. My trip here was to see the place and take a measure of its evanescent beauty, and to watch Virtual Wonders, a company devoted to sharing and documenting the world's natural and cultural wonders, use all manner of modern technology to create a virtual model of the site so precise that it will, in effect, freeze Petra in time.

* * *

I arrived in Petra just as the summer sun cranked up from roast to broil; the sky was a bowl of blue and the midday air was piping hot.
The paths inside the Petra Archaeological Park were clogged.

Horse-drawn buggies clattered by at a bone-joggling speed. Packs of visitors inched along, brandishing maps and sunscreen. In a spot of shade, guides dressed as Nabateans kneeled to conduct their midday prayers.

At its peak, 2,000 years ago, Petra was home to as many as 30,000 people, full of temples, theaters, gardens, tombs, villas, Roman baths, and the camel caravans and marketplace bustle befitting the center of an ancient crossroads between east and west. After the Roman Empire annexed the city in the early second century A.D., it continued to thrive until an earthquake rattled it hard in A.D. 363. Then trade routes shifted, and by the middle of the seventh century what remained of Petra was largely deserted. No one lived in it anymore except for a small tribe of Bedouins, who took up residence in some of the caves and, in more recent centuries, whiled away their spare time shooting bullets into the buildings in hopes of cracking open the vaults of gold rumored to be inside.

In its period of abandonment, the city could easily have been lost forever to all but the tribes who lived nearby. But in 1812, a Swiss explorer named Johann Ludwig Burckhardt, intrigued by stories he'd heard about a lost city, dressed as an Arab sheikh to beguile his Bedouin guide into leading him to it. His reports of Petra's remarkable sites and its fanciful caves began drawing ogles and adventurers, and they have continued coming ever since.

Two hundred years later, I mounted a donkey named Shakira and rode the dusty paths of the city to ogle some of those sites myself. This happened to be the middle of the week in the middle of Ramadan. My guide, Ahmed, explained to me that he had gotten permission to take his blood pressure medication despite the Ramadan fast, and he gobbled a handful of pills as our donkeys scrambled up rock-hewn steps.

Ahmed is a broad man with green eyes, a grizzled beard, a smoker's cough, and an air of bemused weariness. He told me that he was Bedouin, and his family had been in Petra "since time began." He was born in one of Petra's caves, where his family had been living for generations. They would still be living there, he said, except that in 1985, Petra was listed as a Unesco World Heritage site, a designation that discourages ongoing habitation. Nearly all the Bedouin families living in Petra were resettled—sometimes against their wishes—in housing built outside the boundaries of the new Petra Archaeological Park. I asked Ahmed if he preferred his family's cave or his house in the new village. His house has electricity and running water and Wi-Fi. "I liked the cave," he said. He fumbled for his phone, which was chirping. We rode on, the donkeys' hard hooves tapping a rhythmic beat on the stone trail.

Petra sprawls and snakes through the mountains, with most of its significant features collected in a flat valley. Royal tombs line one side of the valley; religious sites line the other. A wide, paved, colonnaded street was once Petra's main thoroughfare; nearby are the ruins of a grand public fountain or "nymphaeum," and those of several temples, the largest of which was probably dedicated to the Nabatean sun god Dushara. Another, the once free-standing Great Temple—which probably served as a financial and civic center in addition to a religious one—includes a 600-seat auditorium and a complex system of subterranean aqueducts. On a small rise overlooking the Great Temple sits a Byzantine church with beautiful intact mosaic floors decorated with prancing, pastel animals including birds, lions, fish and bears.

The grander buildings—that is, the grander caves—are as high and spacious as ballrooms, and the hills are pocked with smaller caves as well, their ceilings blackened by the soot left from decades of Bedouin campfires. Some of the caves are truly imposing, like the Urn Tomb, with its classical facade carved into the cliff on top of a base of stone-built arches, and an eroding statue of a man (perhaps the king) wearing a toga. Others are easy to miss, such as the cave known as the Triclinium, which has no facade at all but possesses the only intricately carved interior at Petra, with stone benches and walls lined with fluted half-columns. Standing inside the valley it is easy to see why Petra thrived. The mountains contain it, looming like sentries in every direction, but the valley itself is wide and bright.

So much of Petra feels like a sly surprise that I became convinced the Nabateans must have had a sense of humor to have built the city the way they did. They were gifted people in many ways. They had a knack for business, and cornered the market in frankincense and myrrh. They had real estate savvy, establishing their city at the meeting point of several routes on which caravans shipped spices, ivory, precious metals, silk and other goods from China, India and the Persian Gulf to the ports of the Mediterranean. They had a talent for melding the dust and dirt around them into a hard, russet clay from which they made perfume bottles and tiles and bowls. They were expert artisans. And while it isn't recorded in historical texts, they clearly appreciated the hallmarks of architectural showmanship—a good sense of timing, a flair for theatrical siting.

The most convincing evidence of this begins with the Siq, the main entrance to the city, a natural ravine that splits the towering rocks for almost a mile. It's a compressed, confined space; its rock walls lean this way and that. Once you inch your way through it, you are spilled out onto a sandy apron and confronted with the most dramatic structure in Petra—Al Khazneh, or the Treasury, a cave more than a hundred feet high, its facade a fantastical mash-up of a Greco-Roman doorway, an Egyptian “broken” pediment and two levels of columns and statues etched into the sheer face of the mountain.

The Treasury wasn't actually a treasury at all—it gets its name from the riches said to have been stored in the great urn atop the circular building at the facade's center. The statues adorning the colonnaded niches suggest it may have been a temple, but most scholars think it was a tomb housing the remains of an important early king. (A favorite candidate is the first century B.C. Aretas III, who used the word Philhellenos on his coins—“friend of the Greeks”—which might explain the building's Hellenistic flair.) Inside the cave there are just three bare chambers, today empty of whatever remains once rested there.

Perhaps the Nabateans placed this grand building here because the Siq served as a buffer to marauders, much like a wall or a moat. But I can't help but think that they knew that forcing visitors to approach the Treasury via a long, slow walk through the Siq would make a perfect lead-up to a great reveal, designed to delight and astonish.

The gradual approach also leaves the world with a timeless pun, because coming upon the Treasury this way makes you feel as if you've found a treasure at the end of a secret grotto.

Life in the Big City

Petra was a nexus of commerce and cultural exchange

When the Nabateans established their capital at Petra they ensured that it was well connected to booming trade routes: the Silk Road to the north, Mediterranean ports to the west, Egypt and southern Arabia to the south. With trading partners across the ancient world, the seat of Nabatean power was “the very definition of a cosmopolitan trade center,” writes the classicist Wojciech Machowski.

As Ahmed and I rode along, I could just make out in the distance the team from Virtual Wonders, who had spent the day flying a drone over the Great Temple, shooting high-resolution images of it from above.

The company was formed in 2018 by three friends with complementary talents. Mark Bauman, a longtime journalist and former executive at Smithsonian Enterprises and National Geographic, knew the people in charge of historical locations like Petra and how to work with local authorities. Corey Jaskolski, a one-time high school dropout/computer whisperer (he eventually earned a graduate degree from MIT in electrical engineering), who has patented systems for impossible-seeming robotic cameras and 3-D scanning for use underwater, on land and from the air, would manage the technological challenges of image capture and digital modeling. Kenny Broad, an environmental anthropologist at the University of Miami, is a world-class cave diver and explorer for whom scrambling around a place like Petra was a piece of cake; he would serve as chief exploration officer. The three of them shared a passion for nature and archaeology and a concern with how to preserve important sites.

While outfits such as the Getty Research Institute and the nonprofit CyArk have been capturing 3-D images of historical sites for some time, Virtual Wonders proposed a new approach. They would create infinitesimally detailed 3-D models. For Petra, for instance, they would capture the equivalent of 250,000 ultra-high-resolution images, which will be computer-rendered into a virtual model of the city and its breathtaking structures that can be viewed—even walked through and interacted with—using a virtual-reality headset, gaming console or other high-tech “projected environments.” Virtual Wonders will share these renderings with authorities and other scholarly and educational partners (in this case, the Petra National Trust). Detailed modeling of this kind is at the leading edge of archaeological best practices, and according to Jordan’s Princess Dana Firas, the head of the Petra National Trust, the data will help identify and measure the site’s deterioration and assist in developing plans for preservation and managing visitors. “It’s a long-term investment,” Firas told me.

By the time I arrived in Petra, the Virtual Wonders team had scanned and imaged more than half of Petra and its significant buildings using an assortment of high-tech methods. A DJI Inspire drone—for which a military escort is required, because drones are illegal in Jordan—uses a high-resolution camera to collect aerial views, shot in overlapping “stripes” so every inch is recorded. Exact measurements are done by photogrammetry, with powerful lenses on 35-millimeter cameras, and Lidar, which stands for Light Detection and Ranging, a revolving laser mechanism that records minute calculations at the rate of a million measurements per second. When combined and rendered by computers those measurements form a detailed “texture map” of an object’s surface. All of this data will be poured into computers, which will need about eight months to render a virtual model.

None of this is cheap. In Petra, the Virtual Wonders team hiked around with about a half-million dollars' worth of gear. According to Bauman, the company's hope is that the cost of the projects will be recouped, and exceeded, by licensing the data to film companies, game developers and the like, with a portion of the revenue going back to whoever oversees the site, in this case the Petra National Trust. This isn't an idle hope. Petra is so spectacular that it has been used as a location in films, most famously Indiana Jones and the Last Crusade; countless music videos; and as a setting in at least ten video games including Spy Hunter, OutRun 2 and Lego Indiana Jones. If its approach succeeded, Virtual Wonders hoped to move on to similar projects around the world, and since I left Jordan the company has begun work at Chichen Itza, the Mayan city in the Yucatán. It has also scored a clear success with an immersive virtual reality exhibit titled "Tomb of Christ: the Church of the Holy Sepulchre Experience," at the National Geographic Museum in Washington, D.C.

I left my donkey and crossed through the ruins of the flat valley to join the team on a ridge overlooking the Great Temple. "We're shooting stripes," Jaskolski called out as the buglike drone rose and jetted across the open sky toward the temple. Jaskolski's wife, Ann, was monitoring the drone on an iPad. She reached out and adjusted the drone's landing pad, a gray rubber mat, which was weighed down with a rock to keep the gusty breeze from toying with it. The drone made a burbling sizzle as it darted over the temple. Somewhere in the distance a donkey brayed. A generator coughed and then commenced its low grumbling. "We're killing it!" Jaskolski called to Bauman, sounding a little like a teenager playing Fortnite. "I'm really crushing the overlap!"

Bauman and I hiked along the ridge to another building known as the Blue Chapel. A few crooked fingers of rebar stuck out of some of the rock—evidence that some clumsy restoration had been attempted. But otherwise, the structure was untouched, another remnant of the city that Petra once had been, a bustling capital, where lives were lived and lost; an empire etched in time, where the city's carapace is all that remains.

On the far side of the valley from the Treasury, across the plain, Petra's architects kept another great trick up their sleeve: Ad Deir, or the Monastery. This ancient temple is thought to have been dedicated to a deified Nabatean king named Obodas I, and possesses Petra's largest carved facade. But the path there gives you no glimpse of it at all. For 40 minutes Ahmed and I clung on as our donkeys climbed up the steep path. I kept my eyes glued to the back of Ahmed's head so I wouldn't have to see the sheer drop-off along the edge of the trail.

As we made yet another turn with no building in sight, I began to wonder if I had misunderstood our destination. Even when Ahmed stopped and announced that we had arrived, there was nothing to see. The heat was getting to me and I was impatient. I grumbled that I didn't see anything. "Over there," Ahmed said, gesturing around a ragged rock wall. When I turned the corner, I was met with the full-frontal view of an enormous facade with an array of columns and doorway-shaped niches, almost 160 feet wide and nearly as tall, carved into a rocky outcropping. It was so startling and beautiful that I gasped out loud.

Like so many of the monuments here, the Monastery's interior is deceptively simple: a single rectangular room with a niche carved into the back wall, which probably once held a stone Nabatean icon. The walls of the niche itself are carved with crosses, suggesting

the temple became a church during the Byzantine era—hence the name. The Monastery is said to be the best example of traditional Nabatean architecture—simplified geometric forms, the urn atop a rounded building at the center. It is believed that the Monastery’s architect took inspiration from the Treasury but pointedly stripped away most of its Greco-Roman flourishes. There are no statues in the spaces cut between the columns, and overall it’s rougher, simpler. But out here, all alone, in front of a wide stone courtyard where Nabateans and travelers from across the ancient world came to worship or feast, the sight of the Monastery is profound.

I stared at Ad Deir for what felt like an eternity, marveling not only at the building but the way it had provided the exquisite pleasure of delayed gratification. When I returned to Ahmed, he was on the phone with his 2-year-old daughter, who was begging to get a new teddy bear on their upcoming trip to town. Ahmed has five other children. His oldest son, Khaleel, also works as a guide in the park. Khaleel had taken me earlier in the day to a ledge above the Treasury, a view even more vertiginous than the trail to Ad Deir. I needed several minutes before I could inch to the edge and appreciate the view. When I steadied my nerves and was able to peek out through squeezed eyes, I could grasp the monumentality of the Treasury—how it loomed, emerging out of the mountainside like an apparition, a building that wasn’t a building, a place that was there but not there.

What will it mean to create a perfect model of a place like Petra—one that you might be able to visit sitting in your living room? Will it seem less urgent to see Petra in person if you can stick on a pair of virtual reality goggles and make your way through the Siq, gawk at the Treasury, hike up to the Monastery, and inspect ruins that are thousands of years old? Or will having access to an almost-real version of Petra make it easier for more people to learn about it, and that, in turn, will make more people care about it, even if they never walk over its red rocks or slide their way through the Siq? The preservation aspect of projects like Virtual Wonders’ is undeniably valuable; it saves, for posterity, precise images of the world’s great sites, and will allow people who won’t ever have the opportunity to travel this far to see the place and experience it almost as it is.

But visiting a place—breathing in its ancient dust, confronting it in real time, meeting its residents, elbowing its tourists, sweating as you clamber up its hills, even seeing how time has punished it—will always be different, more magical, more challenging. Technology makes it easier to see the world almost as it is, but sometimes the harder parts are what make travel memorable. The long climb to Ad Deir, with its scary path and surprising reveal, is what I will remember, long after the specific details of the building’s appearance have faded from my memory. The way Petra is laid out means you work for every gorgeous vision, which is exactly what I imagine the Nabateans had in mind.

As soon as I left Petra, I found myself staring at the pictures I had taken and finding it hard to believe I had been there; the images, out of context, were so fantastical that they seemed surreal, a dream of a red stone city dug into the mountainside, so perfectly camouflaged that as soon as you drive the steep road out of the park, it seems to disappear, as if it were never there.

In Amman, where signs advertised this fall’s Dead Sea Fashion Week (“Bloggers and Influencers Welcome!”), my driver pulled up to the front door of my hotel and I stepped out, passing a sign directing Fashion Week attendees to the ballroom. The hotel had just

opened for business—it was a glossy, glassy building that advertised itself as being in the heart of the new, modern Amman. But ancient Jordan was here as well. The entry was puzzlingly dark and small, with a narrow opening that led to a long hallway with walls that were akimbo, leaning in at some points and flaring out in others, with sharp angles jutting out. I inched along, dragging my suitcase and banging a corner here and there. Finally, the dark hall opened wide onto a big, bright lobby, so unexpected that I stopped cold, blinking until my eyes adjusted to the light. The young man at the reception desk nodded at me and asked if I liked the entrance. “It’s something special,” he said. “We call it the Siq.”

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Please visit the site: <https://www.smithsonianmag.com/history/petra-jordan-drone-3d-scan-digital-modeling-180970310/> [Go there for nice pix]

SHIPWRECK FOUND IN BLACK SEA IS 'WORLD'S OLDEST INTACT'

A Greek merchant ship dating back more than 2,400 years has been found lying on its side off the Bulgarian coast.

The 23m (75ft) wreck, found in the Black Sea by an Anglo-Bulgarian team, is being hailed as officially the world's oldest known intact shipwreck.

The researchers were stunned to find the merchant vessel closely resembled in design a ship that decorated ancient Greek wine vases.

The rudder, rowing benches and even the contents of its hold remain intact.

"It's like another world," Helen Farr from the expedition told the BBC.

"It's when the ROV [remote operated vehicle] drops down through the water column and you see this ship appear in the light at the bottom so perfectly preserved it feels like you step back in time."

The reason the trading vessel, dating back to around 400 BC, has remained in such good condition for so long is that the water is anoxic, or free of oxygen. Lying more than 2,000m below the surface, it is also beyond the reach of modern divers.

"It's preserved, it's safe," she added. "It's not deteriorating and it's unlikely to attract hunters."

The vessel was one of many trading between the Mediterranean and Greek colonies on the Black Sea coast. It was discovered more than 80km off the Bulgarian city of Burgas.

The team used two underwater robotic explorers to map out a 3-D image of the ship and they took a sample to carbon-date its age.

The vessel is similar in style to that depicted by the so-called Siren Painter on the Siren Vase in the British Museum. Dating back to around 480 BC, the vase shows Odysseus strapped to the mast as his ship sails past three mythical sea nymphs whose tune was thought to drive sailors to their deaths.

As yet the ship's cargo remains unknown and the team say they need more funding if they are to return to the site. "Normally we find amphorae (wine vases) and can guess where it's come from, but with this it's still in the hold," said Dr Farr.

"As archaeologists we're interested in what it can tell us about technology, trade and movements in the area."

Over the course of three years the academic expedition found 67 wrecks including Roman trading ships and a 17th Century Cossack trading fleet.

Please visit the site: <https://www.bbc.com/news/world-europe-45951132>

POMPEII GRAFFITI MAY REWRITE TIME **LINE OF VESUVIUS ERUPTION,** **BY OWEN JARUS**

Graffiti scribbled on the wall of a Pompeii house that was being renovated in A.D. 79 may help solve a long-standing mystery about when Mount Vesuvius erupted that year, burying the Roman settlement in ash.

There is little doubt among archaeologists and historians that Vesuvius erupted and destroyed Pompeii in the year A.D. 79. But experts still debate the time of year when the volcano blew its top.

The newly discovered graffiti, written in Latin, indicates that it was created on a date that, on our calendar, corresponds to Oct. 17. These markings refer to an unnamed individual who overindulged in food. The writing includes no year, but the text was found in part of a house that was undergoing renovation at the time the eruption occurred, wrote a team of archaeologists that conducted the investigation in a statement released Oct. 16 by the Pompeii Parco Archeologico, a government agency in charge of archaeological and conservation work at Pompeii.

Archaeologists can tell that the room was being renovated as the flooring was incomplete and there was undecorated plaster on the walls.

"Furthermore, since it [the graffiti] was done in fragile and evanescent charcoal, which could not have been able to last long, it is highly probable that it can be dated to the October of A.D. 79," the statement said.

Long-standing debate

Archaeologists and historians have long debated when, exactly, Mount Vesuvius blew up and destroyed Pompeii. Some copies of a letter written by Pliny the Younger (who lived around A.D. 61-113) to Tacitus (a Roman historian who lived A.D. 56-120) say that the eruption happened on a date that corresponds to Aug. 24.

However, multiple lines of scientific evidence suggest that the eruption occurred in the autumn rather than in August, a team of scientists led by Giuseppe Rolandi, a professor of Earth sciences at the University of Naples, wrote in a paper published in the *Journal of Volcanology and Geothermal Research* in January 2008.

For instance, the dispersion of tephra, a type of debris produced by a volcanic eruption, closely matches wind patterns seen around Pompeii in the autumn rather than in August, Rolandi's team reported in the paper. The researchers also noted that organic finds at Pompeii suggested that crops harvested in the autumn, such as grapes and pomegranates, had been harvested at Pompeii before Vesuvius blew its top.

Rolandi's team additionally noted that a coin found at Pompeii bears an inscription suggesting that the money was minted no earlier than September of A.D. 79. The

researchers further noted that not all surviving copies of Pliny the Younger's letter show the Aug. 24 date, meaning that the people who copied down Pliny's letters in ancient times may have made an error.

Understanding disease

Pompeii, and the other communities destroyed by Vesuvius, preserve a snapshot in time, a point in history where many people died, suddenly, from a major disaster. This gives scientists the opportunity to see what diseases people were suffering from before they were killed in the eruption. However, knowing whether this snapshot in time happened in August or in the autumn can make a difference in understanding disease patterns, wrote Kristina Killgrove, a professor at the University of North Carolina at Chapel Hill, in an article she wrote recently in Forbes.

"Since many diseases are seasonal, or at least [reach their] peak in certain seasons, like the current flu season, a difference of two months — from late summer to early fall — is incredibly important to researchers like me, who deal with the analysis of organic remains," Killgrove wrote. Her research focuses on the remains of people who died when a giant Roman villa at the site of Oplontis was destroyed by Vesuvius. [The 11 Biggest Volcanic Eruptions in History]

For instance, if scientists know that that the eruption happened in autumn and Killgrove finds a high rate of a particular disease at Oplontis, she can then study whether the spread of the disease had anything to do with the autumn season.

"This new graffito may not rewrite history, but I am more convinced than ever that an early fall date for the eruption is the one I should use when formulating hypotheses about and interpreting data from the human skeletal remains," Killgrove added in her article.

Please visit the site: <https://www.livescience.com/63866-pompeii-graffiti-rewrites-vesuvius-timeline.html> [Go there for pix]

THE UPPER TIGRIS AND THE ILISU DAM, **BY ANTHONY COMFORT AND MICHAŁ** **MARCIAK**

Many areas of the Near East are under threat from development projects, but in some the peril is more immediate. Our book *How Did the Persian King of Kings Get his Wine? The Upper Tigris in Antiquity (c.700 BCE to 636 CE)* was recently published, the culmination of several years' research and various visits to South-East Turkey and Iraqi Kurdistan.

The area is notoriously difficult for historians and archaeologists who wish to study it because of the security situation, in particular the long-running conflict between the PKK and the Turkish security forces. This area, just beyond the northern border of Assyria, was a very important crossroads from the Iron Age through the modern period.

The upper Tigris is also the location for various dam projects, in particular the Eski Mosul Dam in northern Iraq, completed in 1986, and the Ilisu Dam in Turkey. The latter has aroused much controversy and was completed only in the spring of this year. It is thought that the reservoir behind the dam is currently being filled. It will thus be in the process of destroying much of the well-known multi-period site at Hasankeyf, but also many other sites along 136 kilometers of the Tigris valley.

This valley (and much of the upper Euphrates valley too) was surveyed in part by a team led by Guillermo Algaze in the 1980s. However, he was unable to visit all of the reservoir area; his final report was never completed because of problems in viewing the ceramics collected by the team; and most of what he saw on the surface has remained unexcavated, despite the very great interest of the valley for the history and archaeology of the Near East. Most of this will now be lost.

Apart from the loss of many Kurdish villages and the damage to the flora and fauna resulting from the creation of the Ilisu Dam, the inundation of this part of the Tigris constitutes a grave and irreversible loss to global cultural heritage. This valley – and those of the tributaries affected by the reservoir now being created – is of especial interest to those interested in Assyria and its relations with Urartu, in the Achaemenid and Hellenistic periods (and especially in the 'March of the Ten Thousand' recounted by Xenophon), in the establishment of Rome's eastern frontier and in its relations firstly with the Parthians and then the Sassanian Persians, in late antiquity and the origins of Christianity in the Aramaic or Syriac-speaking communities, many of which lasted in this region until after the First World War – with some groups holding on even now, especially in the Tur Abdin and the area east of Mosul.

Our book provides an overview of the history of the region between the zenith of the late Assyrian empire around 700 BCE and the arrival of the Arab armies that conquered Sassanian Persia at the battle of Qadissiyah in 636 CE. It examines the importance of the valley for transport and communications, both along the river itself but also through a road network for which remains of several ancient bridges provide good evidence. The book also briefly examines the damage caused by dam construction, and a link to the

publisher's site allows those interested to view the archaeology sections of the 'Environmental Impact Statement' created for the Ilisu Dam.)

The valley and its surroundings are particularly rich in ancient rock reliefs. Those dating from the period reviewed are discussed and presented.

A series of specially drawn maps is included in the text. The major section of the book is however the final catalogue, which presents sites along the valley. In many cases these are hardly known to the world of scholarship despite their great importance for the history of the entire Near East.

They include Hasankeyf, of course, which was base of a Roman Legion in the third and fourth centuries CE and capital of the district of Arzanene; but also Tigranokerta (the capital of the short-lived Armenian empire created by Tigranes II, thought to be located at Arzen); Amida (now Diyarbakır), the capital of the Roman province of Mesopotamia after the surrender of Nisibis to the Persians in 363CE; Tilli/Çattepe, an important river port at the confluence with the Bohtan river where the Tigris turns south and passes through magnificent gorges (and now the Ilisu Dam), before emerging onto the plains of Mesopotamia near the remarkable and unexcavated fortified twin sites of Bezabde/Phaenica (Fenik).

The catalogue travels south/north and starts with the twin cities of Mosul/Nineveh. It provides many images from recent satellite imagery to illustrate the sites along and around the valley, some of which have hardly been visited at all by archaeologists. These include Zaferan, visited by Gertrude Bell and one of a very few known fortified sites from the sixth century CE; Shakh, east of Cizre, which may be one of the three cities of Gordyene mentioned by Strabo and which has Assyrian reliefs and ancient fortifications including – possibly – a Roman winter camp used by Lucullus in 64 BCE; it also seems to have been a summer hill resort used by at least one Sassanian king. The book also examines crossing points of the Tigris north of Mosul and discusses the location of 'Castrum Maurorum', one of the major fortresses handed to the Persians after the death of the emperor Julian in 363 CE.

The discussion of Nineveh and the origins of Mosul is accompanied by a description of the early monasteries of the area, several of which were founded during the period reviewed in the book. Although Nineveh was sacked during the fall of the Assyrian Empire in 612 BCE, neighbouring Mosul seems to have regained the position of pre-eminent city of the region, possibly even before its refoundation by the Arabs. It has never lost this position since.

We are aware of the preliminary nature of much of our own work in the area. It is of course highly desirable that others should be able to continue this research as soon as possible. Sadly, the completion of the Ilisu Dam has shut off a large area and destroyed various important sites, but there are many others that need urgent study before more damage is inflicted. In Iraqi Kurdistan, survey work and some excavation is still possible and a current project is examining the site of the battle of Gaugamela. Archaeological and historical work has begun in this special and beautiful region but much remains untouched.

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Please visit the site: <http://www.asor.org/onetoday/2018/10/Upper-Tigris-II%C4%B1su-Dam> [Go there for maps & pix]
