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# Πληροφοριακό Δελτίο της Ελληνικής Αρχαιομετρικής Εταιρείας

**- Απρίλιος 2019 -**

**Day by day, what you choose, what you think and  
what you do is who you become. (Heraclitus)**

## Newsletter of the Hellenic Society of Archaeometry

**- April 2019 -**

**Nr. 217**

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## **ΣΥΝΕΔΡΙΑ - CONFERENCES/WORKSHOPS**

### **HISTORICAL METALLURGY SOCIETY 2019**

#### **AGM, POWER AND CONTROL OVER METALLURGY PRODUCTION, SATURDAY**

#### **THE 8<sup>TH</sup> JUNE 2019, WATERHOUSE CHAMBER, READING TOWN HALL**

This meeting will explore how metal production was controlled in different societies, in the UK and further afield. The plan is to explore control in a range of periods, including how the Roman military controlled iron production in the UK and beyond, the Anglo-Saxon elites control and use of precious metals in Anglo-Saxon workshops and even exploring Chinese control over iron production during the Warring States period.

The registration fee is £35 for members and £45 for non-HMS members includes all tea/coffee breaks and lunch (£25 for all students). The HMS AGM is being held at 1pm and is free for all members, but please contact the organiser below in advance. General enquiries can be directed to Eleanor Blakelock at [events@hist-met.org](mailto:events@hist-met.org) and for our online booking service, the latest news and updates please visit [webpage](#).

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# **ITCHALKI2019 – INFORMATION** **TECHNOLOGY AND CHURCH IN 21<sup>ST</sup>** **CENTURY, SEPTEMBER 19-22, 2019,** **THEOLOGICAL SCHOOL OF CHALKI**

Information and Communication Technologies, the so called "New Technologies" even at the end of first quarter of 21st century, among with other sciences of physics, chemistry and mathematics, create a fruitful framework for dialog and collaboration with Orthodox Church. This framework focus on a wide area of subjects from documentation, study and promotion of the rich culture of Church, to theological, pastoral, social and educational dimension of the mission of Church to the modern world.

ITCHALKI2019 will be held on Heybeliada Island, Turkey where the Holy Trinity Stavropegic Monastery and the famous Theological School of Chalki are located between 19th and 22nd September 2019. It aims to support a stronger interaction and synergy with the spiritual and cultural heritage of Ecumenical Patriarchate and its primate His All Holiness Patriarch Bartholomew. The conference will be held under the high auspices of His All Holiness Patriarch Bartholomew who is a pioneer among worldwide Religion leaders, concerning the ecological crisis of modern world.

ITCHALKI2019 aims to provide an overview of the state-of-the-art, explore new R&D directions and emerging trends, information exchange regarding the use, ethics, philosophy, management of modern technological advances and their applications, evaluation methodologies and tools in the cultural and spiritual activities of the Orthodox Church and other religion institutions, with respect to scientific, technology, policy and organisational issues.

ITCHALKI2019 will provide a unique forum for researchers, industrials and funding agencies from a wide spectrum of disciplines such as Theology, Philosophy, Chemistry, Physics and Engineering to discuss issues and opportunities, find new synergies and promote initiatives and applications for promoting and preserving the cultural and spiritual heritage of Orthodox Church.

## **TOPICS**

- ✓ Design, construction and utilisation of applications concerning the activities of Church
- ✓ Methodologies and tools for pastoral and social interaction
- ✓ Social Networks and Spiritual Guidance
- ✓ Databases for Pastoral care, liturgical and canonical law
- ✓ Applied ethics and New Technologies
- ✓ Theological education
- ✓ Philosophical and theological issues of Information Theory
- ✓ Study and preservation of Ecclesiastical Culture and Heritage

✓ Documentation, digitisation and promotion of Ecclesiastical Culture

Please visit the site: <http://www.itchalki2019.org/>

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**13<sup>TH</sup> INTERNATIONAL CONFERENCE,**  
**“METHODS OF ABSOLUTE CHRONOLOGY”,**  
**TARNOWSKIE GÓRY, POLAND, 5-7 JUNE**  
**2019**

**SECOND CIRCULAR**

Dear Sir/Madam,

Gliwice Absolute Dating Methods Centre, Institute of Physics – Centre for Science and Education at the Silesian University of Technology invites you to participate in the 13th International Conference “Methods of Absolute Chronology”, which will be held on 5-7 June 2019 in Tarnowskie Góry, Poland.

The multidisciplinary conference will concern the following subjects:

1. Methods of absolute chronology and their application in Quaternary geology.
2. Dating methods and creation of numerical time scales for palaeoclimatic reconstructions.
3. Isotopic methods in research of palaeo- and modern environment.
4. Dating of the archaeological objects.

The scientific programme of the conference includes plenary and poster sessions. The working language of the conference is English.

The conference will be accompanied by a workshop for young scientists. Two morning lectures covering the basics of isotope and dosimetric dating methods will be delivered on 6th and 7th June.

**CONTRIBUTIONS**

Please register and submit your abstract on the website (<http://www.carbon14.pl/13thMAC/>), and indicate preferred session and presentation form (oral/poster). In case of a large number of oral presentations, some contributions may be moved to poster sessions upon the decision of the Scientific Committee.

The accepted presentations will be published in the open-access journal “Geochronometria”, following the regular reviewing procedure. We have secured funding to waive a fee for selected manuscripts.

**THEMATIC SESSIONS – preliminary list**

Depending on the scope of received abstracts the following list may be updated by the Scientific Committee:

- Methodological updates
- 210Pb and 137Cs
- Dating applied in Earth Sciences

- Dating applied in Archaeology
- Terrestrial archives

### **COSTS Conference fee**

<b>Professional</b>	700 PLN (ca. 165€)
<b>Student</b>	550 PLN (ca. 126€)
<b>Accompanying person</b>	550 PLN (ca. 126€)

The fee covers admission to conference sessions, book of abstracts (for participants), coffee breaks, lunches, ice-breaker dinner (5th June), gala dinner (6th June), and a conference kit.

The fee should be paid in advance in PLN (Polish zloty) by a bank transfer to the following account:

ING Bank Śląski SA O/Gliwice

Zwycięstwa 28, 44-100 Gliwice, Poland

BIC/SWIFT Code: INGBPLPW, Account No: PL 60 1050 1230 1000 0002 0211 3056

When making your bank transfers please quote clearly your name and that it is conference fee payment for 13th Conference MACH2019.

### **VENUE**

Tarnowskie Góry is a town in Upper Silesia (southern Poland), located in the Silesian Highlands near Katowice (25 km) and Gliwice (20 km), and conveniently close (15 km) to the Katowice-Pyrzowice airport.

The conference will be held at the Opera Hotel (<http://operahotel.pl>; ul. Zamkowa 1, 42-600 Tarnowskie Góry, Poland), a minute walk from the Town Square, adorned by old romantic Renaissance buildings, the 17th-century Protestant church, the impressive town-hall. The area is spotted with bars and restaurants. On the outskirts of the town a swim can be taken at the Water Park.

### **ACCOMMODATION**

The accommodation will be managed by hotel reception. Please contact the hotel via e-mail ([hotelopera@wp.pl](mailto:hotelopera@wp.pl)) and include “MACH 2019” in a subject to make your reservation.

The Opera Hotel has a limited number of rooms (27 rooms, 50 beds), please book ASAP.

- Single room with breakfast: 180 PLN / person
- Double room with breakfast: 100 PLN / person

Hotel Opera manages also economy beds with shared facilities in a nearby separate building (45-55 PLN). Please contact hotel reception ([hotelopera@wp.pl](mailto:hotelopera@wp.pl)).

Other nearby accommodation choices are listed below.

#### **Hotels:**

- 1) Olimpijski Hotel, 1.5 km, 18 min. walk
- 2) Neo Hotel near the Water Park, 1.6 km, 20 min. walk, convenient road connection
- 3) Aslan Hotel in Bobrowniki Śląskie, 2.5 km, communication by local buses
- 4) Na Podzamczu, 3.5 km, communication by local buses

#### **Budget accommodation:**



- 5) Kropka Restaurant and Rooms, near Aslan Hotel
- 6) Guest rooms on Opolska 43, 1.1 km, 14 min. walk

**Camping** Camp9, 5 km (10 min. by car, accessible by local buses) should you wish to stay closer to nature.

**CONFERENCE TRIP**

The trip to the Historic Silver Mine in Tarnowskie Góry (UNESCO heritage site) will be organised.

**TRAVEL**

The nearest airport is Katowice-Pyrzowice (KTW), ca. 20 km from Tarnowskie Góry.

**IMPORTANT DATES**

Submission of abstracts and registration: **31 March 2019**

Abstract acceptance **12 April 2019**

Payment **21 April 2019**

Third circular **15 May 2019**

Conference **5-7 June 2019**

On behalf of the Local Organising Committee

Natalia Piotrowska

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**43<sup>RD</sup> INTERNATIONAL SYMPOSIUM ON  
ARCHAEOLOGY, MAY 18<sup>TH</sup> - 22<sup>TH</sup>, 2020,  
LISBON, PORTUGAL**

Dear colleagues,

The 43<sup>rd</sup> International Symposium on Archaeology will be held from May 18<sup>th</sup> to 22<sup>th</sup> 2020 in Lisbon, Portugal.

ISA 2020 is a specialized forum for research and applications of Archaeology and Archaeological Sciences that covers the full spectrum of topics, materials, techniques, chronologies and regions.

You may find the complete information regarding the scope of the symposium, the venue, important dates, registration, etc, in the web page <https://www.isa2020-lisboa.pt/>

On behalf of the Local Organizing Committee

Isabel Dias

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**VIENNA, INTERNATIONAL WORKSHOP**  
**"BRONZE AGE METALLURGY -**  
**PRODUCTION - CONSUMPTION -**  
**EXCHANGE", 23-24/05/2019, UNIVERSITY**  
**VIENNA**

Dear colleagues,

Hereby I want to draw your attention to the upcoming international workshop (UK-Gespräche), which will take place in Vienna from the 23rd - 24th of May 2019.

It will focus on "Bronze Age Metallurgy : Production - consumption - exchange". The program can be downloaded via:

[https://www.orea.oeaw.ac.at/fileadmin/Institute/OREA/Events/2019/UKGespraech/UKGespraech\\_Program.pdf](https://www.orea.oeaw.ac.at/fileadmin/Institute/OREA/Events/2019/UKGespraech/UKGespraech_Program.pdf)

A brief summary of the program is attached below. The workshop is free, but space is limited, in case of interest please contact [mathias.mehofer@univie.ac.at](mailto:mathias.mehofer@univie.ac.at) or [Mario.Gavranovic@oeaw.ac.at](mailto:Mario.Gavranovic@oeaw.ac.at)

We hope, that you find it interesting!

Best wishes from Vienna

Mathias Mehofer, Mario Gavranovic

23rd – 24th May 2019 INTERNATIONAL WORKSHOP  
UK-Gespräche “Bronze Age Metallurgy: production – consumption – exchange“  
and  
20th Anniversary Archaeometallurgical Laboratory VIAS, University Vienna

**PROGRAM**

**23.05. 2019**

1. Panel – Mining and smelting

9:00 Welcome: B. Horejs

Introduction: M. Gavranović, M. Mehofer

9:30 G. Goldenberg

The process of extractive copper metallurgy in the Bronze Age - theory and practise

10:00 M. Staudt

Late Bronze Age copper smelting in the fahlore mining district Schwaz-Brixlegg?

10:30 P. Trebsche

Geophysical prospection and radiocarbon dating of the Bronze Age copper mine at Prigglitz in Lower Austria

11:00 – 11:30 COFFEE BREAK

11:30 T. Koch Waldner

Discovery of a mining area in the Ortler region, South Tyrol - Prehistoric settlements and traces of mining at the traffic junction of the Central Alps

12:00 L. Reitmaier-Neaf

From Ore to Metal: Late Bronze and Early Iron Age Copper production in the Oberhalbstein, Valley (CH)

12:30 M. Mehofer, A. Kapuran, M. Gavranović, I. Jovanović

New insights into Bronze Age metal production in Eastern Serbia - the copper smelting sites of Trnjane and Ružana

13:00 – 14:30 LUNCH BREAK

2. Panel – Exchange of raw metals and distribution networks

14:30 E. Pernicka

The problem of mixing and recycling in the study of Bronze Age metallurgy

15:00 B. Nessel

How do you recognize the quality of an ingot? Some thoughts about raw metal distribution

in Bronze Age Europe

15:30 C. Grutsch

The use of different copper types in the Middle and Late Bronze Age in Western Austria

16:00 – 16:30 COFFEE BREAK

**17:30 Keynote lecture**

**Th. Stöllner**

**Der Mitterberg und die alpinen Kupfererzreviere. Technische Innovationen und Verwobenheit in alpinen Wirtschaftsräumen der Bronzezeit.**

**24.05.2019**

2. Panel – Exchange of raw metals and distribution networks

9:30 C. Bruyère, S. Daly, D. Jovanović, B. Molloy

Metal Mobility and Social Interaction in the Later Bronze Age of Northern Balkans

10:00 M. Gavranović, M. Mehofer

Metal consumption and exchange networks during the Bronze Age in the Western Balkans

10:30 A. Bankhoff, W. Powell, A. Bulatović, V. Filipović

Sn isotopic evidence for Late Bronze Age exploitation of multiple tin sources across the Central Balkan

11:00 – 11:30 COFFEE BREAK

3. Panel – Metallurgical activities and finished products

11:30 S. Karavanić, A. Kudelić

The evidence of bronze-casting at the Kalnik-Igrišće Site (NW Croatia)

12:00 E. Borgna

Of hoards, individuals and communities in Late Bronze Age Italy

12:30 R. Jung

Zur Metallurgie in den Regionen des südlichen Tyrrhenischen Meeres

13:00 – 14:00 LUNCH BREAK

14:00 G. Tarbay

Archaeometallurgical characterization of Late Bronze Age metal artefacts from Hungary by the “Neutron Methods”

14:30 M. Črešnar, R. Urankar

Late Bronze Age metallurgy in Slovenia. Current state of research

15:00 – 15:30 COFFEE BREAK

15:30 K. Nowak

Die aktuellen Forschungsergebnisse zur bronzezeitlichen Metallurgie in Südwest-Polen

16:00 J. Sobieraj, Z. Stos-Gale and R. Anczkiewicz

Remote from mining and smelting: second millennium BC bronze finds from north-east Poland.

16:30 – 17:00 Final Discussion

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HAVE A LOOK at our research projects: FWF-project(P 32095):  
<https://vias.univie.ac.at/en/research/archaeometallurgy-and-archaeometry/projects/archaeometallurgical-and-mining-archaeological-studies-on-late-bronze-age-metallurgy-in-the-western-balkans/>

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## **CYPRIOΤ ARCHAEOLΟGY, PRE-MODERN MATERIAL CULTURE, AND CULTURAL HERITAGE IN THE UK - PROGRAMME AND RSVP LINKS**

Dear colleagues,

Please find below the full programme and RSVP links for the symposium “**Cypriot archaeology, pre-modern material culture, and cultural heritage in the UK**”. Please feel free to forward the programme and registration links to your institutional mailing lists and/or potentially interested individuals.

UCL Institute of Archaeology, The High Commission of the Republic of Cyprus in the UK & The British Museum cordially invite you to the symposium “Cypriot archaeology, pre-modern material culture, and cultural heritage in the UK” that will take place on Friday, 5 April 2019, in the Auditorium G6 and A.G. Leventis Gallery, at the Institute of Archaeology, University College London. Please see the symposium’s full programme further below.

The symposium will be inaugurated on Thursday, 4th of April 2019, at 18:30 with a keynote lecture by Dr Jennifer M. Webb, Adjunct Professor, Department of Archaeology, La Trobe University, Melbourne & Senior Research Fellow, Department of History and Archaeology, University of Cyprus. Dr Webb will deliver a lecture on “Cyprus in the Middle Bronze Age: New evidence from the Anglo-Cypriot excavations at Lapithos in 1913” that will be hosted at the High Commission of Cyprus, 13 St. James’s Square, SW1Y 4LB.

If you are interested in attending the inaugural lecture by Dr J. Webb on the 4th of April, please RSVP following this link: [https://www.eventbrite.co.uk/e/cyprus-in-the-middle-bronze-age-new-evidence-from-the-anglo-cypriot-excavations-at-lapithos-in-1913-tickets-58007793873?mc\\_eid=92d318b1ae&mc\\_cid=af4833be1a](https://www.eventbrite.co.uk/e/cyprus-in-the-middle-bronze-age-new-evidence-from-the-anglo-cypriot-excavations-at-lapithos-in-1913-tickets-58007793873?mc_eid=92d318b1ae&mc_cid=af4833be1a)

If you are interested in attending the symposium on the 5th of April, please RSVP following this link: <https://www.eventbrite.com/e/cypriot-archaeology-pre-modern-material-culture-and-cultural-heritage-in-the-uk-tickets-55567394573>

### **Symposium programme**

**Friday, 5<sup>th</sup> April 2019**

Auditorium G6 and A.G. Leventis Gallery, Institute of Archaeology, University College London

**08:30-9:00     Registration**

**9:00-9:10     Welcome addresses**

Session 1: Collections and archives of Cypriot antiquities and related studies

Chairperson: Dr Thomas Kiely, British Museum

- 9:10-9:25 The use of an Erbium: YAG laser in the removal of biological growth from polychrome archaeological terracotta and limestone figurines from Cyprus**  
*Dr Lucía Pereira-Pardo, Dr Duygu Camurcuoglu, Miriam Orsini, Stephanie Vasiliou, Dr Kasia Weglowska, Dr Thomas Kiely & Dr Capucine Korenberg*  
British Museum, UK
- 9:25-9:40 The Collection of Cypriot Antiquities at the Ashmolean – History, content, digitisation**  
*Dr Anja Ulbrich*  
Ashmolean Museum of Art and Archaeology, University of Oxford, UK
- 9:40-9:50 The Kent Collection in Harrogate**  
*Anna Reeve*  
University of Leeds, UK
- 9:50-10:05 Object handling with 3D prints of Kamelarga figurines**  
*Prof. Amy C. Smith & Claudina Romero Mayorga*  
Ure Museum of Greek Archaeology, University of Reading, UK
- 10:05-10:15 Q&As**
- 10:15-10:30 Investigating ancient Cypriot food practices and diets as part of the narratives developed for the ‘Being an Islander’: Art and Identity of the large Mediterranean Islands’ exhibition (Fitzwilliam Museum, September 2021)**  
*Dr Anastasia Christophilopoulou, The Fitzwilliam Museum, University of Cambridge, UK & Dr Evi Margaritis, The Cyprus Institute, Cyprus*
- 10:30-10:45 From Cyprus to Egypt, from Egypt to the United Kingdom: Tracing Cypriot antiquities in the UK**  
*Dr Giorgos Bourogiannis*  
National Hellenic Research Foundation, Greece
- 10:45-11:00 Wilhelm Deecke’s bequest at the Bibliothèque Nationale et Universitaire de Strasbourg: a glimpse into 19th cent. archaeological investigations in Cyprus**  
*Dr Artemis Karnava*  
Berlin-Brandenburgische Akademie der Wissenschaften, Germany
- 11:00-11:10 Q&As**
- 11:10-11:30 Coffee break**

Session 2: Chalcolithic and Bronze Age Cyprus in the UK

Chairperson: Dr Jennifer M. Webb, La Trobe University and University of Cyprus

- 11:30-11:40 Textiles are in the details. Looking for a Chalcolithic ‘textile culture’**  
*Giulia Muti*  
University of Manchester, UK
- 11:40-11:55 Excavating a looted cemetery: methods and results from Chalcolithic Souskiou-Laona**  
*Dr Lindy Crewe*  
The Cyprus American Archaeological Research Institute, Cyprus
- 11:55-12:05 Picrolite: the chaîne opératoire in a practical approach**  
*Elizabeth Cory-Lopez*

- Independent Researcher, UK  
**12:05-12:15 Exploring changes in activity patterns among Cypriot Chalcolithic and Bronze Age communities**  
*Martina Monaco*  
University of Sheffield, UK
- 12:15-12:25 Q&As**
- 12:25-12:35 Is it an “elite” world? Unfolding the deathways at the Prehistoric Bronze Age Cemetery of Vounous, Cyprus**  
*Rafael Laoutari*  
University of Cambridge, UK
- 12:35-12:45 Burials, Bodies and Objects: Using the Mortuary Record to Interpret Bronze Age Identity on Cyprus**  
*Sarah Douglas*  
University of Manchester, UK
- 12:45-13:00 Early and Middle Bronze Age Lapithos X-rayed: The ReCyPot project**  
*Dr Maria Dikomitou-Eliadou*  
University College London, UK
- 13:00-13:10 Q&As**
- 13:10-14:10 Lunch break**

**Session 3: UK-based Studies of Bronze Age and Iron Age Cyprus on land and in the sea**

Chairperson: Dr Lindy Crewe, The Cyprus American Archaeological Research Institute

- 14:10-14:25 Of opium and oil: detection of alkaloids in a Cypriot base-ring juglet**  
*Dr Rebecca J. Stacey, British Museum & Dr Rachel K. Smith & Prof. Jane Thomas-Oates, University of York, UK*
- 14:25-14:40 Opium abuse in ancient Cyprus? Out of context, it’s just fake news**  
*Dr Lesley Bushnell*  
Independent Researcher, UK
- 14:40-14:50 Hierarchy and heterarchy, a brief re-exploration of Cypriot socio-political organisation in the Late Bronze Age**  
*Thomas Humphrey*  
University of Wales Trinity St David, UK
- 14:50-15:00 Q&As**
- 15:00-15:10 To fish or not to fish: The case study of fishing communities in Cyprus**  
*Maria Michael*  
University of Southampton, UK
- 15:10-15:20 Shipshape: Re-examining the role of terracotta boat models in Late Bronze and Iron Age Cyprus**  
*Mark Dolan*  
University of Southampton, UK
- 15:20-15:30 Deep-Sea archaeology in the Exclusive Economic Zone (EEZ) of Cyprus**  
*Achilleas Iasonos*  
University of Oxford, UK
- 15:30-15:40 Q&As**
- 15:40-16:00 Coffee break**



**Session 4: Bringing together Ancient And Late Antique Cyprus**

Chairperson: Dr Athanasios Vionis, University of Cyprus

- 16:00-16:10 Revisiting data from old excavations: discovering the rediscoveries in the Amathous eastern necropolis**  
*Elisavet Stefani*  
University of Cyprus, Cyprus
- 16:10-16:25 Cyprus' status and identity as a copper landscape in the Roman Empire**  
*Dr Ersin Hussein*  
Swansea University, UK
- 16:25-16:40 Old excavations, new biographies: bringing Kourion's Amathous Gate cemetery back to life**  
*Dr Michael Given*  
University of Glasgow, UK
- 16:40-16:55 Sculptural decoration of Cypriot bath buildings in Roman and Late Roman times**  
*Dr Panagiotis Panayides*  
University of Oxford, UK
- 16:55-17:05 Q&As**

**Session 5: Sacred Cypriot landscapes**

Chairperson: Dr Michael Given, University of Glasgow

- 17:05-17:20 New insights into the religious landscape of Late Antique Cyprus**  
*Dr Georgios Deligiannakis*  
Open University of Cyprus, Cyprus
- 17:20-17:30 Heritagisation of Byzantine Churches: an unfinished project**  
*Alexis Thouki*  
University of Sheffield, UK
- 17:30-17:45 Unlocking the Sacred Landscapes of Cyprus (UnSaLa-CY) – Settled and Sacred Landscapes of Cyprus (SeSaLaC): Two interconnected Cyprus-based Projects**  
*Dr Giorgos Papantoniou & Dr Athanasios K. Vionis, University of Cyprus & Dr Doria Nicolaou, Johannes Gutenberg-Universität Mainz, Germany*
- 17:45-18:00 Q&As and Closing remarks**

**Convenors:**

Dr Maria Dikomitou-Eliadou, UCL Institute of Archaeology  
Dr Marios Psaras, High Commission of Cyprus in the UK  
Dr Thomas Kiely, British Museum

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Dr Maria Dikomitou – Eliadou

Marie Skłodowska-Curie Postdoctoral Research Fellow  
Institute of Archaeology  
University College London  
31-34 Gordon Square, London WC1H 0PY UK

[email: m.dikomitou@ucl.ac.uk](mailto:m.dikomitou@ucl.ac.uk)

<https://twitter.com/ReCyPot>

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## **ARCHÉOMÉTRIE DE L'IFAO, JUNE 11, 2019,** **PARIS, CALLS FOR PAPERS**

Le 11 juin 2019 à 9h30, En Sorbonne

4e journée de rencontres en archéométrie de l'Ifao (Inscription avant le 31 mai 2019)

Partenaire(s) de l'Ifao: Sorbonne Université, UMR8167 Orient & Méditerranée, UMR8233 MONARIS

La '4e journée de rencontres en archéométrie de l'Ifao' se tiendra le mardi 11 juin 2019 à Paris (En Sorbonne, Cour d'honneur, Amphi Guizot). Dans le prolongement des trois premières journées, ces rencontres visent à rassembler des archéomètres de toutes spécialités et des archéologues travaillant en Égypte, pour les faire se rencontrer et discuter de différents projets. Elles s'inscrivent dans le cadre de l'appel à projets scientifiques publié annuellement par l'Institut français d'archéologie orientale <http://www.ifao.egnet.net/actualites/#178>, afin de susciter la mise en place de nouvelles collaborations.

À cette occasion et après avoir fait le bilan des travaux engagés au pôle archéométrie en 2018, nous évoquerons l'état de la recherche actuelle et les perspectives à venir. Les responsables de programmes, projets ou chantiers sont invités à exposer leurs travaux, les problématiques archéométriques et de conservation/restauration auxquelles ils cherchent à répondre et les résultats obtenus. Cette année, une session particulière sera dédiée aux étudiants de toutes disciplines souhaitant s'investir dans les questions d'archéométrie égyptienne. La journée s'achèvera par une discussion générale et des échanges ouverts.

Inscription gratuite mais obligatoire avant le 31 mai par email :  
[aquiles@ifao.egnet.net](mailto:aquiles@ifao.egnet.net)

=> Si vous souhaitez communiquer, merci de préciser le titre de la présentation proposée (avant le 15 mai).

Un buffet sera offert pour le déjeuner.

Les frais de déplacement sont pris en charge par les participants.

Télécharger l'annonce:

[http://www.ifao.egnet.net/uploads/manifestations/2019/2019\\_Annonce\\_rencontresArcheometrie>Ifao\\_Sorbonne\\_11Juin2019.pdf](http://www.ifao.egnet.net/uploads/manifestations/2019/2019_Annonce_rencontresArcheometrie>Ifao_Sorbonne_11Juin2019.pdf)

LIEU : En Sorbonne, Cour d'honneur, Amphi Guizot, 17, rue de la Sorbonne 75005 PARIS

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## **SCIENTIFIC TRADITIONS IN THE ANCIENT MEDITERRANEAN, 19-20 SEPTEMBER, 2019, NYC, CALLS FOR PAPERS**

We are pleased to announce that the call for papers is now open for the second annual conference hosted by the international research collaboration, Scientific Papyri from Ancient Egypt: New Medical and Astrological Texts (SPAE). While the collaboration is centered on Egyptian scientific texts, this year's conference, titled Scientific Traditions in the Ancient Mediterranean and Near East, aims for a broader cross-cultural perspective and increased interdisciplinarity in the approach to the ancient sciences.

The conference will be held at the Institute for the Study of the Ancient World, New York, on 19-20 September 2019. We welcome abstracts related to medicine, astronomy, and astrology (and divination more broadly defined) in the ancient Mediterranean and Near East from scholars at the PhD level or higher (current PhD students welcome). Abstracts should be no longer than 300 words.

**Deadline for application: 30-04-2019.**

Successful applicants will have 20 minutes to present their work, followed by a 10-minute Q&A session. The language of the conference is English. A publication of the conference proceedings is planned and select papers will be invited for submission as part of this endeavor.

Please send abstracts to the following email address:  
[spaecollab@gmail.com](mailto:spaecollab@gmail.com). Any questions regarding the conference may also be directed to this email.

### **Confirmed Speakers**

Friedhelm Hoffmann (Ludwig Maximilians Universität München) Richard Jasnow (Johns Hopkins University) Luigi Prada (Oxford University) Joachim Quack (Universität Heidelberg) Kim Ryholt (University of Copenhagen)

### **About the collaboration**

SPAE is a research collaboration formed in 2017 as an important link in the publication of heretofore unpublished scientific texts from Pharaonic to Late Antique Egypt. The collaboration consists of leading experts in the fields of medicine, astronomy, and astrology, from the University of Copenhagen, Johns Hopkins University, Freie Universität Berlin, New York University (ISAW), Universität Heidelberg, Ludwig Maximilians Universität München, Universität Leipzig, Musée du Louvre, and the University of Oxford. For more information, please visit our webpage at <http://scientific-papyri-from-ancient-egypt.org/>.

### **Conference organizers**

PhD fellow Amber Jacob (ISAW)

PhD fellow Sofie Schiødt (University of Copenhagen) PhD fellow Lingxin Zhang (Johns Hopkins University) Prof. Alexander Jones (ISAW)

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**WORKSHOP ‘CONSERVATION AND  
PHYSICO-CHEMICAL STUDY OF NISYROS  
SHIPWRECK POTTERY’, ATHENS  
(GREECE), 17-28 JUNE 2019, LEIDEN  
UNIVERSITY–EPHORATE OF  
UNDERWATER ANTIQUITIES–NIA- NCSR  
DEMOKRITOS**

**The Workshop**

During two weeks in the summer of 2019 (17-28 June 2019), a workshop for the **‘CONSERVATION AND PHYSICO-CHEMICAL STUDY OF NISYROS SHIPWRECK POTTERY’** will take place at Athens in Greece. The course will be organized by the Faculty of Archaeology, Leiden University (NL), in collaboration with the Ephorate of Underwater Antiquities at Athens, the Netherlands Institute at Athens (NIA), and the **Greek Research Center/Laboratory ‘NCSR Demokritos’ at Athens**.

This workshop provides a unique opportunity for BA, MA, RMA and PhD students to gain more knowledge and a hands-on experience in Byzantine, Medieval and Post-Medieval underwater **pottery conservation**. It guides the participants through the history and technology of Byzantine, Medieval and Post-Medieval pottery in Greece, and through stages of the study, conservation, restoration and documentation of archaeological artefacts. Both the theoretical and practical classes will be based on authentic pottery finds from Nisyros shipwreck. Finally, a first approach of physicochemical analyses will be presented. All teaching will be in English.

During the workshop students start their training with replicas of vessels and then progress to original artefacts once they reach to an acceptable level of skill, accuracy and precision. Most participants will be able to master conservation and restoration techniques within this workshop, and will complete work on 2-4 artefacts by the end of the program, depending on the initial state of the objects’ conservation, the necessity of conservation treatment and the individual performance of the student. The participants should present their results on the last day of the workshop.

**Application deadline:** **10 May 2019**, or until the places are filled (maximum 10 persons).

**Application:** application forms can be downloaded from the website of the Netherlands Institute at Athens (NIA): see [www.nia.gr](http://www.nia.gr). Completed forms (including a motivation letter) should be send before 30 April 2018 to: [nia@nia.gr](mailto:nia@nia.gr).

**Workshop coordinator:**

Prof. Dr. J.A.C. Vroom, Archaeology of Medieval and Early Modern Archaeology in Eurasia, Faculty of Archaeology, Leiden University (NL).

**Workshop instructor:**

Adamantia Panagopoulou, **PhD Candidate at Leiden University**, Institute of Nanoscience and Nanotechnology ‘NCSR Demokritos’.

Contact for more information:

[m.panagopoulou@hotmail.com](mailto:m.panagopoulou@hotmail.com)

**All participants will receive: 5 ECTS.**

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# **11<sup>TH</sup> INTERNATIONAL GEOCHRONOLOGY** **SUMMER SCHOOL 2019, DATING** **TECHNIQUES IN ENVIRONMENTAL** **RESEARCH, SEPTEMBER 1ST - 5TH, 2019**

Optional: 1 full day excursion September 6th, 2019 (for details see webpage)

The Summer School is open to young researchers worldwide (PhD-students & Post-Docs)

Location: Morteratsch (Pontresina, Engadine; Switzerland)

Dating techniques

- numerical methods (radiocarbon, exposure dating with cosmogenic nuclides, OSL, etc.)  
Dendrochronology, ice-core chronologies as well as relative methods (soil weathering, Schmidt-hammer technique, etc.)

Reconstruction of environmental parameters

- dendroecology, stable isotopes, etc.

Climate and landscape history

- Forest fires, charcoal identification and dating

Reconstructing geomorphic processes

- Avalanches, debris flows, rock fall, etc.

Participation is limited to a max. 20 (first come, first served).

Registration fee includes full accommodation (room sharing), breakfast, lunch and dinner.

Registration fee: 750,- CHF (incl. full accommodation)

**Deadline for application: April 30, 2019**

On-line information and registration:

<http://www.geo.uzh.ch/en/units/gch/geochronologysummerschool.html>

**Organizing committee / Lecturers:**

Markus Egli, Dmitry Tikhomirov (University of Zürich); Holger Gärtner, Paolo Cherubini (WSL)

Susan Ivy-Ochs (University of Zürich / ETH); Dennis Dahms (University of Northern Iowa)

Eileen Eckmeier (Univ. of Munich); Irka Hajdas (ETH); Evdokia Tema (Univ. of Torino)

Pierre Valla (Univ. of Bern); Nathalie Dubois (EAWAG) and others



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

**FITCH LABORATORY BURSARY AWARDS**  
**2019-2020**

Applications are invited from graduate students or young scholars for an award to support research at the Fitch Laboratory, British School at Athens (BSA) for up to 3 months in the academic year (September 2019-June 2020) in any of the fields in which the Laboratory is active (e.g. ceramic studies, archaeometallurgy, geophysical prospection, zooarchaeology, archaeobotany, soil micromorphology, ethnoarchaeology, landscape archaeology, archaeology of technology; normally in the context of Aegean/Mediterranean archaeology). The Bursary includes a monthly stipend (400€), BSA membership and accommodation at the BSA Hostel in Athens and, if required for research purposes, also in Knossos. The award holder will be required to submit a report on her/his research at the Laboratory to the Laboratory's Subcommittee and Director.

The successful applicant will be expected to use the facilities of the Fitch Laboratory (including analytical equipment and reference collections) as well as the BSA library to further on-going work, in the context of a postgraduate degree or postdoctoral research. No bench fee charges will be applied but the bursary holder will need to cover the cost of thin section preparation or elemental analysis. The award carries no other formal obligation, although involvement in the academic life of the BSA (for example in the form of a seminar) is welcome.

Applications should include a covering letter (indicating the preferred length and period of stay), a Curriculum Vitae, a statement of the proposed programme of research (up to one page) and the names and contact details of two referees. Applicants should ask referees to send their recommendations by the deadline. The successful applicant will be responsible for acquiring on time any required permits for study and transfer of archaeological material to the Fitch Laboratory. If the use of in-house analytical facilities is necessary for the proposed research, applicants are advised to contact the Laboratory Director to get feedback on analytical costs and timing; the latter mainly in relation to the WD-XRF analysis.

Applications and reference letters should be submitted by Monday 20 May 2019 via e-mail as combined pdf (with the following order: cover letter, CV, research proposal) to Mrs Tania Gerousi, the BSA administrator ([school.administrator@bsa.ac.uk](mailto:school.administrator@bsa.ac.uk)). Candidates will be informed on the selection outcome by the end of June.

Potential applicants may contact Dr Evangelia Kiriati, the Laboratory Director ([e.kiriati@bsa.ac.uk](mailto:e.kiriati@bsa.ac.uk)), for further information. Additional details about the School and the Laboratory can be also found at <http://www.bsa.ac.uk/>.

## **RESEARCH SCIENTIST IN THE FIELD OF ARCHAEOMETALLURGY, UNIVERSITY COLLEGE DUBLIN**

Applications are invited from enthusiastic and talented individuals for a 24-month laboratory support and research position as a part of a European Research Council funded project - The Fall (The Fall of 1200BC: The role of migration and conflict in social crises at end of the Bronze Age in South-eastern Europe).

The position is available from September 2019 in the field of archaeometallurgy. Candidates are expected to have a Master's qualification in the field of archaeometallurgy. They must have expertise in Aegean and / or Balkan prehistoric archaeology.

The ERC funded The Fall of 1200 BC project explores changes in migration and conflict at the end of the Bronze Age (ca.1300-1000 BC) and their relevance for understanding the collapse of Europe's first urban civilisation in the Aegean and proto-urban groups of the Balkans. Combined with mortuary research, material culture studies, and landscape / settlement archaeological research, the project seeks to better understand the social context of personal and cultural mobility, including the social networks through which traditions moved within and between distinct societies.

This Research Scientist will conduct analysis of metalwork of the 14th to 11th century BC from the Balkans and the Aegean, with a particular focus on transcultural artefact forms. This will include, but is not limited to, the creation of an up to date database of known finds and studying metallographic samples. They shall work closely with the PI and project collaborators to identify suitable bodies of material.

As a part of this project, we offer a challenging full-time position for 24 months in an inspiring multidisciplinary and international environment at University College Dublin. It is anticipated that the position will begin on 2nd of September 2019.

The successful applicant will be working directly with The Fall's principal investigator, Assoc. Prof. Barry Molloy and a team of international collaborators. They will have access to the resources of the newly established Laboratory of Artefact Biographies at UCD School of Archaeology and collaborating laboratories within the University. Visits to European museums, higher education institutes and research organisations is a requirement for this position and may include extended durations for primary research activities amounting to several months per calendar year. This position will primarily be based at University College Dublin (IE) in the School of Archaeology as part of Assoc. Prof. Molloy's research group.

Please visit [UCD Human Resources](#) page and search for jobs in archaeology

### **PhD and postdoctoral studies at UCD**

We have recently completed a recruitment campaign for a PhD student and postdoctoral researcher and there are no current vacancies. If you are interested in applying to conduct

PhD or postdoctoral Research at University College Dublin School of Archaeology, please get in touch with us to discuss your ideas!

**Contact**

Visit Barry's [profile at UCD](#) for further information

Please visit the site: <http://www.thefall1200.eu/jobs.html>

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## **BOSTON UNIVERSITY POSITION:** **ARCHAEOLOGICAL SCIENCES**

The Archaeology Program at Boston University seeks a Lecturer who can serve as instructor for courses in archaeological sciences and/or geospatial analyses. The course load is 3/2, and candidates should be able to teach introductory courses in general archaeology as well as upper-division undergraduate and graduate courses providing overviews of archaeological sciences (e.g., paleobotany, zooarchaeology, geochemistry, dating methods, isotopic analyses) and/or geospatial methods (e.g., remote sensing, GIS).

Candidates should apply using Academic Jobs Online to upload a cover letter, CV, teaching portfolio, and list of three referees to Faculty Search Committee, Archaeology Program, Boston University, 675 Commonwealth Avenue, Boston, MA 02215. Review of applications will continue until the position is filled.

We are an equal opportunity employer and all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability status, protected veteran status, or any other characteristic protected by law. We are a VEVRAA Federal Contractor.

Application Materials Required:

Submit the following items online at this website to complete your application:

<https://academicjobsonline.org/ajo/jobs/13363>:

- Cover Letter
- Curriculum Vitae
- Teaching Portfolio
- Three References (no actual letters, just names and email addresses )

And anything else requested in the position description.

Further Info: <http://www.bu.edu/archaeology/>

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Maria H. Sousa [mhsousa@bu.edu](mailto:mhsousa@bu.edu)

675 Commonwealth Avenue

Boston, MA 02215

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**CYPRUS UNIVERSITY OF TECHNOLOGY**  
**(CUT) DEPARTMENT OF ELECTRICAL AND**  
**COMPUTER ENGINEERING AND**  
**INFORMATICS UNESCO CHAIR ON**  
**DIGITAL CULTURAL HERITAGE - FULL**  
**TIME MARIE S. CURIE EARLY STAGE**  
**RESEARCHER POSITION (ESR) IN THE**  
**FIELD OF ENRICHMENT OF 3D**  
**VOLUMETRIC DATA WITH METADATA**  
**AND SEMANTICS**

Applications are invited from candidates who possess the necessary qualifications in order to fill one (1) full time Marie S. Curie Early Stage Researcher (ESR) Fellow Position in the newly established UNESCO Chair on Digital Cultural Heritage / Digital Heritage Research Lab of the Cyprus University of Technology (CUT) in the research field of *Enrichment of 3D volumetric objects with Metadata and Semantics*: The selected Marie S. Curie ESR will work for thirty six (36) months within the ITN CHANGE Marie S. Curie ITN Project, an EU-funded programme bringing together eight (8) leading European Institutions as full beneficiaries and ten (10) other as partners in a transnational network, aiming at implementing a multidisciplinary and intersectorial research and training programme between academic, research and the industrial partners.

**Description**

Cultural Heritage (CH) is an integral element of Europe, vital for the creation of a common European identity and one of the greatest assets for steering Europe's social, economic development and job creation. However, the current research training activities in CH are fragmented and mostly designed as single-discipline, failing to cover the whole lifecycle of Digital Cultural Heritage (DCH) research, which is by nature a multi-disciplinary and intersectorial agenda. The CHANGE project will train a new generation of early stage researchers towards a common goal, namely the assessment of changes in tangible cultural heritage objects and their monitoring in the atmosphere and/or during their conservation treatment, using multimodal imaging techniques to complement more traditional analytical techniques. Their research will consist in optimizing capture of data and their analysis, visualisation and management, to ensure a better documentation and long-term preservation of our common European cultural heritage. This work will be carried out within an interdisciplinary environment involving 5 CH and 4 ICT beneficiary institutions as well as 9 CH, ICT and industrial partners from 8 EU countries. This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 813789 H2020 Marie Skłodowska-Curie Action ITN 2018 CHANGE <http://change-itn.eu/>

**Position:**

One ESR to be recruited by the host organization of the Cyprus University of Technology in Limassol, Cyprus for the duration of three (3) years under full employment contract. The fellow will work on:

*Development of advanced metadata and semantic model for integrating: (1) Paradata of the acquisition technologies and historical and archaeological evidence of CH objects, (2) the argumentation leading to virtual reconstruction and discussing alternatives with the object owners/ stakeholders, (3) the connection of physical and social-historical, constructive, functional, aesthetic and environmental parameters, etc. with 3D/4D documentation of CH objects.*

*Expected Results:*

*A complete online platform for the holistic e-documentation of 3D CH objects: metadata, paradata, semantics, reflecting the interpretation and story of the 3D asset.*

*The Applicant should:*

1. Have completed at least a four or five-year education cycle (e.g. Diploma in Engineering, Master's Degree etc) from a recognized university in Geomatics, Computer- / Electrical Engineering Computer Science, Surveying Engineering and/or BA or MA in Humanities with a focus on e-CH with less than four (4) years of continuous full-time research experience in the above fields, with excellent programming skills and very good language and communication / implementation skills,
2. At the time of recruitment, not have resided (or carried out his/her main activity e.g. work, studies, etc.) in Cyprus, for more than 12 months in the last 3 years immediately prior to the reference recruitment date,
3. Possess excellent knowledge of the English language at a proficiency level (spoken and written)

### **Career Stage**

Early stage researcher or 0-4 years of experience (Post graduate) – According to the H2020 (Marie S. Curie Actions) Regulations. Eligibility rules for the Marie S. Curie fellows can be found at the H2020 MSCA 2018-2020 Work programme:

[http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-msca\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-msca_en.pdf)

### **Research Profile**

First Stage Researcher (R1) This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 813789 H2020 Marie Skłodowska-Curie Action ITN 2018 CHANGE <http://change-itn.eu/>

### **Benefits**

- Competitive salary to cover living allowance (2.701,02 Euro – gross salary), mobility (600,00 Euro) plus a family allowance (if the candidate is married: 500,00 Euro), social and health insurance (**according to the H2020 Marie S. Curie Actions Programme and CUT regulations**).

- In the context of a personal Career Development Plan, opportunities for international collaboration, attend outstanding conferences/events and exchanges to world-class academic and industrial partners will take place.
- Registration for a PhD at CUT / UNESCO Chair on Digital Cultural Heritage, Limassol, Cyprus.
- Training in a range of state-of-the-art scientific skills, intellectual property and project management skills and visiting GR language courses at CUT language center,
- Secondment placements within the network's partners (up to max. 30% of the training period).

For more details on the fellow salary and other benefits/eligibility criteria please refer to the H2020 Marie S. Curie actions CHANGE website at <http://change-itn.eu/> and [http://change-itn.eu/wp-content/uploads/2018/12/Guide\\_Applicants\\_shortened.pdf](http://change-itn.eu/wp-content/uploads/2018/12/Guide_Applicants_shortened.pdf)

**Applicants are requested to submit the following:**

1. Detailed EuroPass - Curriculum Vitae in English – three (3) copies (see also: <https://europass.cedefop.europa.eu/documents/curriculum-vitae>),
2. Motivation Letter – three (3) copies,
3. Official certified transcripts of grades from all academic institutions of higher education listed in his/her application, certified copies of degrees, or/and certifications of fulfillment of the required obligations for entering a graduate PhD programme – three (3) copies
4. Official certified copies of titles in English language – three (3) copies
5. Names and full address (including valid email) of three referees who, upon request, can provide recommendation letters – three (3) copies
6. Copies of any related research papers or other significant achievements/work by the applicant – three (3) copies

Applications must be submitted in a closed envelop marked as “*Application for H2020 Marie S. Curie CHANGE Research Fellow Position (ESR)*” – UNESCO CHAIR DCH - Department of Electrical and Computer Engineering and Informatics at the premises of the Cyprus University of Technology, Human Resource Department, 4th Floor, Arch. Kyprianos 31, CY-3036 Limassol via express courier or must be sent via registered post (P.O. Box 50329, CY-3603 Limassol) with a clearly visible post office stamp of a date not later than 31st of May, 2019, 24:00 which is the deadline for the submission of the applications.

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 813789 H2020 Marie Skłodowska-Curie Action ITN 2018 CHANGE <http://change-itn.eu/>

Applicants are also requested to send their applications electronically to the email address [marinos.ioannides@cut.ac.cy](mailto:marinos.ioannides@cut.ac.cy) before the deadline of 31st of May 2019, however, please note that the electronic submission alone will not be considered as a formal application unless the printed application is received as requested in the previous paragraph.

For further information please contact Dr. Marinos Ioannides at email [marinos.ioannides@cut.ac.cy](mailto:marinos.ioannides@cut.ac.cy) and telephone number +357-25-002020 or visit the website: <http://change-itn.eu/>.

### **Research Fields**

Computer Science, Geomatics, Archives, libraries, semantics, ontology, Photogrammetry, Computer Vision, Computer Graphics, Big Data, Holistic documentation

**Start of the fellowship: 1st of October 2019**

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**CYPRUS UNIVERSITY OF TECHNOLOGY**  
**(CUT) DEPARTMENT OF ELECTRICAL AND**  
**COMPUTER ENGINEERING AND**  
**INFORMATICS UNESCO CHAIR ON**  
**DIGITAL CULTURAL HERITAGE FULL**  
**TIME EUROPEAN RESEARCH AREA (ERA)**  
**CHAIR HOLDER POSITION IN THE FIELD**  
**OF DIGITAL HERITAGE**

Applications are invited from candidates who possess the necessary qualifications in order to fill one (1) **Full-time Researcher Position: Special Scientist for Research / Senior Researcher A / ERA Chair holder on Digital Cultural Heritage**) at the newly established UNESCO and European Research Area Chairs on Digital Cultural Heritage within the Digital Heritage Research Laboratory (DHRLab) of the Cyprus University of Technology (CUT) in the research field of *Digital Heritage and Cultural Informatics*.

The selected scientist will work for fifty-four (54) months within the EU H2020 ERA Chair ‘Mnemosyne Project’, a unique EU-funded programme bringing together for the first time a worldwide network, aiming at implementing a multidisciplinary and intersectoral educational, research and training programme between academic research, creative industries and key Cultural Heritage stakeholders.

### **Description**

Cultural Heritage is a strategic resource for Europe with high cultural, social, environmental and economic value. The era of Digital Cultural Heritage (DCH) is now well underway and the European research resource for DCH has grown significantly in recent years worldwide. But the visible contribution of the EU Widening countries to this effort remains relatively weak. The Digital Heritage Research Laboratory (DHRLab) at Cyprus University of Technology (CUT) [www.digitalheritagelab.eu](http://www.digitalheritagelab.eu) has been an exception in this respect, becoming a beacon in the Eastern Mediterranean and for Europe in general, in particular through its leadership of key initiatives in DCH research training and in EU policy co-ordination and support. While the Cypriot economy gradually recovers, in order to maintain and expand its leading role in DCH research, DHRLab needs further investment. This call for an ERA Chair is an ideal opportunity to ensure this by means of a well-designed and iterative process of strengthening its research capacity and restructuring of its role. Therefore, the EU ERA Chair Mnemosyne project will proceed from the appointment of an outstanding researcher and research manager as ERA Chair holder in 2019, who will attract, direct and maintain high quality human resources and negotiate and implement the necessary structural changes to achieve excellence on a sustainable basis. The project will be carried out over a period of 5 years. Following recruitment of the ERA Chair Research Team, a three-phase research programme centered on holistic documentation (knowledge management) of the DCH life cycle in support of existing and potential user needs, will be carried out and

extensively evaluated, with strong attention paid to exploitation. Communication activities will be strategically planned and refined from the outset of the work and will last throughout the project duration.

## **POSITION:**

The ERA Chair will be recruited by the host organization of the Cyprus University of Technology in Limassol, Cyprus for the duration of fifty-four (54) months under a full employment contract with the possibility of extension. **The Chair holder** will work closely together with the Director of DHRLab and the team of the UNESCO Chair on DCH and be responsible for the planned research topics and areas. It is noted that for this purpose funding is included in the MNEMOSYNE project for a group of post-doctoral scholars and PhD researchers to assist the Chair, the team at DHRLab and the UNESCO Chair.

An outline of the research topics under consideration (subject to agreement with the ERA Chair) includes:

### **A. Holistic structures and standardization**

- definition and creation of holistic documentation ‘pipelines’ for specific user communities;
- creation of standards for 3D documentation and knowledge management.

### **B. DCH data acquisition**

- advanced digitisation and approaches such as mass, crowdsourced and on-demand digitisation;
- methods for crowdsourcing content and allowing user-generated content for DCH in the cloud on cloud-computing for DCH, e.g. by leveraging popular photography;
- the use of UAVs and related technologies in capturing documentation;
- automated metadata extraction and crowd;
- realizing the potential of big data management and opportunities created by the vast volume, variety and velocity of mainly unstructured new data, generated every day most for finding and using previously inaccessible European digital content;

### **C. DCH data processing**

- user-oriented metadata and ontology standards for the description and exchange of DCH data;
- metadata designs especially of language-based data close to human conceptual systems and gaining insights from data in natural language;
- innovative tools and methods to extract meaning from digital artefacts, including video recordings, audio recordings, digital images, text, multispectral and thermal information and 3D representations of objects or scenes;
- generation and presentation of localized DCH content and its documentation to enhance audience value (in services such as Europeana) for example through efficient and innovative acquisition and deployment of geospatial data.

### **D. Data modelling**

- data modelling and semantics, including those for Intangible Heritage and the modelling of motion for DCH;

- classification and typology of objects, sites and monuments and its impact on media display and environments where these can be exhibited;
- using immersive VR and AR technology (Mixed Reality – MR) to blend and/or emphasize dimensions and detail environmental experiences;
- interactive environments in DCH e.g. re-creating 3D space through spatial references, imaging and modelling.

#### **E. Knowledge management (interpretation)**

- establishing meaningful narratives (storytelling) for DCH objects which are meaningful to identified user groups for interpretation purposes;
- using crowdsourcing and the Internet to provide documentation resources for experiencing, contributing and gaining understanding in cultural heritage scenarios;
- systems for managing and re-using complex documentation and deriving knowledge e.g. for monuments and sites;
- applications of Artificial Intelligence/Machine Learning in DCH;
- applying Big Data Analytics to DCH;
- the role and applications of Linked Open Data in enriching DCH information, linking exhibited content to other relevant content to provide greater understanding;
- curation of digital assets;
- linking exhibited content to other relevant content to provide greater understanding of the viewed item.

#### **F. Preservation**

- documentation for the preservation of European heritage;
- the virtual or actual reconstruction of destroyed or degraded sites and artefacts including the digital restoration of important monuments destroyed during conflict protecting against or remedying looting and destruction;
- virtual ‘reunification’ of CH assets which have been scattered to different parts of Europe and the world.

#### **G. Use and re-use**

- cost reduction and simplification of digital technologies;
- personalisation and interactivity of viewing experiences in DCH, including the use of social media;
- new types of User Experiences (UX) with DCH that arise from the current ‘hardware and software revolution’ in the realms of VR/AR; interface selection (e.g. Augmented Reality, holograms) to allow seamless blending of on-site and on-line dimensions;
- visualisation techniques and their combination in different contexts, drawing on the state of the art in technology and standards e.g. for Interactive Video (IV); Immersive VR (IVR); Augmented Reality (AR); 3D Real-time Editors (game-engines), Ultra High and Giga-Pixel Panoramas; infinite zooming images; VR Wearables and Gesture Recognition Interfaces;
- inter-disciplinary collaborative research to establish paradigms in socio-economic areas of DCH impact e.g. tourism, education, employment, economic growth;
- crowdsourcing, co-creation and Citizen Science;
- using innovative social platforms to exchange user experiences and support multidisciplinary approaches.

**The Applicant should:**

- Have completed at least a four or five-year education cycle (e.g. Diploma in Engineering, Master's Degree etc.) from a recognized university in Geomatics, Computer- / Electrical Engineering, Computer Science, Surveying Engineering and/or BA or MA in Humanities with a focus on e-CH) with at least eleven years of continuous full-time research experience in the above fields, and very good language, communication and implementation skills;
- For this unique position, an earned Doctorate degree from a recognized University is required;
- The qualifications required for this position are the same as those required for the post of a full Professor at the Cyprus University of Technology and, in addition, the following qualifications are required:
  - o A total of at least eleven years of university / research work or experience of equal value after the award of the doctoral title, out of which, at least four shall be years of university work or holding a post in the rank of Professor in a recognized University or holding a position as a Senior Researcher in a recognized research organization.
  - o International recognition of scientific work of acknowledged merit, promising an important contribution to science: publication of works, such as articles in international pre-reviewed scientific journals of well-known reputation or monographs or books of internationally recognized publishing companies, substantiating notable autonomous research work.
  - o Ability to instruct and promote research, including the supervision of postgraduate students, significant contributions in research projects and track record in ensuring additional financing of research activities.
  - o Indications of international recognition of the candidate's contribution to the research fields described or similar fields, such as research reports, invitations for scientific lectures/keynotes, assignment of the evaluation of articles, research reports/projects or doctoral theses, participation in committees for the publication of scientific journals or participation in the organization of seminars, workshops and conferences.
  - o Significant contribution to the teaching and/or administrative/management work of a University or research center.
  - o Supervision/coordination of successfully completed of research projects or doctoral theses.
  - o Excellent knowledge of the English language at a proficiency level (spoken and written).

**BENEFITS**

The yearly gross salary for this position will be 78.000,00 Euro. From this amount employer and employee contributions to the Cyprus government funds will be deducted. A 13th monthly salary is incorporated into the monthly gross salary. In addition, health insurance will be funded by the program.

**ABOUT THE HOSTING INSTITUTION:**

Cyprus University of Technology (CUT), was established by law in 2004, and enrolled its first students in 2007. With its orientation towards applied research, the University aspires to establish for itself a role in support of the state and society in their efforts to confront problems, which cover all areas of science and technology. CUT involvement in research can be recognized from the fact that within the last four years, projects with

more than 30M Euro have been funded. CUT is an advanced University equipped with the most modern infrastructures and technological equipment which makes it possible to be the strongest on the island in research, with specialized units directed by distinguished professionals. The Digital Heritage Research Laboratory (DHRLab), established in 2013, is directed by Dr. Marinos Ioannides and already works in the digital and holistic documentation of Cultural Heritage Objects as well as contributing to national and European policies for DCH. Moreover, the Lab is very active in 3D Reconstruction and HBIM with a special focus on semantics and symbolic representation.

**UNESCO Chair on Digital Heritage:** The main scope of this unique Chair is to extend the successful work of the DHRLab and address a full range of key aspects of novel research and innovative developments such as:

- the e-documentation and analysis of cultural heritage data for both tangible and intangible heritage;
- technical areas, including 2D and 3D virtual environments (tangible and intangible), archives and collections management systems, web and museum based interactive applications and language technologies;
- non-technical areas, including testing, economic and social impact evaluation in support of the development of the cultural heritage sector and its opportunities in tourism, entertainment and education.

Applications must be sent via email at: [HRecruits@cut.ac.cy](mailto:HRecruits@cut.ac.cy) with the subject: “Application for Researcher Position (Special Scientist for Research – Senior Researcher A) Position – Department of Electrical and Computer Engineering and Informatics” no later than Friday 5 April 2019, 12:00 (noon) which is the deadline for the submission of the applications.

For further information please contact Dr. Marinos Ioannides (Director of the UNESCO Chair on Digital Cultural Heritage) at email [marinos.ioannides@cut.ac.cy](mailto:marinos.ioannides@cut.ac.cy) and telephone number +357-25-002020

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The EU ERA Chair MNEMOSYNE has received funding from the European Union’s Horizon 2020 Programme as Coordination and Support Action, under GA n° 810857.

## **ΑΝΑΚΟΙΝΩΣΕΙΣ - ANNOUNCEMENTS**

### **OPTO-CH 2019 MEETS POLITEIA II, JUNE 03-07, 2019, IESL-FORTH, HERAKLION, CRETE, GREECE**

*Join us for an exciting journey to Crete to become acquainted with the latest developments on non-invasive optical technologies and explore their field applications in Cultural Heritage research and conservation.*

#### **AIMS AND CONTENT**

The aim of **OPTO-CH 2019** summer course is two-fold:

1. to introduce participants to applications of advanced laser-based technologies in Heritage Science (HS),
2. to inform them on the latest developments of the National KRIPIS II project **POLITEIA II (Advanced analytical, diagnostic, surveying and documentation technologies in Cultural Heritage, MIS 5002478)** as regards the multidisciplinary research performed at FORTH related to Heritage Science.

Lectures from experts on modern laser diagnostic and analytical techniques, as well as on laser cleaning methodologies will be combined with practical demonstrations and laboratory hands-on sessions. In parallel, experts of FORTH researching on a wide range of heritage disciplines (i.e. Geophysical – Satellite Remote Sensing and Archaeo-environment, ArchaeoDNA, Cultural Informatics etc.) will present their work within the interdisciplinary concept of POLITEIA II.

The summer course will conclude with field experiments on-site at a selected monument in Crete in order to demonstrate the applicability of the techniques in practice.

#### **TIME-LINE:**

**Application deadline: April 10, 2019**

**Notice of acceptance: April 15, 2019**

**OPTO-CH 2019 POLITEIA II summer course: June 03-07, 2019**

\*\*\*\*\*

#### **Ms Paraskevi Pouli (PhD)**

Institute of Electronic Structure and Laser (IESL)

FOundation for Research and Technology - Hellas (FORTH)

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Fax: +30 2810 391318

<https://www.iesl.forth.gr/en/research/photonics-heritage-science> and

<http://al5801.wix.com/lasersforartsake>

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Please visit the site: <https://opto-ch.iesl.forth.gr/>

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## **ANOTHER KEROS MYSTERY: EXPLORING THE UNUSUAL BURIAL CHOICES AT THE EARLY CYCLADIC ISLAND OF KEROS BY DR IOANNA MOUTAFI**

Please join us for the following British School at Athens (BSA) Friends lecture given by Dr Ioanna Moutafi.

What: Another Keros mystery: exploring the unusual burial choices at the Early Cycladic island of Keros

Where: Room 349 in the South Block of Senate House, London.

When: Tuesday 14 May 2019, 6pm.

RSVP to Kate Smith: [bsa@britac.ac.uk](mailto:bsa@britac.ac.uk) / 10 Carlton House Terrace, London SW1Y 5AH

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The Early Bronze Age (ca. 2700-2200 BC) site of Keros (Cyclades) is one of the most significant and fascinating prehistoric sites in Greece, recognised as the first maritime sanctuary in the Aegean and beyond. A series of excavations, led by Prof Colin Renfrew (University of Cambridge) under the auspices of the British School at Athens, has revealed evidence for unique ritual practices on Kavos and a prominent settlement on nearby Dhaskalio. Both the exceptional ritual practices and the peculiar monumental settlement on Dhaskalio are posing several compelling questions about the character of this Early Cycladic society. The scarce skeletal remains found on site are also attesting to rather unusual burial choices, unique so far in the Early Cycladic period. In this lecture, Dr Ioanna Moutafi will explore these mortuary assemblages through a taphonomic bioarchaeological approach that will shed light on both the biological profiles of the dead and the funerary acts of the people who buried them.

Dr Moutafi, a Marie Skłodowska-Curie Postdoctoral Fellow at the McDonald Institute for Archaeological Research, University of Cambridge, is a bioarchaeologist specialising in the excavation and contextual analysis of human remains from the prehistoric Aegean. Her research interests lie primarily in social bioarchaeology and funerary taphonomy, investigating the social dimensions of prehistoric mortuary practices. Working mostly on collective skeletal assemblages, she employs a multi-dimensional biosocial approach that brings together traditional archaeology, mortuary theory and current advances in biological and field anthropology. Ioanna has worked as leading bioarchaeologist in several international archaeological projects around Greece.

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## ***ΝΕΕΣ ΕΚΔΟΣΕΙΣ – NEW PUBLICATIONS***

### **RADIOCARBON VOLUME 61 / ISSUE 2,** **APRIL 2019**

Research article

[Selecting the Most Reliable <sup>14</sup>C Dating Material Inside Mortars: the Origin of the Padua Cathedral](#)

Anna Addis, Michele Secco, Fabio Marzaioli, Gilberto Artioli, Alexandra Chavarría Arnau, Isabella Passariello, Filippo Terrasi, Gian Pietro Brogiolo

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 375 - 393

doi: 10.1017/RDC.2018.147 Published Online on 13 March 2019

[Influence of Different Acid Treatments on the Radiocarbon Content Spectrum of Sedimentary Organic Matter Determined by RPO/Accelerator Mass Spectrometry](#)

Rui Bao, Ann P McNichol, Jordon D Hemingway, Mary C Lardie Gaylord, Timothy I Eglinton

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 395 - 413

doi: 10.1017/RDC.2018.125 Published Online on 13 November 2018

[Otolith-Based Chronology of Brazilian Shellmounds](#)

Carla Carvalho, Fabiana Oliveira, Kita Macario, Tania Lima, Ingrid Chanca, Eduardo Q Alves, Thayse Bertucci, Orangel Aguilera

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 415 - 433

doi: 10.1017/RDC.2018.135 Published Online on 25 January 2019

[<sup>14</sup>C High Concentration Measurements with Relevance for Decommissioning of Nuclear Reactors](#)

M Enachescu, C Stan-Sion

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 435 - 444

doi: 10.1017/RDC.2018.144 Published Online on 2 January 2019

[Radiocarbon Dating Informs Tree Fern Population Dynamics and Disturbance History of Temperate Forests in Southeast Australia](#)

Melissa Fedrigo, Stephen B Stewart, Sabine Kasel, Vladimir Levchenko, Raphael Trouvé, Craig R Nitschke

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 445 - 460

doi: 10.1017/RDC.2018.119 Published Online on 5 November 2018

[Radiocarbon in the Maritime Air and Sea Surface Water of the South China Sea](#)

Pan Gao, Liping Zhou, Kexin Liu, Xiaomei Xu

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 461 - 472

doi: 10.1017/RDC.2018.100 Published Online on 5 December 2018  
[Selective Dating of Paint Components: Radiocarbon Dating of Lead White Pigment](#)

Laura Hendriks, Irka Hajdas, Ester S B Ferreira, Nadim C Scherrer, Stefan Zumbühl, Markus Küffner, Leslie Carlyle, Hans-Arno Synal, Detlef Günther

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 473 - 493

doi: 10.1017/RDC.2018.101 Published Online on 18 October 2018

[Dating Gordion: the Timing and Tempo of Late Bronze and Early Iron Age Political Transformation](#)

Lisa Kealhofer, Peter Grave, Mary M Voigt

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 495 - 514

doi: 10.1017/RDC.2018.152 Published Online on 29 January 2019

[<sup>14</sup>C Dating of the Roman Military Interventions in the Middle Danube Barbarian World](#)

Balázs Komoróczy, Marek Vlach, Claus-Michael Hüssen, Ján Rajtár

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 515 - 530

doi: 10.1017/RDC.2018.117 Published Online on 31 October 2018

[The Neolithic Transition in the Western Mediterranean: a Complex and Non-Linear Diffusion Process—The Radiocarbon Record Revisited](#)

C Manen, T Perrin, J Guilaine, L Bouby, S Bréhard, F Briois, F Durand, P Marinval, J-D Vigne

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 531 - 571

doi: 10.1017/RDC.2018.98 Published Online on 31 October 2018

[Partitioning of Microbially Respired CO<sub>2</sub> Between Indigenous and Exogenous Carbon Sources During Biochar Degradation Using Radiocarbon and Stable Carbon Isotopes](#)

Niels C Munksgaard, Anna V McBeath, Philippa L Ascough, Vladimir A Levchenko, Alan Williams, Michael I Bird

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 573 - 586

doi: 10.1017/RDC.2018.128 Published Online on 5 November 2018

[Marine Reservoir Corrections for the Brazilian Northern Coast Using Modern Corals](#)

Maria Isabela Oliveira, Carla Carvalho, Kita Macario, Heitor Evangelista, Saulo Lamounier, Izabela Hammerschlag

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 587 - 597

doi: 10.1017/RDC.2018.145 Published Online on 13 March 2019

[The Bivalve \*Glycymeris pilosa\* as an Archive of <sup>14</sup>C in the Mediterranean Sea](#)

Melita Peharda, Andreja Sironić, Krešimir Markulin, Slaven Jozić, Damir Borković, Carin Andersson

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 599 - 613  
doi: 10.1017/RDC.2018.146 Published Online on 15 January 2019  
[Eight New Late Pleistocene/Early Holocene AMS Dates from the Southeastern Baltic](#)

Bente Philippsen, Livija Ivanovaitė, Kirill Makhotka, Florian Sauer, Felix Riede, Jesper Olsen  
[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 615 - 627  
doi: 10.1017/RDC.2018.153 Published Online on 29 January 2019  
[Enhancing Radiocarbon Chronologies of Colonization: Chronometric Hygiene Revisited](#)

Magdalena M E Schmid, Rachel Wood, Anthony J Newton, Orri Vésteinsson, Andrew J Dugmore  
[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 629 - 647  
doi: 10.1017/RDC.2018.129 Published Online on 18 January 2019

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Review article

[Status Report on the Sample Preparation Laboratory for Radiocarbon Dating at the New Bucharest Roams Center](#)

Tiberiu B Sava, Corina A Simion, Oana Gâza, Iuliana M Stanciu, Doru G Păceșilă, Gabriela O Sava, Lukas Wacker, Bianca Ștefan, Vasile D Moșu, Dan G Ghiță, Alexandru Vasiliu  
[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 649 - 658  
doi: 10.1017/RDC.2018.123 Published Online on 15 November 2018

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Erratum

[Vegetation Changes Around Haven Lake, Adak Island, Central Aleutians, Alaska, Determined from Pollen Analysis - ERRATUM](#)

Makoto Noguchi, Toshiyuki Fujiki, Mitsuru Okuno, Lyn Gualtieri, Virginia Hatfield, Brenn Sarata, Masayuki Torii, Keiji Wada, Toshio Nakamura, Dixie West  
[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp 659 - 659  
doi: 10.1017/RDC.2018.151 Published Online on 1 February 2019

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Front Cover (OFC, IFC) and matter

[RDC volume 61 issue 2 Cover and Front matter](#)

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp f1 - f4  
doi: 10.1017/RDC.2019.22 Published Online on 13 March 2019

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Back Cover (OBC, IBC) and matter

[RDC volume 61 issue 2 Cover and Back matter](#)

[Radiocarbon, Volume 61 / Issue 2](#), April 2019, pp b1 - b1  
doi: 10.1017/RDC.2019.23 Published Online on 13 March 2019

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## **THE CONSTRUCTION OF TIME IN ANTIQUITY: RITUAL, ART, AND IDENTITY**

Jonathan Ben-Dov, Lutz Doering (ed.),  
Cambridge; New York:  
Cambridge University Press, 2017. Pp. xii, 296. ISBN 9781107108967.  
£75.00.

Reviewed by Kassandra Miller, Union College ([millerk3@union.edu](mailto:millerk3@union.edu)) [Authors and titles are listed below.]

Our temporal frameworks are so fundamental to our experience of the world that we can easily forget they are not universal. Although, by now, timekeeping has become standardized across much of the world, each component of our current system—e.g., the idea of dividing the globe into time zones, or the notion that our primary temporal unit, the second, should be defined in relation to a caesium atom—represents a choice that was made by humans in response to specific cultural and historical circumstances.

The Construction of Time in Antiquity, edited by Jonathan Ben-Dov and Lutz Doering, explores, in their words, "the relationship between time and human agency" (p. 3) as it is articulated within a variety of cultures (including Babylonian, Egyptian, Greek, Roman, Jewish, and Christian) and social contexts (political, legal, medical, historical, theological, and artistic). This volume celebrates the diverse and complex ways in which people shape—and are, in turn, shaped by—their own temporal concepts and structures. In addition to nuanced case studies, the thirteen contributing authors also present useful lenses and heuristics that will help future researchers to navigate this exciting, burgeoning field.

The sociocultural history of time and timekeeping in antiquity has begun to attract an increasing amount of scholarly attention. In the 1990s and early 2000s, pioneers in the field, such as Jörg Rüpke, Denis Feeney, Robert Hannah, and Sacha Stern, began to encourage readers to consider calendars and other timekeeping devices not only as scientific instruments, but also as political tools that could be used to reinforce, subvert, or modify group identities.<sup>1</sup> Over the past decade, scholars have also begun to examine other temporal constructs (such as the sundial, the hour, or the concept of *kairos*) through sociocultural lenses. Institutions like Berlin's Einstein Center Chronoi, for example, and the Israel Institute for Advanced Studies have recently made such topics the focus of sustained research projects, and several conferences in 2017 and 2018 alone have advanced the conversation.<sup>2</sup> Ben-Dov and Doering's edited volume is one of the first interdisciplinary and multi-authored books to emerge from such endeavors and will undoubtedly become a standard within the field.

The Construction of Time in Antiquity developed out of a conference with the same title, which the editors organized in 2013. The volume's fourteen chapters (one co-authored introduction and thirteen stand-alone contributions) represent revisions of and additions to papers presented during the original program. Academic professionals and graduate students will likely derive the greatest benefit from this book, as its authors assume a certain amount of background knowledge. Because of the volume's interdisciplinary

nature, however, most of its contributing authors are careful to frame their arguments so as to be accessible to specialists outside of their own fields.

The wide range of perspectives represented in this volume is one of its greatest strengths and most important contributions. This collection invites readers to draw interesting comparisons across geographical regions, historical time periods, and cultural contexts, and it puts many types of evidence in conversation with each other, including statues, friezes, vases, lectionaries, the Antikythera Mechanism, and texts from a variety of genres. The contributors themselves represent institutions in six countries and include many well-established scholars as well as a few new voices. One could, however, wish for greater diversity in a couple of areas. For example, only three of the thirteen authors are women. Furthermore, while the book's title promises to address "the construction of time," broadly speaking, the majority of its chapters focus specifically on calendrical time, leaving other kinds (e.g., chronological or daily time) underrepresented.

The chapters are not arranged chronologically but instead cluster around interesting constellations of themes, which are revealed in pages 3-5 of the introduction (a full list of authors and titles is included at the end of this review). Ben-Dov and Doering explain that the first three chapters (Ben-Dov, Stern, Rüpke) "are concerned with time, ideology, and identity," while the two that follow (Steele, Hannah) "investigate the interplay between time, science, and ideology." The next four chapters (von Lieven, Verderame, Kim, Kattan Gribetz) "explore [time in] the fields of myth, metaphor, and visual art," and the last set of four (Doering, Stökl Ben Ezra, Hayward, Leonhard) "deals with time in Jewish and Christian ritual and calendrical practice." Because the relationships between these themes are so complex and the volume itself so wide-ranging, it would have been helpful if the chapters had been grouped under section headings that underlined their shared themes. Nevertheless, the interleaving of contributions by Classicists, Assyriologists, Egyptologists, Art Historians, and Biblical Philologists is thought-provoking and encourages readers to make interdisciplinary, cross-cultural connections.

The quality of the chapters is consistently high. In the interest of space, I would like to focus on four that seem—at least, from my own Greco-Roman perspective—to introduce to the study of ancient time and timekeeping some promising critical lenses. The first of these, in terms of sequence, is the chapter by Jonathan Ben-Dov (Ch. 2: "Time and Natural Law in Jewish-Hellenistic Writings," pp. 9-30). Here, Ben-Dov makes an interesting observation: while Israelites of the Biblical period did not use their calendar as a means of differentiating themselves from non-Israelites, Jews of the Hellenistic and Roman periods frequently employed calendars in their efforts to subvert imperial systems. The Hellenistic period emerges from Ben-Dov's discussion as a watershed "moment" in which Jewish communities begin (a) to define their own quintessentially Jewish calendars and (b) to endeavor to make those calendars correspond to natural phenomena. To explain these shifts, Ben-Dov ultimately points to two features of the Hellenistic world: its increasingly "global" and agonistic political environment and the growing interest in this period in "nature as an object for observation and as a model for imitation" (p. 27). Ben-Dov's chapter identifies politics, theology, and natural philosophy as key ingredients in Jewish calendar formation and illustrates the complexity of their interactions.

John Steele's chapter (Ch. 5: "Real and Constructed Time in Babylonian Astral Medicine," pp. 69-82) demonstrates that practitioners of Babylonian astral medicine



employed different temporal modes depending on whether their goal was to describe a patient's symptoms or to predict the right moment to perform a certain action. In instances of description, Babylonian physicians relied on what Steele calls "real time": typically, durations, given in days or months, which were based on actual observations and could be "either independent of or fixed within the calendar" (p. 80). When making predictions, however, Babylonian physicians relied on "constructed time", which involved the mathematical manipulation of schematic 360-day calendars (distinct from the 384-day Babylonian civil calendar). Steele's chapter highlights the tensions that can arise between "real" and "ideal" temporal frameworks and raises important questions about the considerations that might lead an individual or community to favor one over the other in particular contexts.

The chapter by SeungJung Kim (Ch. 9: "Toward a Phenomenology of Time in Ancient Greek Art," pp. 142-173) offers an important counterpoint to many of the volume's other contributions. Firstly, Kim focuses on a temporal unit, *kairos* or 'opportune moment', that—unlike, for instance, the years, months, and days measured by calendars—is typically represented as having no meaningful duration. Moreover, Kim explores not only the intellectual construction of *kairos*, but also its physical construction—namely, how Greek artists of the Classical period translated the experience of a *kairotic* moment into sculpted and painted media. Kim productively considers how a phenomenological approach to ancient time and its artistic representation can help us to better understand the lived experience of time in antiquity. She applies this approach quite effectively in analyzing a 3D digital reconstruction (prepared by herself and artist Dave Cortes) of the lost Lysippan statue of *Kairos*. Kim's contribution neatly bridges the divide between the fields of ancient technology and art history and allows her to explore with greater precision how a viewer's "interaction with the actual three-dimensional statue unfolds both in space and in time" (p. 151).

Finally, I would like to draw attention to the chapter by Sarit Kattan Gribetz (Ch. 10: "Women's Bodies as Metaphors for Time in Biblical, Second Temple and Rabbinic Literature," pp. 173-204). In this chapter, Kattan Gribetz considers the intersection of time and gender from both male and female perspectives. She observes that male Jewish writers of these periods frequently employ metaphors of labor and birth to talk about eschatological time and often relate lunar and calendrical cycles to the cycles of women's bodies. Kattan Gribetz proceeds to contrast the prominence of women's bodies in temporal rhetoric with their actual exclusion from official time-related activities, such as the ritual of witnessing and sanctifying the new moon. Kattan Gribetz notes how "the mapping of these times onto women's bodies ironically highlights their forced distance from the unfolding [timekeeping] process" (p. 197). The lens of gender has not been frequently applied to ancient time and timekeeping, due in no small part, of course, to the scarcity of sources. Kattan Gribetz offers an important contribution here, one that will undoubtedly inspire further research.

This volume contains many other excellent chapters worthy of mention, such as that by Daniel Stökl Ben Ezra ("Seasoning the Bible and Biblifying Time through Fixed Liturgical Reading Systems (Lectionaries)"), which elegantly and engagingly demonstrates how, on the one hand, Christian and Jewish calendars became "Biblified" through the construction of seasonal ritual units linked through narrative, and how, on the other, the Bible itself became "seasoned" as particular passages became increasingly

associated with particular times of year. To conclude this review, however, I would like to offer a few minor critiques and an assessment of the book's production quality.

Some of the very features that make this volume such an important contribution—such as its interdisciplinarity, its thematic organization, and the diverse ways in which the authors interpret central themes—also create certain challenges (ones that edited volumes commonly face). For instance, this reader would have liked the authors or editors to draw more explicit connections between individual chapters. As it stands, no chapter refers to another, and the succinct introduction (six pages, excluding bibliography) does not elaborate on potential resonances. Readers must therefore notice for themselves how, for example, the chapters by Kim and Kattan Gribetz each approach the notion of "embodied" in time in different ways, or how the Babylonian system outlined by Verderame can be usefully compared and contrasted with the Egyptian system explicated by von Lieven.

The volume could also have attained greater conceptual coherence if the introduction had laid out the book's theoretical commitments more clearly and defined the central terms of its title. Each of these terms—"construction", "time", "antiquity", "ritual", "art", "identity"—is polysemous and has been much-debated. One would like to know how the editors of this particular work decided what does and does not belong within each of these categories. Finally, given the title's ambitious scope, it would have been helpful to include a discussion of the book's limitations and productive avenues for further research.

The book's production quality is generally high, although one notices several typos and inconsistencies. The cover image, for instance, is not credited, and Kattan Gribetz and Doering, in back-to-back chapters, make different choices about whether to render Hebrew in Unicode or transliteration. Overall, however, this volume is deeply thought-provoking and a pleasure to read. It will surely become an essential title for anyone interested in the comparative sociocultural history of time and timekeeping in the ancient Mediterranean.

### **Authors and titles**

1. Lutz Doering and Jonathan Ben-Dov, "Introduction"
2. Jonathan Ben-Dov, "Time and Natural Law in Jewish-Hellenistic Writing"
3. Sacha Stern, "Calendars, Politics, and Power Relations in the Roman Empire"
4. Jörg Rüpke, "Doubling Religion in the Augustan Age: Shaping Time for an Empire"
5. John Steele, "Real and Constructed Time in Babylonian Astral Medicine"
6. Robert Hannah, "The Intellectual Background of the Antikythera Mechanism"
7. Alexandra von Lieven, "Divine Figurations of Time in Ancient Egypt"
8. Lorenzo Verderame, "The Moon and the Power of Time Reckoning in Ancient Mesopotamia"
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11. Lutz Doering, "The Beginning of Sabbath and Festivals in Ancient Jewish Sources"
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13. Robert Hayward, "The Roman Ember Days of September and the Jewish New Year"



14. Clemens Leonhard, "Celebrations and the Abstention from Celebrations of Sacred Time in Early Christianity"

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**Notes:**

1. Jörg Rüpke, *Kalendar und Öffentlichkeit: Die Geschichte der Repräsentation und religiösen Qualifikation von Zeit in Rom* (Berlin: de Gruyter, 1995); Denis Feeney, *Caesar's Calendar: Ancient Time and the Beginnings of History* (Berkeley: University of California Press, 2007); Robert Hannah, *Time in Antiquity* (London: Routledge, 2009); Sacha Stern, *Calendars in Antiquity: Empires, States, and Societies* (Oxford: Oxford University Press, 2012).

2. E.g., "Down to the Hour: Perspectives on Short Time in the Ancient Mediterranean" (University of Chicago, February 2017), "The Day Unit in Antiquity and the Middle Ages" (Israel Institute for Advanced Studies, June 2018), and "Conflicting Chronologies in the Pre-Modern World" (University College Dublin, October 2018).

Please visit the site: <http://bmcr.brynmawr.edu/2019/2019-03-20.html>

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## **EΙΔΗΣΕΙΣ - NEWS RELEASE**

### **SILVER AND THE PHOENICIAN EXPANSION**

PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES—A study\* finds that lead isotopes in Phoenician silver artifacts chart a course of exploration and expansion into Europe and Asia in the 10th and 9th centuries BCE. Phoenician expansion throughout the Mediterranean in the first millennium BCE is a significant cultural inflection point in the history of northern Africa, southern Europe, and the Levant.

The reason for the Phoenician expansion is a subject of debate. Tzilla Eshel, Yigal Erel, and colleagues analyzed lead isotopes in silver artifacts from four hoards of Phoenician silver dating to the 10th and 9th centuries BCE. The lead impurities in the silver are an artifact of the silver production process and can identify the metal's source region. In connection with archaeological studies, the authors found that the silver in the artifacts came from regions in Anatolia, Sardinia, and the Iberian Peninsula, with the oldest artifacts identified as Anatolian and the most recent artifacts as Iberian.

The results outline a temporal and geographic progression of the Phoenician quest for silver, including the acquisition of silver production methods in Anatolia and a shift to almost exclusive use of Iberian silver in the course of the 9th century BCE. According to the authors, the results suggest that the search for silver established pre-colonization contacts between Phoenicia and the West, and that silver was likely the driving force behind the Phoenician expansion in the Mediterranean.

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\*\*"Lead isotopes in silver reveal earliest Phoenician quest for metals in the west Mediterranean," by Tzilla Eshel, Yigal Erel, Naama Yahalom-Mack, Ofir Tirosh, and Ayelet Gilboa.<<https://www.pnas.org/content/early/2019/02/15/1817951116>

**Please visit the site: <https://popular-archaeology.com/article/silver-and-the-phoenician-expansion/>**

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## **EGYPT COMPLETES GROUNDWATER LOWERING PROJECT AT ALEXANDRIA CATACOMBS, BY NEVINE EL-AREF**

The projects comes within the framework of mutual collaboration and partnership between Egypt and the United States to preserve Egypt’s archaeological heritage as well as restore, preserve and protect world-class monuments

In collaboration with the United States Agency for International Development (USAID) and the National Authority for Potable Water and Sewerage (NAPWAS), Egypt’s Ministry of Antiquities has completed a groundwater lowering project at Kom El-Shuqafa archaeological site in Alexandria.

Minister of Antiquities Khaled El-Enany said, “as we are celebrating today the completion of the groundwater lowering project for the Catacombs of Kom El-Shuqafa in Alexandria, we will also celebrate the completion of the Kom Ombo Temple groundwater lowering project in one month.”

Both projects, according to the minister, come within the framework of mutual collaboration and partnership between Egypt and the United States to preserve Egypt’s archaeological heritage as well as restore, preserve and protect world-class monuments for future generations.

Kom El-Shuqafa catacombs in Alexandria were suffering damage caused by the infiltration of groundwater into their lower level.

Several efforts were previously exerted to lower the groundwater level and prevent leakage into the catacombs.

The most recent efforts were carried out in the 1990s, when a number of pumps were installed to reduce the water levels, but the high humidity, caused by the nearby Mahmoudiya Canal, and increased urban development continued to cause flaking of the bedrock that damaged relief decorations and caused the growth of green algae.

With a USAID grant of \$5.7 million, the Ministry of Antiquities – in collaboration with NAPWAS, the CDM Smith and AAW– has succeeded in fixing the problem through the implementation of Kom El-Shuqafa groundwater lowering project.

Meanwhile, Egyptian restorers have completed a comprehensive reconstruction and conservation project for tombs no 989 and no 990 in the catacombs. Work at tomb no 989 started in November 2017 and lasted for one year, while work at tomb no 990 began in February 2019 and is still awaiting the reconstruction of its ceiling and front pillars.

Mostafa Waziri, General Secretary of the Supreme Council of Antiquities, explains that the project started in November 2017 and aims to reduce the groundwater level on site and protect the tombs from any damage caused by the leakage. This was achieved through providing a technical system to draw down the water level.

Waziri pointed out that the accumulation of rain water has also had negative effects.

To protect the tombs, said Engineer Waadala Abul El-Assasif, head of the Projects Sector, six 40-metre-deep wells were dug and a number of electronic pumps were installed along with drainage pipes.

He asserted that the ministry carried out the project after carrying out all required studies.

El-Assasif added that Kom El-Shuqafa archaeological site has suffered from rising groundwater since its discovery, and that the lower level of the site was submerged with water, prompting the ministry to launch a project to establish drainage wells at a depth of 20 metres as a preliminary solution until the completion of the necessary studies before the start of the project.

Kom El-Shuqafa is considered one of the important examples of Roman funerary architecture as it was dug of a series of catacombs, dug three levels into the ground. The cemetery was used in the second half of the first century AD and continued its role as a grave until the fourth century AD.

Waziri mentioned that a development project that aims to convert the Kom El-Shuqafa archaeological site into an open-air museum will involve the creation of a new display scheme for its artefacts. A visitors' route will be also provided.

The necropolis consists of a series of Alexandrian tombs, statues and archaeological objects of the Pharaonic funeral cult with Hellenistic and early imperial Roman influences.

Another feature of the catacombs is the Hall of Caracalla; tombs created for the horses of the Roman Emperor Caracalla in 215 AD.

**Please visit the site:**

<http://english.ahram.org.eg/NewsContent/9/40/326562/Heritage/Ancient-Egypt/Egypt-completes-groundwater-lowering-project-at-Al.aspx> [Go there for pix]

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## **ARCHAEOLOGICAL EVIDENCE SHOWS MINOANS USED VIOLENCE AND WERE PREPARED FOR WAR**

They were not the "flower children" of Ancient Greece, as the impressive, "cyclopic" protopalatial wall of Petras, in Siteia with surviving height considerably over 2m indicates

Just how peace loving were the Minoans? Why did they not leave behind images of wars, battles and walls despite their contacts with other eastern peoples who were their contemporaries and who used such representations? Were the inhabitants of Minoan Crete perhaps "flower children" living among the lilies and passing their time with bullfights and festivities in meadows and olive groves?

"Unfortunately this is not the case. Single city political entities evolved in Crete and at some point, Knossos seems to have dominated the whole island. States are not founded without violence, they are not established without struggles and upheavals, whether internal, within the community or external with their neighbours", answered Greek Archaeologist Dr. Metaxia Tsipopoulou in her talk "War in the prehistoric Aegean: evidence of violence and martial readiness in Minoan Crete", which she recently gave at the Herakleidon Museum, opening the thematic cycle of archaeological lectures on "War in Antiquity", according to [archaeology.wiki](http://archaeology.wiki).

Ms. Tsipopoulou is honorary director of Greece's Ministry of Culture and Sports, a specialist in the Bronze Age and Early Iron Age in the Aegean, and specifically in Crete, where she has conducted many important excavations. For the last 15 years she has been head of archaeological research at Petras in Siteia; a cemetery of the early and middle Minoan period (continuous use from 2800 to 1700 BC).

So how can the absence of martial themes in the art of the Minoans be interpreted? In two ways, the speaker pointed out. "First of all, that in over 2,000 years of Minoan civilization there were no wars or other conflicts, or secondly that the Minoans believed for some reason that they should not depict battles and warfare ... Obviously common sense is in favour of the view that the Minoans chose not to portray war", she pointed out.

It is hard to explain why such a thing occurred. As well as why in Minoan culture there is no representation of or reference to a lord.

"In Minoan culture we have no representation of a lord, neither has any name come down to us except for that of Minos and perhaps Radamanthes, about whom we do not have much information. Moreover, Homeric Idomeneas was a Mycenaean king of Crete", noted Mrs Tsipopoulou having already stressed the mystery of Minoan culture which continuously thickens, despite new finds and fresh interpretations. Here is an interesting piece of information from the archaeologist herself: "For those who wonder about the famous Prince with the lilies from Knossos, I am afraid I shall have to disappoint them, because this fresco has been made up of two or three different images; the body belongs to a boxer while the head is that of a sphinx, according to a study of the fragments published by Wolf Dietrich Niemeyer".

However, walls did exist in Minoan Crete, like those discovered during systematic excavations conducted by Mrs Tsipopoulou in the 1980s in the Bay of Siteia, specifically in Aghia Fotia and mainly in Petras. A Minoan palace was discovered there, part of an urban settlement as well as a un plundered elite cemetery which was in use for approximately 1.000 years. In Aghia Fotia , the wall that surrounds the, so far, only rectangular building, dates with the latter from around 2100-2000 B.C. “Was there perhaps danger from the sea ?or did the people who constructed it want to protect their space and activities from the neighbours?” are some of the questions that arise, according to the honorary director of the Ministry of Culture and Sports.

Likewise in adjacent Petras, at the site of Minoan Siteia, what part could be played by two more walls, nearly cyclopean in structure and with rectangular towers , the second of which surrounds the palace’s plateau on the hill top? According to its excavator, these two walls are part of extensive configuration works of the greater area which are related to the founding of the palace. So what does she believe?

“Around 1900 B.C. the founding of the Early Minoan palaces was predated by social upheavals, the scale of which we cannot know, until one of the elites of each place prevailed or ,most likely, a compromise was reached between a few distinguished lines of rulers, who then undertook the palaces’ administration. The walls were built immediately afterwards, so they were probably a declaration of power and propaganda by the new authorities in the face of those considering to undermine it, whether local or from across the sea”. Consequently the walls “are not associated with any type of warfare, but were built immediately after whatever upheavals, precisely to avoid similar ones in the future, against the new ruling class”, explained the speaker, adding that there are walls belonging to the same period from two other important palatial sites in eastern Crete, those of Malia and Zakros.

What about weapons? During the Early Minoan period (circa 3000-2100), most of them were daggers, i.e. small swords either silver or bronze which according to scholars were either used for display (the silver ones) or as knives(he bronze ones) for various daily uses, while on rare occasions they could have been used as weapons in duels. “Roughly about that time, as well as slightly later, we also encounter male figurines that wear similar daggers in their belts, as in the very well known one from the peak sanctuary of Petsofas, near Palaikastron, east of Petras. Such weapons could kill if necessary, but those who carried them probably aimed to impress, displaying their high social position which allowed them to access expensive imported raw materials such as copper and ivory”, Mrs Tsipopoulou pointed out.

After the destruction of the palaces of Crete around 1900 B.C.-probably by an earthquake- new palaces were erected with Knossos being the most important. The policy of expansion in the Aegean commences in that same period. How peaceful was it? “ Minoan settlements in Thera, Rhodes, Kea, Samos but also in Miletos and Iasos in Asia Minor were probably colonies established for trading purposes. It is certain that a number of Minoans lived there, not just for trading reasons; they transferred their culture, their seals, in some cases tablets of Linear B script, their vases, cooking, weaving and so on.

Minoan, or rather Knossian, dominance in the Aegean was called “Minoan peace” corresponding to the much later “Roman peace” that prevailed across the Mediterranean after the Roman conquests of all Hellenistic kingdoms. Was there perhaps a Minoan

army on the islands to protect their sovereignty or was it just an initially peaceful, commercial and cultural expansion? Did some war precede the “Minoan peace”? We do not know. Apart from the Minoan expansion in the Aegean, there are two other interesting changes during this Neopalatial period; the first in weaponry and the second in imagery”, Ms Tsipopoulou remarked.

She explains that at that time in Crete, large swords started to appear that were certainly more functional than the earlier daggers. Moreover, for the first time we have depictions of duals on signet rings. What do these examples signify? “They are probably linked with the so called Minoan maritime empire, but they definitely indicate the rise of new elites within Minoan society in the Neopalatial period, who felt the need to distinguish themselves as warriors. They obviously had the time to also train in arms so as to promote their ideology to a symbolic level” noted Ms Tsipopoulou, adding that it is very strange these depictions of duals should be restricted to microsculpture, when they would work better as frescoes, as was the case later on in Mycenaean Greece. “As we have said however, in Minoan wall paintings we have no scenes of violence or war”.

After 1450, Crete came under Mycenaean rule and many changes took place within the society and the administration. New elites appeared. The Mycenaeans were warriors and many of them had been buried with their long swords but also with their helmets made of boar’s tusks. Following the fall of the Mycenaean palaces in Mainland Greece, new waves of Mycenaeans arrived on Crete and were assimilated into the local population. Among them were also groups of warriors who, in the 12th century B.C. were buried in small tholos/bee-hive tombs along with their powerful weapons.

**Please visit the site: <https://www.tornosnews.gr/en/greek-news/culture/34666-archaeological-evidence-shows-minoans-used-violence-and-prepared-for-war.html>**

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## **NILE SHIPWRECK DISCOVERY PROVES HERODOTUS RIGHT – AFTER 2,469 YEARS, BY DALYA ALBERGE**

Greek historian's description of 'baris' vessel vindicated by archaeologists at sunken city of Thonis-Heraclion

In the fifth century BC, the Greek historian Herodotus visited Egypt and wrote of unusual river boats on the Nile. Twenty-three lines of his *Historia*, the ancient world's first great narrative history, are devoted to the intricate description of the construction of a "baris".

For centuries, scholars have argued over his account because there was no archaeological evidence that such ships ever existed. Now there is. A "fabulously preserved" wreck in the waters around the sunken port city of Thonis-Heracleion has revealed just how accurate the historian was.

"It wasn't until we discovered this wreck that we realised Herodotus was right," said Dr Damian Robinson, director of Oxford University's centre for maritime archaeology, which is publishing the excavation's findings. "What Herodotus described was what we were looking at."

In 450 BC Herodotus witnessed the construction of a baris. He noted how the builders "cut planks two cubits long [around 100cm] and arrange them like bricks". He added: "On the strong and long tenons [pieces of wood] they insert two-cubit planks. When they have built their ship in this way, they stretch beams over them... They obturate the seams from within with papyrus. There is one rudder, passing through a hole in the keel. The mast is of acacia and the sails of papyrus..."

Robinson said that previous scholars had "made some mistakes" in struggling to interpret the text without archaeological evidence. "It's one of those enigmatic pieces. Scholars have argued exactly what it means for as long as we've been thinking of boats in this scholarly way," he said.

But the excavation of what has been called Ship 17 has revealed a vast crescent-shaped hull and a previously undocumented type of construction involving thick planks assembled with tenons – just as Herodotus observed, in describing a slightly smaller vessel.

Originally measuring up to 28 metres long, it is one of the first large-scale ancient Egyptian trading boats ever to have been discovered.

Robinson added: "Herodotus describes the boats as having long internal ribs. Nobody really knew what that meant... That structure's never been seen archaeologically before. Then we discovered this form of construction on this particular boat and it absolutely is what Herodotus has been saying."

About 70% of the hull has survived, well-preserved in the Nile silts. Acacia planks were held together with long tenon-ribs – some almost 2m long – and fastened with pegs, creating lines of ‘internal ribs’ within the hull. It was steered using an axial rudder with two circular openings for the steering oar and a step for a mast towards the centre of the vessel.

Robinson said: “Where planks are joined together to form the hull, they are usually joined by mortice and tenon joints which fasten one plank to the next. Here we have a completely unique form of construction, which is not seen anywhere else.”

Alexander Belov, whose book on the wreck, *Ship 17: a Baris from Thonis-Heracleion*, is published this month, suggests that the wreck’s nautical architecture is so close to Herodotus’s description, it could have been made in the very shipyard that he visited. Word-by-word analysis of his text demonstrates that almost every detail corresponds “exactly to the evidence”.

Please visit the site: <https://www.theguardian.com/science/2019/mar/17/nile-shipwreck-herodotus-archaeologists-thonis-heraclion> [Go there for pix]

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## **THE GREEK ALPHABET: OLDER THAN YOU MAY THINK? BY WILLEMIJN WAAL**

The Greek alphabet is often considered to be the first ‘true’ alphabet, from which all modern alphabets are derived. So why does it look so ‘old?’ Or is the question, how old is it really?

The Greeks took over the consonantal alphabetic writing system used by the Phoenicians, whose origins go back to the beginning of the 2nd millennium BCE, and are credited with adding vowel signs to this consonantal script. Nobody doubts the Semitic background of the Greek alphabet, but there is considerable debate about when the transmission of the alphabet to Greece took place. In classical studies, the prevalent opinion is that the alphabet was introduced in or shortly before the 8th century BCE, when the first alphabetic inscriptions on stone and pottery turn up in Greece.

There are, however, compelling reasons to assume that the alphabet was introduced in the Aegean much earlier, around the 11th century BCE. The initial texts have not survived, because they were written on perishable materials, like wood, leather or papyrus. The texts themselves may be missing, but there is substantial indirect evidence for their existence.

The pluriformity, diversity and spread of the Greek alphabets As soon as the first Greek alphabetic inscriptions appeared, they turn up regularly in a large area including the entire Greek mainland, the Aegean islands, Italy and Sicily. These inscriptions show significant regional variety; no less than 33(!) different versions of the Greek alphabet can be distinguished. Despite their obvious differences, however, these alphabets all share certain innovations, like the presence of vowel signs, which means that they must ultimately go back to the same source.

If one assumes that the alphabet was introduced around or slightly before 800 BCE, this would mean the alphabet changed, developed and spread like wildfire throughout the Aegean at an incredible speed. This would be all the more astonishing after ‘Dark Age’ of some 300 years without any writing. There are better explanations.

### **The archaic Greek writing habits**

The writing habits of the archaic Greek alphabets are also of interest. The writing direction of the earliest Greek inscriptions was not yet fixed and the letters were written from right to left, left to right, horizontally, vertically or boustrophedon (i.e. alternating between left-to-right and right-to-left). Further, the early Greek letter forms varied greatly. This is in sharp contrast to the Phoenician script, which at least from the 9th century onwards had a fixed writing direction (right to left) and stabilized and standardized letter forms.

In these respects, the archaic Greek script more resembles early West-Semitic inscriptions of before ca. 1050 BCE, which also do not have a fixed writing direction and show great variety in letter forms. In addition, the early Greek inscriptions make use of the same type of word divisions (multiple dots or vertical strokes) that are also attested in early West-Semitic, but not in later Phoenician inscriptions.

If one assumes that the Greeks took over the alphabet in the 9th or 8th century, this would mean that they ignored the accomplishments of the Phoenicians, but instead used a less developed writing system, which coincidentally mimicked much earlier writing practices. If, however, one assumes that the Greek took over the alphabet in or before the 11th century, this would mean that they simply took over existing Phoenician writing habits. The Greek and Phoenician scripts subsequently developed independently, ending up with completely opposite writing directions (Greek: left to right, Phoenician: right to left).

### **The earliest text genres**

It is noteworthy that some of the earliest known Greek inscriptions are literary, presenting poetic hexametric verses (e.g., the Nestor-cup from Pithekoussai, the Dypilon vase from Athens, the Acesander cup from Methone). This circumstance has led classicist Barry Powell to claim that the Greeks introduced writing for the sole purpose of recording Homer. However, a more plausible explanation may be that writing was already in use for other, more mundane text genres, such as economic and administrative documents on ephemeral materials, before the first surviving literary inscriptions on durable materials. This assumption gains strength if one bears in mind that most, if not all, early Greek inscriptions are of a private nature – including erotic graffiti, which can hardly be considered a primary use of writing. This implies a wider, and in all likelihood earlier, usage of the script.

### **Light in the Dark Age**

Recent archaeological studies have shown that the Greek ‘Dark Age’ (ca. 1100-800 BC) was not as dark as has long been assumed, but that – apart from obvious decline – there was substantial continuity with the Late Bronze Age and considerable prosperity. Greece was not isolated and there was still maritime contact with the Near East. In these conditions, the existence of literacy in the Aegean is conceivable, and even likely in view of contacts with the (literate) Levant. It is also important to bear in mind that writing had been present in Greece for about 700 years until ca.1200 BCE; in the 2nd millennium BCE several syllabic writing systems were in use, of which Linear B, used for the Mycenaean language, is the best known.

Moreover, it has become clear that an international network of trade and diplomatic contacts across the Mediterranean existed from at least the 3rd millennium onwards. This means that the necessary infrastructure for a transmission of the alphabet was already in place long before the traditional date of its assumed introduction in the Aegean.

### **Homeric Questions**

The combined facts call for a revision of the current paradigm. Rather than assuming that there was a sudden ‘explosion’ of writing in the 8th century after an illiterate phase of three centuries, the available evidence favours a scenario in which alphabetic writing was already introduced to Greece around the 11th century BCE.

A potentially earlier date of the Greek alphabet also has important consequences. It opens up new perspectives for understanding the Greek Dark Age and the relations between the early alphabets. It may also shed new light on the Homeric Question, as it would allow a scenario in which the Iliad and Odyssey are the results of a mixed written/oral tradition, just like the Epic of Gilgamesh to which they bear so many resemblances. An early date

for the transmission of the alphabet links the Greek and Near Eastern worlds in important ways, pointing to their development in tandem and suggesting they must be studied in unison.

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Willemijn Waal is a Lecturer at Leiden University.

For further reading:

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<https://www.aegeussociety.org/en/studies/on-the-phoenician-letters-the-case-for-an-early-transmission-of-the-greek-alphabet-from-an-archaeological-epigraphic-and-linguistic-perspective/>)

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**Please visit the site: <http://www.asor.org/anetoday/2019/03/Greek-Alphabet-Older-Than-You-Think> [Need to go there for charts and pix]**

## **DID DIETARY CHANGES BRING US ‘F’ WORDS? STUDY TACKLES COMPLEXITIES OF LANGUAGE’S ORIGINS, BY JOANNA KLEIN**

Softer foods from agricultural lifestyles may have changed the human bite, making it easier to form certain sounds.

Thousands of years ago, some of our ancestors left behind the hunter-gatherer lifestyle and started to settle down. They grew vegetables and grains for stews or porridge, kept cows for milk and turned it into cheese, and shaped clay into storage pots.

Had they not done those things, would we speak the languages and make the sounds that we now hear today? Probably not, suggests a study published Thursday in Science.

“Certain sounds like these ‘f’ sounds are recent, and we can say with fairly good confidence that 20,000 or 100,000 years ago, these sounds just simply didn’t exist,” said Balthasar Bickel, a linguist at the University of Zurich and an author of the new research.

The study concluded that the transition to eating softer foods changed how bites developed as people aged. The physical changes, the authors said, made it slightly easier for farmers to make certain sounds, like “f” and “v.”

Through various other processes that the study did not directly address, these sounds made their way into about half the languages used today. The study’s authors called for greater consideration of biological factors in studying the development of human language.

A number of linguists agreed that the findings are plausible, but others said the study’s broader conclusions about agriculture’s effect on language may be overstated. Some cautioned against interpretations that may unwittingly restate discredited ethnocentric or racist views that in the past have tarred the study of linguistics.

Dr. Bickel and his colleagues revisited a question about the origins of language: Were some of the diverse sounds we hear today acquired only recently? While most linguists think language abilities are universal and haven’t really changed over the course of human history, the new study suggested that over the past few thousand years, agriculture fostered the arrival of new sounds in human voices.

In 1985, a linguist named Charles Hockett observed that “f” and “v” sounds appeared less frequently or were absent in the languages of some hunter-gatherers. He proposed that dietary changes, promoted by the spread of agriculture, may have transformed teeth and jaws, making it easier for people to produce some sounds and more difficult to articulate others.

But many criticized Dr. Hockett's idea, which he ultimately abandoned — and that was even before linguists began favoring the brain's role in guiding language over social or physical influences.

In the time since, however, researchers learned that through gradual processes, diet may shape human bite. But the connection to sounds we make remained unclear.

In the new study, researchers pored over thousands of languages. With computer simulations of differently shaped mouths and other techniques gathered from paleoanthropology, linguistics, speech science and evolutionary biology, the scientists found that eating softer foods, associated with agriculture, changed adult bites.

For those living on a hunter-gatherer diet, overbites in the jaws and teeth in youth were often replaced in adulthood by what are called edge-to-edge bites, where front teeth sit atop one another. But with a softer diet, overbites may persist into adulthood.

With an overbite, pronouncing sounds called labiodentals, which require moving the bottom lip against the top teeth — think of the words “fava” or “fever” — is about 30 percent easier. Over thousands of years, more of these sounds could have made their way into language.

This scenario is more probable than not, the researchers said, although they concede it may not occur universally. “Some languages will develop labiodentals,” said Steven Moran, a linguist at the University of Zurich. “Some languages don't.”

The findings challenge the idea that the sounds we make are more related to human evolution and how it shaped our brains, a subject the paper doesn't dwell on.

Our hominin ancestors may have cooked food, for example, which made it softer. That contributed to changes in the shape of the skull and mandible, which made way for a more complex brain long before agriculture influenced diet, said Jordi Marcé-Nogué, who studies jaw evolution in primates at the University of Hamburg in Germany.

“What came first?” he asked. “The changes in the speech, or the changes in the brain?”

Ray Jackendoff, a linguist at Tufts University who was not involved in the study, said the group's finding that the ease of saying some sounds may vary with diet “is interesting but not earthshaking.” That different cultures may have uttered certain sounds more often than others “doesn't say much about the deep history of language.”

Other cultural and social factors, like adopting sounds from neighbors, also may have contributed to changes in language, the study's authors said. For example, when hunter-gatherer groups and agrarian groups mixed, so did their sounds.

And others point out that labiodental sounds have even been found among hunter-gatherers with edge-to-edge bites, like some Yanomami people of South America, who live mostly as isolated hunter-gatherers, fishers and horticulturists.

Other linguists also point out that the study rests on untested assumptions, like just how much these small bite changes might influence sounds, the types of errors they could



produce, the age at which hunter-gathers' teeth wear down, and the notion that agriculture is a useful proxy for diet. The role of cognitive factors, including neural control of speech organs, also goes unaddressed.

The authors respond that they are not minimizing the roles played by culture, society or cognition in the development of language. But they say that physical differences between people deserve as much attention in the study of human language development as they do in research into the communication systems of animals.

Some linguists worry that if not handled with extreme care, subsequent studies of the physical or biological differences of language could invigorate ethnocentric beliefs that have plagued linguistics in the past, especially if research is publicly interpreted as making value judgments of different groups' languages.

“The risk here is a bias to focus on positive benefits or what is gained by individuals in agrarian societies, rather than also considering whatever benefits individuals in hunter-gatherer societies might have,” said Adam Albright, a linguist at M.I.T.

Dr. Albright said the current study considered those questions, and he hopes that future inquiries in this area will also investigate what sounds might have been left behind in the shift to agriculture.

Dr. Bickel agreed: “It will be just as interesting to investigate which sounds might have gone lost with the transition to softer diets.”

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A version of this article appears in print on March 19, 2019, on Page D4 of the New York edition with the headline: A Language's Origins In a Few Small Bites.

**Please visit the site: <https://www.nytimes.com/2019/03/14/science/language-origins-agriculture.html>**





## **A HISTORY OF THE IBERIAN PENINSULA, AS TOLD BY ITS SKELETONS, BY CARL ZIMMER**

With an analysis of DNA from nearly 300 fossilized remains, scientists are peering into human prehistory in the region.

For thousands of years, the Iberian Peninsula — home now to Spain and Portugal — has served as a crossroads.

Phoenicians from the Near East built trading ports there 3,000 years ago, and Romans conquered the region around 200 B.C. Muslim armies sailed from North Africa and took control of Iberia in the 8th century A.D. Some three centuries later, they began losing territory to Christian states.

Along with historical records and archaeological digs, researchers now have a new lens on Iberia's past: DNA preserved in the region's ancient skeletons. Archaeologists and geneticists are extracting genetic material spanning not just Iberia's written history but its prehistory, too.

“We wanted to bridge the ancient populations and the modern populations,” said Iñigo Olalde, a geneticist at Harvard Medical School. Dr. Olalde is the lead author of a paper published on Thursday in *Science* that analyzes the DNA of 271 ancient Iberians.

In recent years, scientists have created similar chronologies for entire continents, based on hundreds of samples of ancient DNA. Now researchers are starting to narrow their focus to smaller regions.

With a total of 419 ancient human genomes obtained by various laboratories, Iberia offers a rich trove. Scientists have recovered only 174 ancient genomes in Britain, and just eight in Japan.

This dense record shows that Iberia's genetic profile changed markedly in response to major events in history, such as the Roman conquest.

But researchers have also uncovered evidence of migrations that were previously unknown. Iberia, it now seems, was a crossroads long before recorded history, as far back as the last ice age.

The oldest known human DNA in Iberia comes from a 19,000-year-old skeleton found in 2010 in a cave called El Mirón, in northern Spain. The skeleton belonged to a woman, a member of a band of Ice Age hunter-gatherers.

People in Iberia continued to live as hunter-gatherers for thousands of years after that, long after the end of the Ice Age. Dr. Olalde and his colleagues analyzed DNA from four additional hunter-gatherers, while a separate team, based at the Max Planck Institute for the Science of Human History, extracted DNA from 10 more.

Both teams obtained the same striking result: Iberian hunter-gatherers had a remarkable mix of genes, showing that they descended from two profoundly distinct groups of early European hunter-gatherers.

One of these groups can be traced as far back as 35,000 years, thanks to a skeleton discovered at a site in Belgium called Goyet. The Goyet-related people spread across Europe, only to be replaced on much of the continent near the end of the Ice Age by a genetically distinct population.

The earliest sign of the second group appears 14,000 years ago, known to researchers by DNA in a skeleton at an Italian site called Villabruna.

But in Iberia, the new studies find, the Goyet and Villabruna people coexisted. Hunter-gatherers across the peninsula had a mixture of ancestry from the two peoples.

“This is quite amazing, because it’s not happening in other areas,” said Vanessa Villalba-Mouco, the lead author of the Max Planck study, published in *Current Biology*.

Ms. Villalba-Mouco speculated that the geography of Iberia — located in a far corner of Europe — may have allowed the Goyet people to endure there after they disappeared elsewhere. “Maybe nobody was bothering these hunter-gatherers,” she said.

But whatever solitude Iberia might have offered came to an end about 7,500 years ago, when new people arrived with crops and livestock. These first farmers, originally from Anatolia, brought with them a distinctive genetic signature.

After their arrival, the genetic makeup of Iberians changed dramatically. Ninety percent of the DNA from the later skeletons derives from the Anatolian farmers; 10 percent comes from the hunter-gatherers.

But this shift was not a simple story of an older population replaced by a newer one. Starting about 6,000 years ago, Dr. Olalde and his colleagues found, hunter-gatherer ancestry in Iberian farmers actually increased to 20 percent.

It’s possible that hunter-gatherers endured beyond the advent of farming. They may have taken up farming as well, and perhaps later the two cultures merged.

For centuries afterward, the researchers found, there was little change in the genetic profile of Iberians. But there are hints of a few remarkable migrations.

A skeleton from an elaborate grave in central Spain about 4,400 years old belonged to a man whose ancestry was 100 percent North African.

“That’s crazy,” said David Reich, a geneticist at Harvard Medical School and a co-author of the paper in *Science*. “We double-checked it because it was so weird.”

Another striking result emerged when the researchers studied the DNA from a 3,500-year-old woman. They concluded she had a North African grandparent.

These findings suggest that people were moving into Iberia from Africa more than 3,000 years before the rise of the Roman Empire. “These are cosmopolitan places,” Dr. Reich said.

About 4,500 years ago, still another wave of people arrived, profoundly altering the makeup of Iberia.

A few centuries earlier, nomads from the steppes of what is now Russia turned up in Eastern Europe with horses and wagons. They spread across the continent, giving up nomadic life and intermarrying with European farmers.

When they finally reached Iberia, these people spread out far and wide. “They really have an impact on the whole peninsula,” said Dr. Olalde.

But skeletal DNA from that period is striking and puzzling. Over all, Bronze Age Iberians traced 40 percent of their ancestry to the newcomers.

DNA from the men, however, all traced back to the steppes. The Y chromosomes from the male farmers disappeared from the gene pool.

To archaeologists, the shift is a puzzle.

“I cannot say what it is,” said Roberto Risch, an archaeologist at the Autonomous University of Barcelona, who was not involved in the new studies. But he ruled out wars or massacres as the cause. “It’s not a particularly violent time,” he said.

Instead, Dr. Risch suspects “a political process” is the explanation. In their archaeological digs, Dr. Risch and his colleagues have found that Iberian farmers originally lived in egalitarian societies, storing their wealth together and burying their dead in group graves.

But over several centuries, palaces and fortresses began to rise, and power became concentrated in the hands of a few. Dr. Risch speculated that the cultural shift had something to do with the genetic shift found by Dr. Olalde and his colleagues.

The Bronze Age in Iberia was followed by the Iron Age about 2,800 years ago. In skeletons from this period, Dr. Olalde and his colleagues found clues of more arrivals.

Iron Age Iberians could trace some of their ancestry to new waves of people arriving from northern and Central Europe, possibly marking the rise of so-called Celtiberian culture on the peninsula.

In addition, the scientists found a growing amount of North African ancestry in skeletons from the Iron Age. That may reflect trade around the Mediterranean, which brought North Africans to Iberian towns, where they settled down.

North African ancestry increased in Iberia even more after Romans took control. Now the peninsula was part of an empire that thrived on widespread trade. At the same time, people from southern Europe and the Near East also began leaving an imprint.

This shift in ancestry could explain one of the biggest mysteries in Iberian history. Researchers have long puzzled over the distinctive culture of the Basque region in northern Spain.

The Basque speak a language that is unrelated to other European tongues. Some researchers have speculated that they descended from a population that had been distinct since the Bronze Age or earlier.

Genetically, at least, that doesn't seem to be the case. Before the Roman era, the Basque had DNA that was indistinguishable from that of other Iron Age Iberians. But Roman genes did not flow into Basque Country.

After the fall of Rome, ancient DNA in Iberia reflects its medieval history. Skeletons from the Muslim era show growing ancestry from both North Africa and sub-Saharan Africa.

Which brings us, just a millennium later, to the present. In February, Clare Bycroft of the Wellcome Trust Center for Human Genetics at the University of Oxford and her colleagues published a study of the DNA of 1,413 people in Spain.

The team was able to identify pieces of North African DNA in people across Spain. The researchers estimated that the subjects' North African ancestors lived about 800 years ago, during Muslim rule.

The researchers were also able to group Spaniards into five genetic clusters. On a map, these groups form five strips running north to south. Those strips line up neatly with history.

At the height of the Muslim rule, a few small Christian states survived on the northern coast of Spain. As Muslims lost power, those states expanded their southern borders, starting roughly 900 years ago.

Up until now, wide swaths of time typically separated genetic studies of living people and those of ancient DNA. But now, in places like Iberia, the gaps are being filled in, creating an unbroken genetic chronology.

“The two worlds are starting to merge,” said Dr. Bycroft.

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A version of this article appears in print on March 19, 2019, on Page D5 of the New York edition with the headline: Stories of Migrant Peoples, Written in DNA

**Please visit the site: <https://www.nytimes.com/2019/03/14/science/iberia-prehistory-dna.html>**

## **1,500-YEAR-OLD GARBAGE DUMPS REVEAL CITY'S SURPRISING COLLAPSE, BY MEGAN GANNON**

Archaeologists thought Elusa, a popular Roman wine center, collapsed with Islam's arrival. Its trash reveals a very different—and alarming—reason.

Some 1,500 years ago, the city of Elusa was thriving on the southern edge of the Eastern Roman (Byzantine) empire, in what is now Israel's Negev desert. The city of up to 20,000 residents featured a theater and public baths, churches and craft workshops, and innovative water management systems that enabled Elusa's citizens to cultivate their most famous export: Gaza wine, a prized white vintage that was shipped across the Mediterranean to ports as far as France.

Within two centuries, however, the Byzantine city of Elusa (also known as Haluza) had collapsed, leaving behind ancient buildings picked apart by later generations or simply buried beneath shifting sand dunes.

Historians have generally believed that Byzantine social and economic systems in the Negev region declined with the rise of the early Islamic period in the mid-seventh century, a time which ushered in changes like restrictions on wine production, a commodity that generated a lot of money and trade for Elusa.

Thanks to a closer look at Elusa's municipal garbage dumps, however, archaeologists now realize that the city's decline occurred almost a century before Islamic influences entered the area, during what had traditionally been considered the peak of the Byzantine period. The culprit? A quick and deadly shift in climate brought about by a succession of distant volcanic eruptions.

### **Trash becomes treasure**

In a study published today in the Proceedings of the National Academy of Sciences (PNAS), Guy Bar-Oz, a professor of archaeozoology at the University of Haifa, and his research team outline the results of excavations of the urban garbage dumps still visible on the outskirts of Elusa.

The dig was spurred by Bar-Oz's curiosity about the downfall of Byzantine society in the Negev—a story he noticed was missing from popular histories like Jared Diamond's 2005 book *Collapse*. For clues, the researchers turned to Elusa's dumps, reasoning that the end of trash collection—a crucial city service—would mark the end of high-level societal functioning in an urban environment.

After digging through layers of refuse like ash from fireplaces, bones from meat and fish, seeds from grapes and olives, discarded construction material, and broken wine jugs, the researchers found that the main dumps stopped receiving trash around 550.

"We were very surprised because we expected that the date of the abandonment of the dumps would be much later," Bar-Oz says.

A close-up of a trash mound at Elusa. Archaeologists excavated these mounds to determine that city organization fell apart around 550 A.D. PHOTOGRAPH BY GUY BAR-OZ

The end of trash management at Elusa does, however, correlate with new developments in climate science, which show that the middle of the sixth century was actually a horrible time to be alive in most of Europe and Asia.

In 2016, a group of scientists led by Ulf Büntgen, a professor of environmental systems analysis at the University of Cambridge, defined an overlooked period of rapid climate change: the Late Antique Little Ice Age, which lasted from 536 to about 660.

By looking at tree ring data and particles trapped in ice cores, Büntgen and his colleagues found that a cluster of volcanic eruptions—in 536, 540 and 547—blotted out the sun and triggered an exceptionally cold period in the northern hemisphere. (Scientists have yet to pinpoint the location of the volcanoes that erupted in those years; last year a group of researchers claimed that the 536 blast may have occurred in Iceland.) Food shortages and famine followed.

The researchers suggested that the climate events may also be associated with major social changes that started in the middle of the sixth century, from the expansion of Slavic populations west into much of continental Europe, to the collapse of the eastern Turk Empire in northeast Asia. The Late Antique Little Ice Age may have also facilitated the world's first recorded pandemic outbreak of the bubonic plague, known as the Plague of Justinian, which spread throughout the Mediterranean beginning in 541.

Elusa now offers "a nice case study from archaeology, from the human side, that provides evidence for what we suggested," Büntgen says. "We are getting more and more aware that our decision making and our systems are not operating independently from environment and climate conditions."

Linking long-duration environmental phenomena to discrete historical events remains challenging, and scientists haven't reconstructed exactly how the Late Antique Little Ice Age affected the Negev. For example, rapid cooling may have been disastrous for crops in Ireland and Scandinavia, but Büntgen says arid, drought-prone environments like the Negev may have benefited from the changes.

Even so, Elusa's economy still relied on outside markets that might have been suffering.

"In terms of the international picture, if there was less demand on the other side of the Mediterranean for the product—probably the wine—then probably the prices went down," Bar-Oz says.

Historians and authors have speculated on the fall of Roman civilization for centuries, and the findings from Elusa are part of new trend to look at the complex web of environmental factors that might have influenced social change across the empire.

Kyle Harper, a professor of Classics at the University of Oklahoma who was not involved in the new research, says garbage is an "under used"

archaeological clue about the past.

"We know that the sixth century A.D. experienced an unusually violent series of volcanic eruptions, triggering abrupt climate change, and even more importantly, the beginning of the first bubonic plague pandemic," says Harper, who wrote the 2017 book *The Fate of Rome: Climate, Disease, and the End of an Empire*. "This study is yet further evidence that these environmental shocks were extremely disruptive to the societies that lived through them."

**Please visit the site: <https://www.nationalgeographic.com/culture/2019/03/ancient-garbage-dump-elusa-reveals-surprising-city-collapse/> [Go there for pix]**

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## **IS ANCIENT DNA RESEARCH REVEALING NEW TRUTHS — OR FALLING INTO OLD TRAPS? BY GIDEON LEWIS-KRAUS**

Geneticists have begun using old bones to make sweeping claims about the distant past. But their revisions to the human story are making some scholars of prehistory uneasy.

### **Part I**

#### **1. The Ghosts of Teouma**

A faint aura of destiny seems to hover over Teouma Bay. It's not so much the landscape, with its ravishing if boilerplate tropical splendor — banana and mango trees, coconut and pandanus palms, bougainvillea, the apprehensive trill of the gray-eared honeyeater — as it is the shape of the harbor itself, which betrays, in the midst of such organic profusion, an aspect of the unnatural. The bay, on the island of Efate in the South Pacific nation Vanuatu, is long, symmetrical and briskly rectangular. In the expected place of wavelets is a blue so calm and unbroken that the sea doesn't so much crash on the land as neatly abut it. From above, it looks as though a safe harbor had been engraved in the shoreline by some celestial engineer.

In late 2003, while clearing land just above the seaside, a bulldozer driver found a broken piece of pottery in the rubble. The villagers of Vanuatu often happen upon shards of timeworn ceramic, which spark an idly mythical curiosity; they're said to be fragments of Noah's Ark, or the original Ten Commandments, or the burst water vessels of powerful ancestral spirits. These shards are often left alone, but word in this particular case traveled quickly, and the artifact soon found its way to the Vanuatu Cultural Center and National Museum, where Stuart Bedford, a New Zealand archaeologist who had studied local pot shards for years, was called in to inspect it. He immediately recognized its distinctive pattern — “dentate stamping,” an ancient technique so named because it looked as though some tiny-toothed creature had bitten an intricate pattern into the ceramic — and understood that this pottery coincided with the very first movement of ancient peoples into the South Seas.

Bedford rushed to the site of the discovery, an old colonial coconut plantation that the bulldozer had been clearing for use as a prawn farm. Further burrowing turned up not only more pottery but also tools of obsidian and a great cache of human bones, which had lain undisturbed and unusually well preserved over thousands of years. The site was soon identified as the oldest and largest prehistoric cemetery ever found in the Pacific. Everything at the site indicated a founding colony — first arrivals to the shores of uninhabited islands. Teouma was, according to Bedford, “unlike anything anyone had ever seen, or was likely to see, in this part of the world ever again.”

Archaeologists hoped the bones might help provide a clue to the abiding mystery of how anybody had gotten to these far-off coastlines in the first place. Vanuatu is a volcanic archipelago of more than 80 islands littered in an extended slingshot shape across an 800-mile arc of the South Pacific. Europeans first heard of its existence in 1606, when a



Portuguese navigator stopped through on a brief but violent imperial errand for the Spanish crown. The islands were largely left to their own devices until the end of the 18th century, when French and British ships arrived to plant their own flags. The two countries ruled the archipelago as a joint colony, called the Condominium of the New Hebrides, until independence was achieved in 1980. National coherence remains a work in progress. By some measures, Vanuatu is per capita the most linguistically diverse country on the planet: Its quarter-million citizens, predominantly the native ni-Vanuatu, speak as many as 140 different indigenous languages and maintain an astonishing variety of cultural practices. A meaningful national identity has been constructed from a common appreciation of ceremonial pig-tusk bracelets and the taking of kava, a very mild narcotic root that looks like primordial pea soup and tastes like a fine astringent dirt. Above all, however, the ni-Vanuatu are bound together by the fact of the country's nautical isolation: Their nearest neighbors are hundreds of miles in any direction.

It is the peculiar geography of this isolation that made the Teouma site so significant. Many of the islands of the South Pacific are much farther-flung: Easter Island makes Vanuatu look like an Australian exurb. But with one very small exception — the tiny eastern outliers of the Solomon Islands — Vanuatu offers the first solid ground on the far side of a major but invisible maritime boundary. On the west side of that border is a string of archipelagoes called Near Oceania: islands chained to one another (and to the rest of the world) by lines of sight. Prehistoric peoples, after tens of thousands of years of travel by foot from Africa, had arrived at the end of Southeast Asia and hopscotched their way forward via short sea outings, presumably crossing the narrow channels they encountered on crude watercraft. Finally, however, some 40,000 years ago, their path was decisively blocked by open ocean. In front of them, across more than 200 miles of empty sea, was the vast aquatic wilderness of Remote Oceania.

That border marked the absolute limit of human expansion for tens of thousands of years, until at last someone sailed out across the naval event horizon and into the unknown. This first traversal was one of the greatest and most courageous passages in human prehistory. The peopling of Remote Oceania — an obscure exodus that easily ranks among the signal triumphs of the ancient world — has inspired awe and vexation for generations. In the mid-20th century, archaeologists came to identify these first voyagers with a set of jars and tools unique to the region, the “Lapita cultural complex,” and determined that they crossed the boundary into Remote Oceania some 3,000 years ago. Further details were presumed lost to history.

But in 2014, Bedford got another surprise call, this time from a researcher affiliated with a genetics team at Harvard. A small group of pioneering lab scientists had found ways to isolate and analyze DNA from ancient bones, methods potent enough to inspire a wholesale revision of our knowledge about ancient peoples. The Harvard operation, which was then preparing a landmark paper about European origins, now intended to visit their attention upon the South Pacific, and they wanted to know whether Bedford might facilitate access to the Teouma remains. Bedford agreed, and over the next four years, the Harvard team used the DNA they found to present a radical new story about Remote Oceania's first settlers.

Bedford and I met last summer in the hilly and sedate capital of Port-Vila, outside the towering thatched A-frame of the national museum. He is tall and friendly, with a square head, short brown hair, a rancher's open gait and the incessant squint of someone in

perpetual communion with the near-hopeless complication of human affairs. We climbed into his white Land Cruiser and drove to a tidy village compound outside town. There, Bedford embraced the local chief, Silas Alben, who led us through village gardens of banana and tuber to a high limestone cliff with a sprawling view of the Teouma site.

As we shared the sweating neon flesh of a machete-split papaya, Bedford, now affiliated with the Australian National University, ran through all the reasons that the sheltered cove far below — just then rippling beneath a late-afternoon rainbow — would have made an inviting stage for the encounter of an ancient people with a primeval place. For whoever arrived in those first canoes, these empty islands offered a bounty of unfished reefs, unoccupied land and naïve, slow-moving animal prey; for those who now studied those first colonists, their arrival represented an important inflection point in human expansion and development. And now, the science of “paleogenomics” had coaxed new stories of ancient lives from the Teouma bones.

## **2. Prehistory: A History**

For most of human history, our beliefs about our origins drew upon oral traditions or the evidence found in ancient texts. One 17th-century scholar calculated, on the basis of biblical genealogies, that the creation happened in 4004 B.C.; subsequent refinements settled on the date of Oct. 23. Sir Isaac Newton criticized the ancient Egyptians for the “vanity” of their own calendrical reckoning, which placed the beginning of their monarchy before the existence of the world. As the pre-eminent British archaeologist Colin Renfrew once put it, “For an educated man in the 17th or even the 18th century, any suggestion that the human past extended back further than 6,000 years was a vain and foolish speculation.”

It wasn't long before a series of scientific interventions pried open human prehistory to methodical study. Two great advances of 1859 helped cement the view that 4004 B.C. was not, in fact, the starting point of all human activity. The first was the argument, made by a geologist and an antiquarian, that animal remains found alongside stone tools in Britain and France proved the antiquity of the human race. The second was the publication of Darwin's “On the Origin of Species,” which was incompatible with both the specifics of biblical creationism and the more general proposition that the world was only a few thousand years old. It was all of a sudden widely plausible that stuff in the ground had been there for an unimaginably long time.

Before anyone could even begin to tell an ordered story about what might have happened, however, there needed to be a way to differentiate what happened sooner from what happened later. In the early 20th century, geologists and archaeologists began to draw upon contemporary observations of regular sedimentary deposits to project elementary prehistorical “clocks” backward in time. The end of the last ice age, for example, was set at about 10,000 years ago. Archaeologists then realized that they could cross-reference these geological clocks with the earliest written documents, ancient Egyptian and Mesopotamian records that reached back 4,000 or 5,000 years. If geological time could be roughly calibrated everywhere, and if even a smattering of places had left behind calendars, recorded history could be tied to sedimentary chronology and true dates derived from the ground.

This was heralded as a magnificent advance. The trouble, as it turned out, was that an emphasis on written records from Egypt and the Middle East prompted scholars to take for granted the cultural superiority of those early civilizations and to make major assumptions on that basis — Stonehenge, for example, simply had to have followed the majesty of the Great Pyramids.

In 1949, the invention of radiocarbon dating, by the American physical chemist Willard F. Libby, turned the whole field upside down. By giving cosmically certain dates rather than cross-referenced estimations, radiocarbon dating undermined virtually all of archaeology's basic premises. (Stonehenge could not have been patterned after the Great Pyramids if it was built at the same time as Giza.) There was stubborn resistance to the new lab results. These dates, pronounced one vaunted Edinburgh archaeologist with a now-notorious sniff, are “archaeologically unacceptable.” By the early 1960s, they could no longer be ignored, and a new generation of archaeologists gutted the discipline and rebuilt it with very different assumptions — ones that did not rely on the idea that a few peoples of first-rate culture and pedigree had been responsible for humanity's major steps forward.

If prehistorians had learned one hard lesson from chemists, their colleagues in biology departments were slowly laying the groundwork for another. In 1967, the molecular biologist Allan Wilson at the University of California, Berkeley, along with one of his students, Vincent Sarich, demonstrated that evolutionary relationships between species could be determined not only from fossils but also, via a quantitative analysis of blood proteins, from living specimens. Humans and apes, Wilson found, diverged only five million years ago — far more recently than previously believed.

Within the decade, researchers trained in the discipline of population genetics would get in on the historical act. Every contemporary genome is a mosaic of individual tiles passed along from thousands of ancestors; each of us thus contains not only our “own” ancestry but those of multitudes. With each new generation, random mutations, like misspellings, are introduced into a population; some of these will disappear over time, but others will increase in frequency until they are common enough to become a statistically significant part of a population's genetic signature. If two populations have been distinct for a long time — that is, if people from one don't tend to mate with people from the other — they will share fewer of these mutations; if they encountered each other and were fruitful, their mutation frequencies will overlap. These insights could be made relevant to prehistorians insofar as they could demonstrate that modern human populations were forged in the mixture of ancient ones. It was still mostly impossible, though, to conclude anything about when these groups might have mixed, or where, or how.

The answers to those questions required not just contemporary genetic data but actual prehistoric DNA. The idea that it might be preserved in old specimens has been around since 1984, when Wilson announced that his lab had extracted DNA from the salted skin of a quagga, an extinct equine species with the head of a zebra and the haunches of a donkey. The further possibilities suggested by ancient DNA were awarded a special place in the public imagination by the 1993 release of Steven Spielberg's “Jurassic Park.” But even as the journal *Nature* capitalized on the premiere with a paper that sequenced the DNA of an amber-trapped weevil — a study rendered dubious after widespread speculation that the sample had been contaminated with the researchers' own DNA —

observers wondered whether the sequencing of ancient genomes was just a neat trick or research of actual value.

Over the past few years, a growing cohort of scientists has at last produced a fantastic answer. Ancient DNA, they believe, not only allows us to cut through what scholars once wrote off as “wrapped in a thick fog” of “heathendom.” It promises nothing less than what the Harvard geneticist David Reich has called “the genome revolution in the study of the human past.”

### 3. The Revisionist

David Reich’s lab is folded into a corner of a glassy, long-corridor labyrinth at Harvard Medical School. The only exterior advertisements of the nature of his research are large mounted maps of landforms all around the world. One afternoon last fall, as I stood and examined a continent, Reich materialized beside me. He is a long-limbed man with a lithe, almost balletic figure, and he wore a closefitting pullover and fading coral chinos. Though his hairline has receded and the curls behind his ears are graying, a boyish precocity makes him seem much younger than his 44 years. He led me swiftly past a confab of postdocs and into his windowed office. There was very little in the way of adornment, save a ghostly, truncated branch of the Indo-European language tree (“Greek,” “Armenian”) that someone had sketched out, on the wall over his desk, with what looked like a permanent marker.

In his recent book, Reich ranks the “ancient-DNA revolution” with the invention of the microscope. Ancient DNA, his research suggests, can explain with more certainty and detail than any previous technique the course of human evolution, history and identity — as he puts it in the book’s title, “Who We Are and How We Got Here.” Though Reich works with samples that are thousands or tens of thousands of years old, the phrase “ancient DNA” encompasses any old genetic material that has been heavily degraded, and Reich’s work has been made possible only by a series of technological and procedural advances. Researchers in the field ship or hand-carry the bones to Harvard, where clean-suited technicians expose them to ultraviolet light to prevent contamination, then bore holes in them with dental drills. These skeletal remains are often rare — one pinkie-finger fragment that researchers in a lab in Leipzig used to demonstrate the existence of a long-extinct form of archaic humans was one of only four such bones ever found. Minuscule portions of genetic code are isolated and enriched, then read by expensive sequencers; statistical techniques then plot the relationship between this particular sample and thousands more in enormous data sets.

Reich inherited from his parents a humanistic bent: His mother, Tova, is a novelist of some renown; his father, Walter, is a psychiatrist who was the first director of the United States Holocaust Memorial Museum in Washington. He entered Harvard with an inclination toward social studies, but halfway through, in pursuit of greater rigor, he switched to physics; after graduation, he went to Oxford, where he studied biochemistry with the idea that he might go on to medical school. The impression he gives when talking about these years is one of restless intellectual ambition in search of a commensurate object. He eventually returned to Oxford to complete a doctorate, in zoology, where he at last found a sense of belonging in the lineage of Luca Cavalli-Sforza, a population geneticist who spearheaded efforts to make historical inquiry resemble a hard science.

After abandoning medical school at Harvard for a postdoc at M.I.T., Reich returned to Harvard to establish his own medical-genetics lab. His chief interest lay in the effort to design novel statistical approaches to better explain how populations were related to one another. He showed, for example, on the basis of contemporary genetic data, that modern Indians are in fact a product of two highly distinct groups, one that had been on the subcontinent for thousands of years and another that formed more recently.

He got his first opportunity to study ancient DNA when Svante Paabo — a Swedish geneticist who had worked with Wilson — enlisted Reich in his efforts, based out of a lab in Leipzig, to sequence the entirety of the Neanderthal genome. Reich's analysis helped demonstrate that most living humans, with the general exception of sub-Saharan Africans, have some Neanderthal ancestry. "It was clear with the sequencing of the Neanderthal," Reich told me in his office, "that this was obviously the best data in the world in any type of science." It didn't just tell you that Indians were a mixed group; it could, in theory, specify the moment where and when that mixture began.

So in 2013, Reich, along with a veteran of Paabo's lab and a longtime mathematician collaborator, retooled his shop at Harvard Medical School as one of the country's first dedicated ancient-DNA labs. The idea, he writes in his book, "was to make ancient DNA industrial — to build an American-style genomics factory" that would liberate such fields as archaeology, history and anthropology from hitherto insoluble debates.

He was more successful than even he anticipated. By the end of 2010, only five ancient genomes had been sequenced in total, but in 2014, 38 were done in one year. Soon the number will be close to 2,000. Reich's lab alone is responsible for at least half of the published output, which doesn't include some 5,500 more bones in the process of being analyzed and 3,000 more in storage. "Ancient DNA and the genome revolution," he declares in his book's introductory overture, "can now answer a previously unresolvable question about the deep past: the question of *what happened*."

#### **4. What Happened?**

Everybody pretty much agrees that the story of what happened began in Africa, with the evolution of modern humans; later, as of 50,000 to 100,000 years ago, the human story continued on the other continents. As Reich sees it, the study of ancient DNA has disproved our conjectures about what happened next. One longtime premise is that as these early humans spread out in all directions over the land, groups of them encountered places that struck their fancy, pitched their tents and more or less stayed "home" for the duration of prehistory. This is not just a pet theory of academic prehistorians but the natural way that human beings have tended, over the millenniums, to connect their identities to where they live. The ni-Vanuatu, for example, take for granted their eternal ties to the archipelago; their oral traditions ascribe their origins to some nonhuman feature of the landscape, their first ancestors having emerged from a stone, say, or a coconut tree. Nonindigenous people seek the same rootedness in consumer ancestry services like 23andMe, which declare that they're "Spanish" or "Yoruba."

Reich believes he has proved, to the contrary, that human history is marked not by stasis and purity but by movement and cross-pollination. People who live in a place today often bear no genetic resemblance to people who lived there thousands of years ago, so the



idea that something in your blood makes you meaningfully Spanish is absurd. Paabo had shown that early humans mated with Neanderthals, but that was only one small part of the swirling “admixture” that characterized human interbreeding. Even after the Neanderthals became extinct, roughly 40,000 years ago, the archaic human populations of the earth — Reich gives them names like Ancient North Eurasians — were utterly unlike the populations we see today.

While Paabo continued to work on the Neanderthal period, Reich devoted his energy to obtaining samples from the last 10,000 or so years — the historical domain of archaeologists. Ancient DNA’s “big bang,” as more than one geneticist described it to me, came with the [2015 publication](#), in Nature, of a Reich paper called “Massive Migration From the Steppe Was a Source for Indo-European Languages in Europe.” On the basis of genetic information culled from 69 ancient individuals dug up by collaborating archaeologists in Scandinavia, Western Europe and Russia, the paper argued that Europeans aren’t quite who they thought they were. About 5,000 years ago, a “relatively sudden” mass migration of nomadic herders from the east — the steppes of eastern Ukraine and southern Russia — swept in and almost entirely replaced existing communities of hunter-gatherers and early farmers in Central and Northern Europe. These newcomers were known to exploit many of the cutting-edge technologies of the time: the domestication of horses, the wheel and, perhaps most salient, axes and spearheads of copper. (Their corpses sometimes featured cutting-edge wounds.)

The Reich team inferred that the major source of contemporary European ancestry — and probably Indo-European languages as well — was not, in fact, from Europe but from far to the east. And this discovery, confirmed by the near-simultaneous publication of almost identical results from a competing ancient-DNA lab in Denmark, had monumental implications for science’s understanding of the whole ancient world. Great migration events — like the movement of Siberian peoples into North America or the spread of voyagers into the Pacific — were not outliers but the norm. After Europe and India, there were similar mass migrations identified in Africa, the Middle East and Southeast Asia. No one ever expected that we could possibly amass so much new evidence about the human past. And no one was producing this work at the pace and throughput of David Reich and his genomics factory. Most scientists felt lucky if they published one or at the most two Nature papers in a lifetime. Reich was publishing three or four a year.

There was an obvious pattern to the great migratory arrows freshly drawn across world geography, which were often coincident with the spread of technology or agricultural practices. Earlier paleogenomic results established thousands of years of heady mixture among long-forgotten ancient populations. With the relatively recent rise of everything we associate with “culture” — technologies like agriculture, metallurgy and eventually writing — much of this continuous “admixture” began to give way, it seemed, to discontinuous episodes better characterized as “replacement” or “turnover.” That is, about 5,000 to 9,000 years ago, human history was, at least in a few crucial places, less about various groups coming together and more about some groups blotting out their neighbors.

This was not only relevant as an eccentricity of prehistoric demography, but broadly consequential for the ongoing study of culture itself — of where new ideas come from and how they proliferate. When we thought of populations as stationary and largely stable, we assumed that whatever evolutionary progress they made, from toolmaking to

agriculture, reflected either a native innovation or the incorporation of some adjacent group's avant-garde practice. Now it seemed as though culture was less about the invention and spread of new ideas and more about the mass movements of particular peoples — and the resulting integration, outcompetition or extermination of the communities they overran. Previously, it was possible to think about prehistory as a kind of grand bazaar. Now the operative metaphor (as multiple science journalists observed) was more like Risk, or even “Game of Thrones.”

## 5. Looking for the Lapita

The ancient-DNA revolution seemed unlikely to have anything to say about Oceania, where the heat and humidity made the preservation of DNA implausible. But in 2014, Stuart Bedford got that second surprise call, from a Dublin-based archaeologist named Ron Pinhasi, a frequent Reich collaborator and procurer of samples. Pinhasi had discovered that the inner ear's petrous bone, one of the densest in the body, often preserved vast quantities of genetic material. Could he and Reich examine the skulls of Teouma? In Vanuatu, human remains are often associated with ancestral spirits and are thus taboo — understandably, Bedford emphasized to me, explaining that he wouldn't be comfortable digging up and boring into “Granddad.” But in this case, the ni-Vanuatu expressed no reservations: Local oral traditions contained no sacred reference to the Teouma dead, and Chief Alben gave his blessing. One of Bedford's colleagues opened the skulls in a workshop warren behind the national museum, extracted the nubbins of petrous bone and shipped them to Dublin, where they were sandblasted. There turned out to be DNA in three of the samples. It was the first to be found in the tropics and suggested the opening of wide new fronts in ancient-DNA research.

The skulls of Teouma were particularly interesting to paleogenomicists not only because they produced the first ancient DNA in the Pacific but because their genetic evidence could be brought to bear on an outstanding debate in the region. The pivotal moment in Pacific archaeological history happened in 1952, when a team of researchers found a cache of dentate-stamped pots at a place called Lapita in New Caledonia, a French collectivity to the southwest of Vanuatu. More than 200 sites eventually turned up nearly duplicate versions of this innovation across an enormous span of the region. The pots were often found with particular varieties of preserved plants and nuts, as well as stone adzes. Whoever made those pots some 3,000 years ago had traveled across more than 2,000 miles of ocean — from near Papua New Guinea to Tonga and Samoa — in perhaps as little as 10 generations. As Patrick V. Kirch, the dean of American archaeology in the Pacific, once put it, “Without a doubt, the Lapita colonization of Remote Oceania ranks as one of the great sagas of world prehistory.”

Where had this “Lapita” culture come from, and who were the people associated with it? Over the last 50 years, a collaboration among archaeologists, linguists, botanists, ecologists, geologists and more had produced some form of consensus. A population of early farmers departed from Taiwan about 5,000 years ago, with the help of the newly developed outrigger canoe. They moved down through the Philippines and the Spice Islands, along the northern coasts of New Guinea and eventually out to the Bismarck Archipelago, more or less the limit of Near Oceania; the “tracer dye” for their path was the language family they left behind, one known as Austronesian. Along the way, they encountered populations of “Papuan” — a generic shorthand for highly distinct groups of people who had been in the Papua New Guinea region for 40,000 years. The

interactions between the incoming “Austronesians,” another shorthand for whoever was presumably spreading those languages, and the indigenous Papuans created the constellation of practices that would become known as Lapita. Finally, the people now associated with Lapita sailed into the blankness of the open ocean for the first time, crossing the Remote Oceania divide to Vanuatu and, from there, outward to the farthest reaches of the Pacific.

Archaeologists differed, often bitterly, on the details, but as Reich describes it in his book, the prevailing opinion was that “the Lapita archaeological culture was forged during a period of intense exchange between people ultimately originating in the farming center of China (via Taiwan) and New Guineans.” This certainly made intuitive sense. The people of contemporary Vanuatu are black, like the Papuan people of New Guinea, but they speak Austronesian languages that can ultimately be traced to Asia. Reich believed that the existing consensus was the perfect sort of hypothesis to put to the ancient-DNA test. The Austronesians and the Papuans had been separated by at least 40,000 years of genetic differentiation, which meant that it would be very easy to discriminate by genetic signature. Would the samples taken from the skulls at Teouma show a closer relationship to the people of nearby Papua or the people of distant Asia?

In October 2016, [the paper](#) — with such well-regarded Pacific archaeologists as Stuart Bedford and his mentor, Matthew Spriggs of the Australian National University, among the 31 authors — was published in *Nature* as “Genomic Insights Into the Peopling of the Southwest Pacific.” The analysis of ancient DNA from three 3,000-year-old skulls from Teouma, along with one skull dated a few hundred years later from Tonga, appeared to provide unambiguous confirmation of Lapita heritage. The First Remote Oceanians, as the paper calls them, were not, after all, a heterogeneous group; they were of unmixed Asian descent.

The paper suggested that the old archaeological consensus — that the Lapita advances reflected the joint contributions of Austronesian and Papuan peoples — could be replaced by a much starker story. The genetic record can be more “parsimoniously explained,” the authors remark, by at least two *separate* migrations to Vanuatu: first, the Austronesians, with their East Asian ancestry, and then, hundreds of years later, the Papuans. This wasn’t a story of “admixture” but one of successive waves of migratory “turnover.”

These results were published two years earlier, but as we sat in his silent office, Reich still betrayed some enduring wonder at his revelation. He reminded me that he hadn’t been trained as an archaeologist and had thus come to these debates as an outsider. In the broadest conceptual terms, though, he saw the lessons of this once-enigmatic Lapita migration to be exceedingly profound. “I think the important finding for archaeologists and for historians and sociologists and anthropologists is that this group moved thousands of kilometers over many hundreds of years, through a region occupied by long-established, sophisticated people, and hardly mixed with them.” He observed that “essentially everybody was surprised.” They were surprised, in part, because archaeologists since the 1960s had been trained never to assume the purity or coherence of a people, a slippery slope to the conclusion that certain peoples came by their advantages “naturally.”



But the data seemed indisputable. “Now we can establish that definitively. That’s what this technology allows us to do. And then they” — meaning all those other disciplines, which heretofore had overseen the study of prehistory — “can get on with answering what really matters, which is try to interpret what happened.”

He paused. “But I think that basically everybody, almost without exception — except for very extreme people — is excited about this data in archaeology.”

## **PART II**

### **6. The Storm Beneath the Surface**

The primary characteristic of the deepest reaches of the past, especially for the sort of observer whose paramount concerns are those of the present, is the accommodating silence found there. The quieter an epoch on its own terms, the more loudly it can be made to speak, in the way of a ventriloquist’s dummy, for ours. The study of ancient peoples — or of the “primitive” ones often taken to stand in as their contemporary proxies — has been framed by our preference for simple, just-so stories of origin and trajectory. Archaeologists, who feel as though they learned this lesson long ago, thus survey the rapid rise of ancient DNA with an overwhelming sense of *déjà vu*. By once again giving “migration” pride of place in the story of prehistory, paleogenomics has resurrected some old intellectual ghosts.

By the time radiocarbon dating had come of age, in the postcolonial ferment of the 1960s, archaeology was already primed to relinquish its emphasis on narratives of migration. In the 1910s, a German named Gustaf Kossinna turned his personal fixation on heightened Proto-Germanic Barbarian activity after the fall of Rome into a theory, “settlement archaeology,” that emphasized the glory of the German nation. For Kossinna, a given material culture — a uniformity in pottery style, say — was the index of a coherent people, and it was the destiny of the Germans, greater than even that of the Romans, to extend their superior Aryan culture from their homeland to the ends of the earth. The Nazis were more than happy to put these claims into service, and even academics with better politics became convinced that the driver of human progress was the roving exogenous shock of migratory adventures. As Colin Renfrew described it: “Prehistory was seen as a kind of global chessboard, with the various cultures as pieces shifting from square to square. The task of the archaeologist was simply to plot the moves — or, in other words, trace the path of the ‘influence’ as new ideas were diffused.”

The brutal ramifications of settlement archaeology, when combined with the dramatic introduction of radiocarbon dating, shook the entire discipline to its foundations. The disruption was so major that the profession felt it had to rehabilitate itself as the “New Archaeology.” This new generation of practitioner agreed that just because similar pots were found in various places didn’t mean they were all made by one homogeneous group of people. Instead, archaeologists retreated to a much more modest and fine-comb preoccupation with what they called the “processual”: very particular inquiries into very particular societal dynamics. They paid much closer attention to how individual cultures appeared to change and grow over time and much less attention to how Culture Had Changed — to the fantasy that some special key will unlock the secrets of history. This left a big-picture vacuum that paleogenomicists like Reich have been eager to fill.

The resulting schism has been easy to caricature as the old struggle between hard scientists and humanists — a suspicion of all geneticists as quantitative imperialists, a derision of all archaeologists as sentimental Luddites — but that isn't quite accurate. Many archaeologists are thrilled about the arrival of the first genuinely new form of prehistoric data in generations. The more meaningful division is between two alternate intellectual attitudes: those bewitched by grand historical narratives, who believe that there is something both detailed and definitive to say about the very largest questions, and those who wearily warn that such adventures rarely end well.

Archaeologists shouldn't necessarily care. They remain theoretically free to continue doing things at processual pace, paying thorough attention to historic context and indigenous sensitivities. Even those who are enthusiastic about ancient-DNA research — not only for the new data it provides but for the vigor it has brought to their field — could in principle choose to partner only with geneticists who respect their priorities and expertise; after all, they are the ones who dig the samples out of the ground, and nobody is forcing them to surrender their treasures at gunpoint. Collaborations between geneticists and archaeologists on an even footing have produced well-received studies that plot, say, the family trees in a medieval cemetery.

But in practice, the paleogenomicists have totally altered the environment in which prehistory is being studied by everyone. The landscape is dominated by four well-funded, well-connected labs, three of which — Paabo's in Leipzig, along with those of two of his protégés, Reich at Harvard and Johannes Krause, who runs a newer outfit in the small German city Jena — collaborate closely with one another, to the point that some critics accuse them of collusion. The power of these top labs extends to samples, data and even technology: Proprietary chemical reagents let them isolate and enrich ancient samples much more accurately and cost-effectively than other labs can. One geneticist compared competing with the big labs to battling an entire navy “with a little dinghy, armed with a small knife.” Another told me: “A small lab focusing on a particular site would not be able to place their work in the context of the bigger picture. The only way I can get access to that data is if I give my bone to David or Johannes and wait until they process it — and bury me in the list of contributors to their paper.”

The selective pressure to collaborate with this state-of-the-art oligopoly is extremely strong, not only because of their advantages in funding, speed and operational scale but also because of the relationships they enjoy with the top-tier journals. Publication in a title like *Nature* or *Science* can utterly transform a young scholar's career, enhancing both the prospect of tenure and the ability to secure grant funding. The rush to corner the market on old bones in some “understudied” place or time period has placed a high premium on virtually all samples, creating perverse incentives for researchers to procure these scarce, nonrenewable resources. The only entry fee for a 27th or 53rd author slot in this “free-for-all bonanza of *Nature* papers” (as one geneticist described it to me) is the cost of a bone shipment and a minimal account of its basic archaeological provenance. Multiple researchers told me that it wasn't unusual for junior authors to be given just days to review a finished manuscript, with little input into its broader framing. (Reich, Krause and Paabo all dispute this, saying they couldn't think of any examples in which co-authors were given such a short time to review a manuscript.)

There thus reigns, in the world of ancient DNA, an atmosphere of intense suspicion, anxiety and paranoia, among archaeologists and geneticists alike. In dozens of interviews with practitioners of both disciplines, almost everyone requested anonymity for fear of professional reprisal. Many archaeologists described a “smash and grab” culture in which hopeful co-authors source their bones by any means necessary. Among teams at work on any given excavation, it takes only a single colleague to deliver a bone to one of the industrial giants for the entire group to lose control of their findings. Museums, too, are being swept up by the perverse incentives: One of the geneticists told me stories about having brokered an agreement to sample a particular collection, only to arrive and discover that someone else showed up the previous day to claim the same bones under a false pretense. The weaker the institutions of the country, the harder it is for local researchers to have a fighting chance. Scientists in Turkey and Mexico told me that museum curators routinely had to explain that they had promised their native bone collections elsewhere. As one ancient-DNA researcher in Turkey put it to me, “Certain geneticists see the rest of world as the 19th-century colonialists saw Africa — as raw-material opportunities and nothing else.”

(Reich, Krause and Paabo strenuously denied the characterization of their labs as colluding in a manner that harms competitors. Krause noted that his lab employs students and scientists from 30 nations and supports foreign researchers. Reich commented via email: “The fact that the substantial majority of the world’s human ancient DNA data has been produced by a small number of laboratories is not because of any special access to samples, but rather because of the high quality of work these laboratories deliver.”)

It has not gone unnoticed that the stunning, magisterial sweep of genetic revisionism, on the one hand, and a genetic emphasis on radical prehistoric migrations, on the other, bear more than a little in common. Some anthropologists and archaeologists accept this analogy with gallows humor. One told me that I should model this article after the format of the standard Nature paper: “Ancient DNA Reveals Massive Population Turnovers in the Humanities,” she suggested as a title, and proposed this as an abstract: “The aristocratic lab scientists arrived with their superior technology and displaced the pre-existing researchers and their primitive truth-implements and overcomplicated belief systems.”

Others saw less to laugh at. Some archaeologists who had collaborated on the 2015 paper about Indo-European invasions withdrew their names to protest conclusions they saw as echoes of Kossinna — the mass migrations of advanced Indo-Europeans into Central Europe. (Reich got the critics back on board by adding a note, on Page 138 of their paper’s 141-page supplementary materials, that said their work in fact contradicted Kossinna, not because he was wrong about mass migration but on a technicality: The European ancestral homeland had, in fact, been far to the east, near the Caucasus and nowhere near present-day Germany.) The analogue was hard to counter. Geneticists had indeed swept down from their laboratory enclaves to extend their sovereignty over what had always been the terrain of archaeology. And no single individual had as much influence or power as Reich.

## **7. The Postage-Stamp Problem**

Migration in the Pacific had never been quite as fraught as it was elsewhere; the people had obviously shown up from someplace. Or rather, this had been obvious to outsiders, if

not to the locals. Upon our return from the Teouma overlook, Bedford went off to catch up on village gossip, and I sat with Chief Alben in the shade of a stout, leggy banyan tree, its exposed root system rising from the earth like a half-exhumed skeleton. Alben is a hale and jovial older man with a round paunch and a push-broom mustache. For years, he has participated in a volunteer fieldworker program that trains the ni-Vanuatu to record and preserve their local traditions amid the creep of global monoculture and to pay attention to the sorts of archaeological finds they might otherwise ignore.

I asked him about how the concept of Lapita migration to empty islands had been received by people whose oral traditions said they came from a stone or a coconut tree. After the Teouma find, the national post issued a special commemorative stamp — “Lapita People: The Pacific’s Original Explorers” — with an artist’s recreation of a colonial Eden that showed men and women, drawn black to resemble the ni-Vanuatu, cleaning fish and making camp, and Bedford printed pamphlets for schoolchildren that explained that the Lapita were the grandfathers of grandfathers of grandfathers. Now Reich’s research had raised the prospect that they bore not even a passing resemblance to Vanuatu’s earliest settlers.

In the wake of the initial discoveries at Teouma, Alben replied, he explained to his villagers that there was nothing surprising in the fact that the grandfathers of grandfathers of grandfathers had once come from someplace else. “Our *kastom* teaches us that people moved from place to place to place,” he told me. *Kastom* is an expansive concept that includes tradition, history, land rights and social norms; local *kastom* varies tremendously across the more than 80 islands of Vanuatu, but the notion itself has become sacrosanct for the continuity and authority it provided in the aftermath of colonial occupation.

Alben told me he had been stymied by the practicalities, though. “Maybe these Lapita people came from Asia! How? How?! How can these people come here?”

He waited for me to answer, but it wasn’t clear what he meant; I shrugged and ventured a timid, “Canoe?”

He shook with laughter at such a painfully obvious answer. His question was not about what they used to cross the water but how they founded a way of life that endured until today. “They took the coconut” — he pointed off to his left — “and they took the breadfruit” — he pointed off to his right — “and they put it into the canoe. When the canoe lands, they plant.” The people, in other words, were tied to the land by what they had brought with them. On the road out of Port-Vila, I’d made an idle remark to Bedford about the primeval greenery around us; he corrected me to say that what looked like jungle was actually under heavy cultivation.

The ni-Vanuatu were not accustomed to thinking about history for its own sake, instead expecting that any story you told about the past necessarily gave form and guidance to the present. If *kastom* told you that your people came from a stone near the lagoon, that was relevant for ongoing disputes about who now deserved to till that land. The idea that in some abstract, scientific way they were “really” from somewhere else didn’t mean anything unless there was a direct contemporary moral.

They did know, however, that what had often been presented to them as abstract scientific knowledge routinely concealed some practical agenda. The first European

explorers in the region, even if they weren't quite so forthrightly instrumental about it, also interpreted the history of the South Seas to suit their own contemporary concerns — both imperial and philosophical. Pacific Islanders, marooned in what were seen as the natural laboratories of primal isolation, were enlisted as the “noble savages” of Enlightenment fantasy. The question of who they were and where they had come from became lively topics. Some ventured that they were refugees from the Lost Continent of Mu. Others tried to classify them in a way that would accord with their own pet-scientific notions of cultural evolution. The French explorer Dumont d'Urville, who first sighted Vanuatu in the 1820s, proposed a tripartite scheme that unfortunately endured: There were the Polynesians (“many islands”), the lighter-skinned people who inhabited an enormous triangle of the Eastern Pacific bounded by Hawaii, New Zealand and Easter Island; the Micronesians (“small islands”), who lived on the atolls of the Western Pacific north of the Equator; and, always finally, the Melanesians (“dark islands”), the dark-skinned people east of New Guinea who spanned the divide between Near and Remote Oceania. Europeans fixated on the differences between the Melanesians and the Polynesians, imagining the Polynesians as a kind of laggard aristocracy, comparable to the ancient Greeks, and the Melanesians as naturally backward black people.

And so, when it came to the question of how ancient peoples had populated the Pacific, the most persistent proposals rested on racial typologies. The Melanesians obviously came from in and around Papua, which was relatively nearby and inhabited by “savage” black people, whereas the lighter-skinned and more “advanced” Polynesians probably sojourned via heroic open-sea navigation from Asia. Anything “superior” — technology or social structure — was linked to the migratory intervention of exceptional groups from distant shores. The European colonial enterprise was thus justified as part of the natural relationship of incoming enlightenment and indigenous savagery.

The ni-Vanuatu are not unaware of the region's racialized history, or of its racialized present. As Bedford and I drove back to town, the only visible graffiti was a reminder of regional Melanesian pride: “Free West Papua,” a show of racial solidarity with the black residents of the western half of New Guinea, a persecuted colonial possession of Indonesia since the early 1960s. A new sort of colonial anxiety, meanwhile, is manifesting itself about the Chinese, who have been investing heavily in the country. The old shops on Port-Vila's main harborside drag have been replaced by cheap Chinese joints hawking souvenir ukuleles, and the new luxury-condominium developments above downtown advertise “Hong Kong Apartment-Style Life” over images of white and Asian people in infinity pools.

Bedford and his archaeologist colleagues on Vanuatu are known for their long tenure in the country and their keen acquaintance with local sensitivities, and it was only on their bond that the Teouma petrous bones were sent abroad for sandblasting. Now their names were on a genetics paper arguing that the ni-Vanuatu's ancestors were not Lapita after all, but latecomers to an archipelago first settled by purely Asian expeditions.

## **8. The Ghosts of Peer Review**

As it happens, this radical claim was not as definitively accepted as the published paper seemed to show: Serious challenges to its soundness were laid out during Nature's peer-review process. And yet, in a highly unusual move, the paper was accepted over steadfast opposition from two of the three original peer reviewers on its anonymous panel.



Confidential documents made available to me reveal deep concerns with the paper's methods and its conclusions.

Among the two objecting reviewers, the methodological critiques — both on the level of archaeological context and that of data analysis — were paramount. “It seems to me that a significant question,” Reviewer Two writes, “is whether these individuals were actually ‘Lapita people,’ assuming that such a thing exists.” The paper listed six of the nine skulls found at Teouma, though the team had only successfully extracted ancient DNA from three of them. “In addition,” Reviewer Two continues, “it seems clear that these skulls were not related to the 100+ individuals excavated from the Teouma site. That is, the skulls do not fit the bodies. Clearly there was a complex set of traditions around these burials including decapitation at some time before or after initial burial. I am curious as to whether these skulls might have been kept by relatives and only later (perhaps much later) (re)buried at Teouma,” a tradition among some indigenous groups.

Even if the skulls were the same age as the rest of the bones at the cemetery, there was still the matter of how oddly they had been interred — one inside a jar, the others arrayed like a shield across another skeleton's chest. “This seems to suggest,” Reviewer Two adds, “that the three people were special in some way. Hence I am concerned about drawing too many conclusions from such a small number of individuals plus individuals who were certainly not a random sample of the population.” Shouldn't the collaborating archaeologists have pointed all this out?

The study's authors, the objecting reviewers insist, had made disproportionate or even wholly unwarranted claims on the basis of both the archaeological and genetic evidence they had provided. Yes, the Teouma skulls came from an important site, and yes, the new data they provided was a fascinating additional piece of evidence. But they still just represented three samples from one site on one island, and the objecting reviewers noted that Reich's inferences could have been skewed by what one of them called “bias in the method” — the set of assumptions necessitated by his complex statistical models. Meanwhile, the contemporary samples they used for historical comparison weren't even from Vanuatu, but from potentially unrelated regional communities used as proxies. “In my opinion,” Reviewer Three wrote, “this paper does not merit a significant advancement over current studies and the lack of detail regarding basic data description is frustrating.”

The paper's purchase on significance, then, seemed to have less to do with its originality than with its certainty. The title of the first submission was “Ancient DNA Documents Multiple Human Migrations Into the South Pacific,” and it presumed to offer the final word on the history and ancestry of an entire region. Three contemporaneous samples might be sufficient for a modest paper about the Teouma site, but modest papers about one archaeological site in Vanuatu are not the sort of thing Nature is in the business of publishing. “In the light of these various comments,” an editor wrote to the reviewers, “we have declined publication of this study.” There is a clear distinction, at Nature and elsewhere, between a rejection and a call to revise and resubmit. “Rejection means rejection,” one geneticist told me, “and rejection is final.”

Yet the Reich team proceeded to revise. They were aided in this by their colleagues at the Max Planck Institute for the Science of Human History, in Jena. Its director of archaeogenetics, Johannes Krause, had worked alongside Reich in Paabo's lab. When the

Jena team heard that the Oceania paper had been found wanting for further regional samples — samples that would allow them to expand their claims beyond simply Vanuatu — one doctoral candidate remembered that their inventory contained a stray petrous bone from a site in Tonga, one already found to contain readable DNA. It was, fortuitously, highly relevant to Reich’s Oceania work, and the data was forwarded along in due course.

On the basis of this single additional ancient bone, the Reich lab resubmitted their paper, and a fourth reviewer was added to the panel. The revision addressed very few of the objecting reviewers’ concerns, and the changes it did provide struck those reviewers — who were asked, to their surprise, to review the revision — as perfunctory and weak. “The analysis and data generation presented herein, in my opinion,” Reviewer Three ultimately concluded, “simply does not merit a Nature-level manuscript.” Nevertheless, the paper was accepted.

When pressed about the peer-review process, Reich told me his reply to the initial round of concerns had been “the most robust, powerful, compelling response we’ve ever given to a set of reviews. We completely answered absolutely every question very robustly; there was not a single point in those Reviewer Two and Three comments that had any validity and that we were not able to fully and powerfully answer.” When I noted that the objecting reviewers had not been convinced by their counterarguments, he said: “The fact that a person who sends a review doesn’t feel like their arguments have been answered doesn’t mean that they haven’t been answered. I felt that those reviews were not compelling reviews, didn’t make sense, didn’t take into account the actual evidence that we had brought to bear properly and were completely addressed by our response, and the journal agreed.”

He acknowledged that it was rare for journal editors to overrule their referees. “This was a case where the reviewers were making egregious errors,” Reich said. “These were problematic reviews that should have been discounted because of their problematic nature, and we were able to successfully make that case on very good grounds, and the editor agreed with that in the course of the review process. And it’s a very rare thing.” (A spokesperson for Nature said in a statement, “For confidentiality reasons, we cannot discuss the editorial history or review process of any Nature paper with anyone other than the authors.”)

At the end of our conversation, Reich returned to his Vanuatu effort, waxing unsolicitedly about his personal attachment to the finding. “That paper is such an important paper. It’s such an important observation, such an important measurement — it’s exactly the type of thing that needs to be published in that type of journal. It’s in the class of an unrejectable paper.”

## **9. The Seductions of ‘Migration’**

In Reich’s view, quibbles about which skull did or did not fit which skeleton in an ancient tropical cemetery in a land he had never visited were entirely beside the point. He was doing large-scale, broad-brush work, and it was up to the archaeologists to add their fine filigree of detail. Even if you accepted the paper’s broad-brush results, however, most archaeologists find this distinction misleading. The problem wasn’t that he was explaining too much on the basis of too little, but that he wasn’t ultimately explaining

anything at all; it was all well and good to put “migration” back on the table, but the concept itself did little to clarify what was actually going on. For example, it was still a mystery that secondary Papuan migrants had replaced the original settlers but somehow adopted their Austronesian language.

The Jena outfit, evenly split between geneticists, archaeologists and linguists, was set up to address questions of this order, in studies designed to include each discipline’s contributors as full partners. The edifice itself is an architectural bricolage, a vaguely Bauhaus-inspired white building conjoined via metal tube to a stately 19th-century villa. The head of the institute’s department of linguistic and cultural evolution had decided that his team’s flagship project would be a fine-grained 10-year investigation of the “Galápagos of language evolution” that made Vanuatu a “microcosm of all those forces that have generated human diversity.”

A young Irish anthropologist, Heidi Colleran, was brought on to help lead the relevant ethnographic field research; just before she left, she and her partner, a British population geneticist named Adam Powell (who also happened to be her collaborator on the project), were asked if they might try to collect spit from the groups she planned to work with, for the purposes of a proper contemporary baseline. Reich had used other modern Oceanic groups as rough proxies in part because no one imagined that any ni-Vanuatu would ever assent to such a study. Stuart Bedford, who had been brought in on the Jena project, believed that it wouldn’t happen in a million years. If outsiders said that spit held secrets about the past, the ni-Vanuatu might worry that those secrets — if these foreigners said they were “actually” from elsewhere, indeed latecomers to their own nation — could nullify their rights to the land. After the publication of Reich’s paper, the indigenous Kanaks of “neighboring” New Caledonia declared a three-year moratorium on any genetic research, for fear that their limited sovereignty might be undermined.

The Jena team sought the ethical oversight of an institutional review board. Once in Vanuatu, Colleran, along with Powell and Kaitip Kami, the curator at the national museum, pitched their project as a way for villagers to understand where they fit in the family tree of the Pacific; they also promised that, in accordance with best ethical practices, they would return to present the results to the participant communities. To their great delight, they were deluged with willing volunteers. Over the next year, the researchers back in Jena put these results together with data they had retrieved from 19 new ancient samples; after a review period of six weeks, [their paper](#) appeared in *Nature Ecology & Evolution* on Feb. 27, 2018.

While so much of Reich’s work has conjured the notion of sweeping, wholesale replacements by one population of another, the Jena paper proposed instead a much more gradual process. Their samples demonstrated not a single decisive turnover event but at least 500 years of ongoing traffic between Papuans and Austronesians — plenty of time to explain how the former had managed to pick up the latter’s languages, for one thing. Whatever happened in that period was clearly complex, but it seemed to them inaccurate to describe it as the one-off snuffing out of one group by another. “The idea that one day there were tons of people in canoes,” Krause told me when I met him in Jena, “that’s not how we should see it.” What Reich was wont to attribute to simple “migration” was just a restatement of the problem of what happened. The actual causal mechanism could have been malaria, or warfare, or volcanic activity, or some competitive advantage in agriculture.



A thought experiment might help to illustrate this. Imagine that the written history of our current era were lost to time, and paleogenomicists of the future were trying to explain the peopling of North America on the basis of a few bones that dated from between the 16th and 20th centuries. If these bones included the descendants of British, Spanish and French colonists as well as those of Yoruba slaves, the researchers might conclude that European migrants arrived together with African migrants and that their “sex-biased admixture” created the people known henceforth as Americans. From our perspective, those geneticists wouldn’t exactly be wrong about all this — but nobody would accuse them of being right, either.

There’s no particularly good reason to believe that the past was significantly simpler than the present, and archaeologists have come to believe that the more digging they do, the more complexity they uncover. It makes sense that they would resist simple explanations. From Reich’s perspective, this archaeological truculence represents a stubborn attachment to the old, complicated stories in the face of new molecular data — just as some archaeologists held fast to their tall tales despite what Renfrew called the “mysterious boffinry” of radiocarbon dating. The analogy, however, doesn’t quite work. This time the scientists have arrived with their advanced technologies not to dismantle theories of coherent “cultures” who “migrated” from “homelands” but to revive them — without any disciplinary memory of the traps involved or the stakes of failure.

Over the course of 2017, Reich was working on his own competing follow-up, though by the time the Jena team submitted its completed paper to journals he had barely begun to compose his own. (Reich, who told me he could not remember the specific timeline, said, “The whole analysis was mature; we basically had the key findings already — we were just slow in writing it up, because we were overextended.”) The two labs had briefly contemplated collaborating, but in May 2017, the Jena team vetoed the idea, one of its leaders told me, because Reich wanted too much control. So the projects advanced separately. Reich tried unsuccessfully to get contemporary ni-Vanuatu spit from other researchers until he learned of some blood samples, drawn decades ago by medical researchers and now held in trust at a repository at Oxford. The Reich team obtained permission to resequence the old samples for their own purposes — even though in gray-area cases like these it is never at all clear who holds the authority to retroactively license the use of vital fluids taken when ethical protocols were considerably more lax. He also had 11 new “ancient” samples, though six of them were from only about 150 years ago.

Reich submitted his manuscript to the journal *Current Biology* on the same day that Jena’s paper was accepted by *Nature Ecology & Evolution*. One week later, on Feb. 19, [the paper](#) was accepted and given an online publication date of Feb. 28 — one day after the online publication date the Jena team had been given. Peer review and acceptance of a paper in a week was in itself an unprecedented feat; not a single person I talked to in the field could think of a similar case. Reich conceded that it was uncommon. “It was the fastest review we ever had,” he told me, “but it was actually a very high-quality review. It was better than most reviews we got. It was actually a serious review, a very serious review.” Some other geneticists doubted it; one said to me: “There’s no way there’s proper peer review there. That’s an egregious violation of scientific norms.” (“The Reich paper was properly reviewed by three relevant experts, all of whom recommended publication with minor requests for revision,” the *Current Biology* editor in chief, Geoffrey North, said in an emailed statement, crediting the turnaround to reviewers who

made the paper a priority.) Even so, publication on successive days was apparently not a satisfactory outcome. On Feb. 19, Reich's paper appeared in [preprint form on the web](#), eight days before the Jena effort came out.

While the Jena samples showed at least 500 years of Austronesian-Papuan mixture, Reich's follow-up argued — on the basis of a single sample from a single island — that the First Remote Oceanians had been replaced by at least one wave of belated Papuans. Otherwise, the paper had little to add. Reich had, however, updated his analysis of the original skulls with improved, “higher-resolution” statistical techniques. One new data point, which Reich saw as a refinement, struck some critics as a significant revision: While Reich emphasized to me in his office that the first paper conclusively demonstrated no mixture between the Austronesians and the people they encountered, the updated analysis showed that Teouma's “Lapita individuals had a nonzero proportion of Papuan-related ancestry.” It “remains striking,” the new paper remarked, that these first migrants were only “minimally admixed” — but admixed they were.

### 10. The Archaeologist's Dilemma

Day's end in Port-Vila is colored by the process of selecting which kava bar to patronize; each imports its kava from a different island, and friendly arguments about kava strength and quality are common. On our return from Teouma, Bedford and I met up with an extended crew from the national museum for kava grown on the volcanic slopes of the northern island of Ambae, where an eruption threatened to stop shipments. Kava is a cloudy green tonic, served in little miso bowls meant to resemble coconut shells. The custom is to collect your shell, retire alone to the cover of a nearby shadow, take the entirety at one draft and then spit the particulate remnants; by nightfall, when even the city is blanketed in thick dark, the only regular sounds are the screech of the fruit bat and the hock of spit.

I sat in the dark next to Frederique Valentin, a French bioarchaeologist who was an author on Reich's original Vanuatu paper; it was she who made the final contribution that rescued the effort, the Tongan petrous bone. As it turns out, in 2015 she submitted a manuscript to Nature that made an almost identical argument to Reich's. She had reached the same conclusions upon examination of the cranial morphology of the exact same skulls, which she believed more closely resembled those of Asians than those of Papuans. But her paper was rejected by Nature. As far as she or many others could tell, the only difference between her conclusions and Reich's were those of methods — hers old, theirs shiny and new — and rhetorical grandeur. I asked if she thought that Reich's definitive statements about Lapita origins were warranted.

“A small sample,” she replied, “is only representative of itself.”

The controversy over paleogenomics was becoming a near-ubiquitous presence in archaeology journals, and Bedford, as an author on all three Vanuatu papers, had recently written the introduction to [an academic forum on the subject](#), in the journal *Archaeology in Oceania*. The evident differences between the two competing follow-ups put him in a bit of a bind, because his name was on both of them. “Both papers,” Bedford maintained, “arrive at a similar conclusion,” that initial Austronesian settlement was followed by a Papuan gene flow. But as the introduction continued, it became increasingly clear that he could not, in fact, at all believe that both could be right, and he tipped his hand in favor

of the Jena paper, with its emphasis on an “incremental and complex” process that accorded much better with the artifactual record as he had spent his career understanding it.

The contradictions of Bedford’s introduction — in which he said that both papers could be right but that the complicated one was probably more right than the simplistic one — felt less like an equivocation than it did a form of subtle apology. As one contributor to Bedford’s forum observed, archaeologists had told the ni-Vanuatu for decades that they were the descendants of the Lapita voyagers; now they had to go back and advise them to alter the commemorative postage stamps to feature not black people but Taiwanese aboriginals. A national self-image was not something to take lightly. “One can only feel,” one forum contributor wrote, “a collective sense of betrayal in all of this.”

Some critics believed that any association with Reich represented a betrayal, too, not only of the ni-Vanuatu but of anyone who believed that culture was as powerful a human determinant as the gene. Shortly before the publication of his book, Reich wrote an [Op-Ed in The New York Times](#) in which he warned that the future was likely to demonstrate some meaningful genetic differences among populations and that we needed to be honest about such truths, lest they be abused by racist pseudoscience. He was careful to differentiate the idea of a genetic population from the old idea of race, which he agreed was a social rather than biological fact. But he nonetheless gave comfort to those who maintain that on the deepest of all levels our destiny is written into our genetic signature. It was hard not to see that conviction reflected in the findings of Reich’s papers, which seemed to blithely recapitulate discredited theories of Pacific expansion, making categorical claims not only about four individual skulls but about the shape of human history — claims that were essentially indistinguishable from the racialized notions of the swashbuckling imperial era.

Younger scholars who don’t think that the big, powerful labs are exhibiting proper respect, sensitivity and historical consciousness — including anthropologists like Heidi Colleran, who went to great lengths for ni-Vanuatu spit — are thus put into impossible positions of tragic compromise; they face the decision to spend their careers as access mercenaries, to work with smaller outfits that get pushed aside or scooped, or to get out of the field entirely. As Colleran would put it to me later: “When any fieldworker talks to collaborating communities in the field, they are putting their professional and personal integrity on the line, their own legitimacy, often in a completely different line of work, for these samples. And once they are out of your hands, you have very little control. That’s a gamble for anyone doing long-term fieldwork.” She expressed reluctance to take part in any future studies in which the paleogenomicists alone set the pace. Her population-geneticist partner, Adam Powell, feels the same way. “I really wanted for us to do things differently,” he told me, “but didn’t think it would be this hard. I’m now going to focus my energies elsewhere.”

The day after our night out at the kava bar, Colleran booked us on an Air Vanuatu flight to the northern island of Malekula to visit a remote village called Alpalak, which was roughly translated for me as “the place where if you go you will definitely die.” There she introduced me to Chief Jimmyson Sanhambath, who sat and drank kava with me in the shifting shadows of a mango tree, heavy with unripe fruit. Sanhambath is an exceptionally vital man in his late 50s, with a slender, wiry physique, a thickly corded neck, and a long, smooth forehead and sharply angled jaws knitted together by a trim

graying mustache. Asked about the spit that his people had given Colleran, he told me he had come to believe that there couldn't be anything in it; spit evaporates to nothing, after all. He admired Colleran and didn't want to trifle with her work, he insisted, but he continued with a mischievous grin, "They must just be making it up."

The next day, he took us through bamboo thickets to see some of the oldest cave art in the region. We crouched down through a dark opening, followed a short slope and emerged into a large, well-lit chamber; a single banyan had snaked its way up and through a skylight opening high above. As we passed into the midday twilight of the rear of the chamber, Sanhambath pointed out dark handprints of a mossy jade color high up on the smooth walls. Nearby were crisp figures with the heads of dogs and pigs and the bodies of men; they wore unmistakable versions of the penis sheaths associated even today with Sanhambath's community.

Archaeologists said they were made by men who ate charcoal, chewed it up and spat it back onto the walls. The oldest dated back 2,600 years and looked at once hauntingly archaic and vividly recent. "They're not Lapita," Sanhambath said, gesturing at the drawings, which had been dated by radiocarbon to shortly after the Lapita period ended. "But so what?" Besides, as much faith as he had in what the archaeologists said about pottery or bones, he just couldn't bring himself to believe them when they said these paintings were made by ancient men.

"These paintings," he said quietly in the cave dark, "were made by the spirits."

**Correction:** Jan. 25, 2019

An earlier version of this article misstated the number of peer reviewers who evaluated the 2016 Nature paper "Genomic Insights Into the Peopling of the Southwest Pacific" before publication. It was four, not three; a fourth reviewer was added to evaluate the paper after the original submission was revised. The article also misstated the geographical area where migrants from the steppes of eastern Ukraine and southern Russia significantly replaced existing communities of hunter-gatherers and early farmers, as reported in an academic paper on the migration. It was Central and Northern Europe, not the entire continent.

Gideon Lewis-Kraus is a writer at large for the magazine. His last feature story was about a [private-jet dealer](#).

Please visit the site: [https://www.nytimes.com/2019/01/17/magazine/ancient-dna-paleogenomics.html?mc=adintl&ad-keywords=IntlAudDev&subid1=TAFI&fbclid=IwAR2pfjEoM299j\\_PESJyFp63Pgjc183T4FpMaJRd1ynMwGNY\\_No7iCgEeZi0&dclid=CP2vuvO3reECFRmC3godMV8Abw](https://www.nytimes.com/2019/01/17/magazine/ancient-dna-paleogenomics.html?mc=adintl&ad-keywords=IntlAudDev&subid1=TAFI&fbclid=IwAR2pfjEoM299j_PESJyFp63Pgjc183T4FpMaJRd1ynMwGNY_No7iCgEeZi0&dclid=CP2vuvO3reECFRmC3godMV8Abw)