

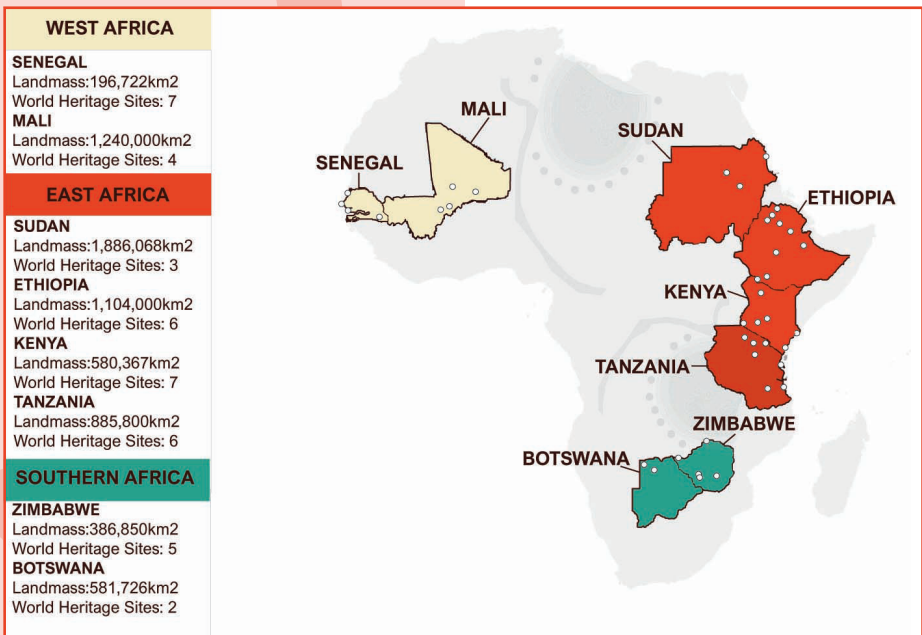
EDITORIAL

Professor Paul Lane, MAEASaM Principal Investigator, introduces the project and discusses the global significance of Africa's archaeology.

Africa, covering c. 30 million square kilometres, has the longest archaeological record of any of the continents. It was where our hominid ancestors evolved and our species originated, leaving material traces of the human story spanning over three million years. Ensuing millennia witnessed countless inventions, innovations and adaptations to the continent's diverse and changing physical and cultural environments, generating an exceptionally rich, complex, and fascinating body of evidence of human ingenuity and resilience. The global significance of the continent's archaeology, and the potential for researchers to combine multiple lines of supplementary evidence to enhance their interpretations of these material traces, is increasingly recognised, and archaeological research by African scholars and their international partners is flourishing.

Disseminating research insights

The insights this research has generated on Africa's deep past and its comparative value for understanding the origins of our species and symbolic behaviour, the evolution of hunting-gathering-fishing societies, the origins and spread of livestock herding and farming, metallurgy, urbanism, complex socio-political systems, transoceanic trade, and—many other topics—should be celebrated and more widely popularised. The rapid growth in the use of social media and access to the internet in the last few decades offers an excellent opportunity to do this, especially if this information can



Above: MAEASaM's eight partner countries and their associated World Heritage Properties.

be made publicly accessible via an open access platform. As public understanding of the continent's rich heritage grows so will the levels of care and protection it is given.

Enhancing public and professional knowledge

The need to raise awareness is becoming more urgent as the continent's archaeological heritage is currently facing escalating threats from multiple factors. These include rapid unmonitored urban expansion, large-scale agricultural intensification, oil, gas and mineral extraction, and other major infrastructure projects. Growing impacts of rapid climate change, inter-community violence and international terrorism, and in some cases, deliberate destruction of sites for ideological purposes pose additional threats. Concurrent with this, before the global pandemic caused by the SARS-CoV-2 virus, a great many African economies were experiencing significant *(continued on p.2)*

SNEAK PEEK

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Going Digital Workshop, 24 May 2021

(continued from p.1) economic growth fuelled in part by foreign investment leading to large-scale landscape change often without sufficient archaeological assessment.

All of these factors make it of paramount importance to enhance both public and professional knowledge of the continent's archaeology and access to reliable, up-to-date information about its condition and threats.

Compiling and collating information on Africa's archaeological heritage

With generous funding from the Arcadia Foundation for an initial three-year pilot project, and as a response to these diverse challenges, the Mapping Africa's Endangered Archaeological Sites and Monuments (MAEASaM) project aims to identify and document endangered archaeological heritage sites across Africa. Coordinated by a team at the University of Cambridge, and assisted by project partners in Africa, Sweden and the UK – at the Université Cheikh Anta Diop (Dakar), University of the Witwatersrand (Johannesburg), the British Institute in Eastern Africa (Nairobi), the University of York, University of Exeter and Institute of Archaeology, UCL, and Uppsala University – the project is using a combination of remote sensing, records-based research, and selective archaeological surveys to compile and collate information on the continent's diverse archaeological heritage.

Launched in September 2020, the project is currently working in eight African countries (Mali, Senegal, Sudan, Ethiopia, Kenya, Tanzania, Zimbabwe, and Botswana) in collaboration with national authorities and other research groups in these countries. The primary output will be a geo-referenced database of the continent's archaeological sites and monuments developed in an Open Access format using the [Arches Project platform](#), tailored for different interest groups and stakeholders. Past, present, and potential future

threats to these sites will be identified and assessed, and approaches to enhancing long-term site protection measures and new management policies will be developed with the project's Africa-based partners and collaborators.

The project aims to ensure long-term sustainability of the mapping and monitoring components through targeted training of in-country collaborators and other heritage stakeholders. Working with national authorities, local archaeologists and heritage managers, sustainable Sites and Monuments registers will be established, providing a resource for researchers and heritage professionals alike.

Professor P.J. Lane

Jennifer Ward Oppenheimer
Professor of the Deep History & Archaeology of Africa

MAEASaM Project Principal Investigator

Department of Archaeology
University of Cambridge

Building Resiliency in African Heritage Management

An interview with Dr Webber Ndoro, Director General of the [International Centre for the Study of the Preservation and Restoration of Cultural Property \(ICCROM\)](#)

We asked Dr Webber Ndoro, one of the MAEASaM project's advisors, to give his perspective on the importance of heritage in Africa today and the role of ICCROM in supporting its preservation.

Q. ICCROM's mission is to provide its member states with the best tools, knowledge, skills and enabling environment to preserve cultural heritage in all its forms, for the benefit of all people. How does ICCROM approach this?

Over the last two decades, ICCROM has developed and implemented many capacity-building initiatives and field projects in various regions of the world. In 2020 we initiated a new programme for Africa: Youth Heritage Africa. This is driven through three key objectives: first, to engage Africa's youth in caring for heritage including its conservation, resilience, management, and promotion; second, to mainstream sustainable entrepreneurship opportunities within the heritage sector; and third, to engage and strengthen



heritage institutions to develop sustainable, resilient, and innovative use of heritage for education, development, and peace.

In all its training courses, ICCROM foregrounds people-centred approaches and recognises the effects of heritage on the well-being of communities. Heritage is no longer just for professionals, conservators, archaeologists, and architects. It is also for communities. For example, our interest in heritage is not just for those who stay at sites, but also for those who may be affected by the heritage itself. In Africa, the saying goes: nothing about us without us. Heritage affects all aspects of our lives and contributes to the well-be-

ing of society. The current global pandemic and the impacts of climate change only serve to underline this.

Q. How do you see the MAEASaM project contributing to the development of professional tools for archaeological documentation and site risk assessments in Africa?

The project's purpose to document the archaeological heritage will in turn enable institutions in Africa to provide the necessary protection and promotion of archaeological heritage. Digitisation makes the information available to planners, educators and those who might want to promote it. The documentation will also ensure that the legal instruments on heritage provide protection to those sites and monuments identified.

Q. In your view, what makes a heritage project sustainable in Africa?

The simple answer is when the project is owned by the local institutions, whose professionals determine the objectives and trustworthiness of the project's activities. This local involvement in critical areas of the project is key. The institutes of education must also play a role in developing capacities.

// We must engage and strengthen heritage institutions to develop the sustainable, resilient, and innovative use of heritage for education, development, and peace. //

— ICCROM Africa

◎ ADVISORY BOARD

The MAEASaM project does not sit alone. It is supported and guided by an international Advisory Board whose members are experts in the fields of African archaeology, cultural heritage, geoinformatics, and digital database design, and who come together from multiple industries, backgrounds, and countries to form an integral part of the project.

- **Dr Robert Bewley,**
Former Director of the Endangered Archaeology in the Middle East and North Africa (EAMENA) project
- **Professor Serena Coetzee,**
Professor of Geoinformatics, Head of School, University of Pretoria
- **Professor Anne Haour,**
Professor in the Arts and Archaeology of Africa, University of East Anglia
- **Dr Webber Ndoro,**
Director General of ICCROM
- **Professor Akin Ogundiran,**
Professor of Africana Studies, Department of Anthropology and History, University of North Carolina
- **Professor Julian Richards,**
Professor of Archaeology and Director of the Archaeology Data Service, University of York
- **Professor Intisar Soghrayhoun el-Zein,**
Professor of Archaeology, University of Khartoum and Minister of Higher Education, Sudan
- **Chao Tayiana,**
Co-founder of African Digital Heritage, Museum of British Colonialism, Nairobi

◎ Managing Archaeological Data

Why the project chose the Arches database platform

As the primary users, Africa's heritage stakeholders have an essential role in how the MAEASaM database develops, making it important to choose a freely available, flexible platform and to tailor-make the solutions. Mahmoud Abdelrazak, the project's database developer, provides some thoughts on the opportunities and challenges afforded by the technology.

Recording data about archaeological sites is a complex task. As well as the need to reduce natural and continuous attributes to quantifiable and standardised measures, the very nature of sites introduces ambiguities and uncertainties. A site's spatial boundaries are often difficult to define and represent on digital systems. To confound things further, archaeological sites

carry ambiguous attributes such as chronology and type of classification. Conceptualising and representing sites in a digital database therefore requires careful consideration.

The choice of a database technology is informed by the technical requirements for the project, and the nature of data and the people who will make use of the system. [Findability](#), [Accessibility](#), [Interoperability](#) and [Reuse](#) (FAIR) data management principles impose certain requirements, while the need to standardise the data model and ensure its sustainability requires standard ontologies in archiving, such as [CIDOC-CRM](#). Additionally, if a database is to be used across different countries, as is the case of the MAEASaM project, Thesauri are needed to define terms that may be applied differently, and in more than one language. A cascading Thesaurus can help in creating a common understanding of the heritage data.

Choosing Arches

[Arches](#) fits our purpose. Developed by the Getty Institute as a free software, licensed under the terms of the GNU Affero General Public License, Arches provides an easy to use and clean interface to the user whilst maintaining complex data and functions on the backend. Arches uses PostgreSQL to build a graph database instance and Elasticsearch as a search engine on top of the database for rapid query response. It supports the use of ontologies and Thesauri for data modelling and data quality control respectively.

Right: The main interface of Arches is a map with a side bar containing search results. The interface allows researchers access to the data stored in an organised manner. The security module built in Arches allows the system administrator to limit access to the data for each user or group of users, which can be employed to regulate access to certain sites of sensitive location and possible threats.

○ Africa's Spatial Revolution

The role of remote sensing technologies

The MAEASaM project will use remote sensing to identify yet-to-be found archaeological sites, to assess and monitor the preservation conditions and susceptibility to threats of new and known sites, and to predict future threats for heritage management planning. The MAEASaM Remote Sensing Working Group discuss the value of this approach.

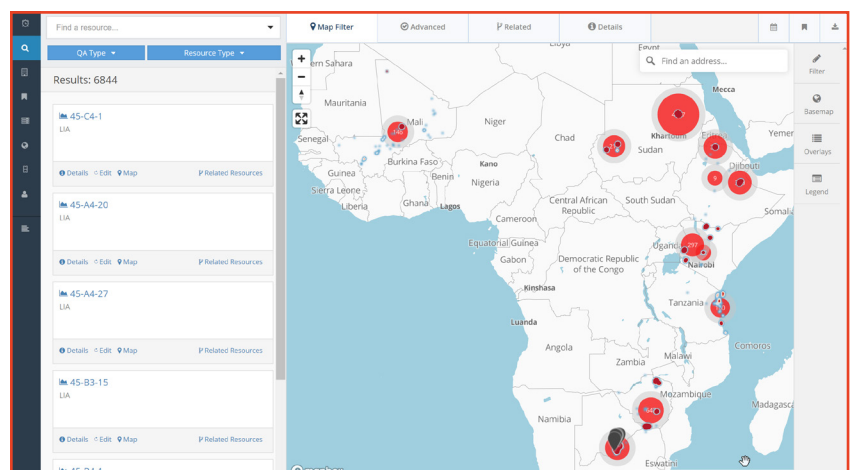
Remote sensing is the science, the technology and the art of obtaining information of an object under consideration, without coming into physical contact with it (Lillesand et al. 2007). While our own eyes are remote sensing devices, they are limited to what we can see within our field of view and the light spectrum range – that is, the visible spectrum. A camera carried on an aircraft or a scanner in a satellite is like an extended eye: it can see an entire landscape at a moment in time, since it is orbiting above the earth and has been enhanced by sensors that capture light well beyond the spectrum visible to humans, into the ultraviolet and the infrared regions, for example. Since the advent of aerial photography in the late 1800s, this extended eye has been used to discover archaeological sites. Observing the earth from above is one of the best ways to find archaeological sites and understand archaeological landscapes, revealing features that are too faint, large or fragmented to be appreciated by an observer at ground level.

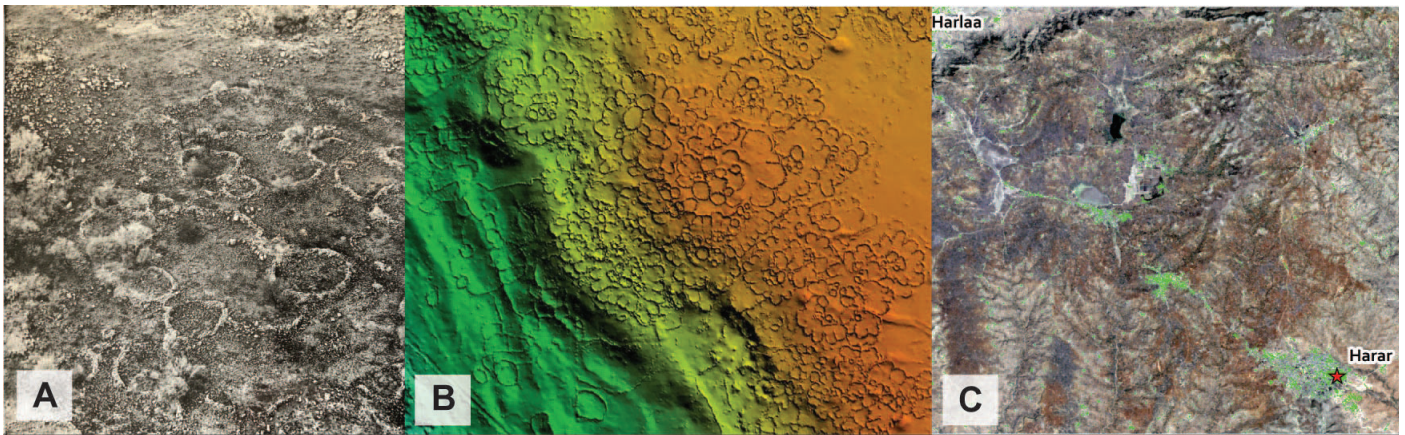
“Using remote sensing in Ethiopia has given me the opportunity to explore the country’s vast and diverse landscape in great detail. My work so far has used open source satellite imagery to analyse and monitor landscapes where known archaeological sites and monuments are located, including the UNESCO World Heritage site of Harar Jugol, the Fortified Historic Town located in eastern Ethiopia. The availability of Google Earth imagery in recent years has meant I can zoom into known areas of historic importance and see what is happening around them - for example, if there are any new urban developments in the area, desertification of the landscape or agricultural change. The opportunities are endless.”

— Nadia Khalaf, University of Exeter

A wider lens

Not surprisingly, more archaeological sites are being discovered every year through remote sensing than by any other method. As an archaeological technique, it has many advantages, being non-destructive, cost-effective and relatively fast. Today it is used by archaeologists to find new archaeological sites in areas that have not been investigated before and that are difficult or dangerous to reach, also proving invaluable in monitoring many and varied heritage threats from looting to flooding. *(continued on p.5)*





above: Remote sensing technologies used to discover, document, and analyse threats to archaeological sites in Africa. (a) A 1960s aerial photograph of stone walling in southern Africa (R. Mason). (b) LiDAR imagery of Molokwane, southern Africa (A. Esterhuysen). (c) Landsat imagery of Harar and Harlaa, Ethiopia, with green pixels indicating the extent of urban growth (N. Khalaf).

(continued from p.5) High-resolution multispectral, hyperspectral, Light Detection and Ranging (LiDAR) and synthetic aperture radar (SAR) satellite imagery have provided new perspectives for archaeological investigation, ranging from synoptic views to small details. Incorporating machine-learning techniques and algorithms that facilitate the automated detection of sites and features, together with multitemporal remote sensing big data, further extends the potential of remote sensing in archaeology.

We plan to use traditional techniques based on visual inspection but also to exploit the complementarity of multi-sensor, multi-polarisation, multi-band and multi-temporal remote sensing systems in combination with innovative machine learning approaches.

MAEASaM Remote Sensing Working Group:
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 A. Akintayo,
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 P. Ochungo,
 Postdoctoral Researcher, Kenya

REPORT

Going Digital Workshop, 24 May 2021

What is a digital archaeological database?

What are the benefits of these software platforms in archaeological data management?

These were two key questions discussed in a collaborative online workshop held by Mapping Africa's Endangered Archaeological Sites and Monuments (MAEASaM) and its sister project, Mapping Archaeological Heritage in South Asia (MAHSA).

Participants from over 16 countries across Europe, Africa, and South Asia engaged and connected on topics of interest to many. The workshop introduced the key principles underlying data organisation and management and was followed by a virtual tour of the Arches database software platform. A recording of the workshop is available on YouTube: [Going digital: An introductory workshop on databases in archaeology](#)

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Contributions and suggestions for future issues should be sent to infomaeasam@gmail.com.

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