

FOREWORD. OPEN SOURCE, OPEN SCIENCE AND COMMUNITIES IN ARCHAEOLOGY

The relationship between open philosophy and archaeology is rooted in the principles of transparency, accessibility, collaboration and democratization of knowledge. In archaeology, open philosophy promotes the sharing of data, tools and methods in a way that makes information widely accessible to researchers, professionals and the general public. One of the key benefits is that archaeological data, such as site records, 3D models and maps, can be freely shared and accessed. This openness allows not only for more comprehensive peer review and reinterpretation of findings, but also makes it possible for a wider audience to engage with and benefit from archaeological discoveries. By making data accessible, researchers around the world can collaborate more easily, bringing new perspectives and expertise to the field. Open platforms encourage international cooperation and community-driven projects, allowing both experts and amateurs to participate in meaningful ways. Sharing research methodologies and data ensures that findings are verifiable and reproducible by others, which strengthens the integrity of the research process. It also helps ensure that archaeological work is conducted responsibly and with a commitment to preserving and documenting cultural heritage for future generations.

The rise of Free and Open Source Software (FOSS) has transformed archaeological digital practice. These tools allow archaeologists to conduct advanced digital analyses, such as GIS mapping and 3D modeling, without the high costs associated with proprietary software (<https://open-archaeo.info>). This makes the technology more accessible, especially to institutions or individuals with limited resources, allowing more researchers to participate in cutting-edge projects. Open source refers to software and tools that anyone can freely use, modify, and share. In archaeology, the availability of open source software has been particularly impactful. Programs such as QGIS for geographic information systems, MeshLab for 3D modeling, and R for data analysis are widely used by archaeologists to process and visualize data. These tools are not only cost-effective, but also customizable, allowing researchers to adapt them to meet the specific needs of their projects. This flexibility is crucial for archaeology, where datasets and research questions can vary greatly across sites and contexts.

The open source approach encourages collaboration across the global archaeological community. Researchers can share their improvements or customizations of tools, helping to refine the resources available to everyone. This spirit of collaboration is exemplified by initiatives such as ArcheoFOSS,

an annual event that brings together professionals and enthusiasts to discuss and promote the use of open source software in archaeology.

Both Open Science and FOSS are built on similar philosophies of openness (MOSCATI 2017), transparency and collaboration. In the realm of research, Open Science encourages the use of FOSS to avoid dependency on closed, proprietary systems that can limit the replicability of research. For example, using open source software ensures that research methods can be fully understood and reused by other scientists, which is a fundamental aspect of reproducibility in science. Both movements are supported by strong, collaborative communities. Open Science relies on the contributions of researchers who share their data, methods and findings openly, while FOSS thrives on the contributions of programmers and developers who continually improve open source software. The collaborative nature of both movements encourages innovation, knowledge-sharing and global cooperation.

Communities, both within and beyond academia, play a crucial role in the open source and Open Science movements. Collaboration among researchers, institutions and the public is essential for maximizing the benefits of open practices in archaeology. Among professionals, communities of practice have emerged around the use of open tools and data. For example, ArcheoFOSS serves as a hub for archaeologists interested in integrating open source software and Open Science principles into their work. These gatherings allow researchers to share their experiences, tools and methods, building a collective knowledge base that drives the discipline forward.

At the same time, involving local and global communities in archaeological research has never been more important. Open Science provides the means for the public to engage directly with archaeological discoveries, whether through contributing to research projects or by accessing reliable, open data. Platforms such as Wikipedia and other open knowledge repositories enable archaeologists to disseminate their findings to a wider audience, helping to raise awareness of cultural heritage and making information accessible to anyone with an Internet connection. While the shift toward open practices in archaeology presents many opportunities, it also comes with challenges. One issue is the need for training and infrastructure to support the use of open source tools and the adoption of Open Science practices. By making archaeological research more accessible and inclusive, these movements democratize knowledge and open the field to new voices and perspectives. Open practices ensure that archaeological data and findings are preserved for future use, offering long-term sustainability for the discipline.

It is not just about software, but also about the use of platforms and the development of new skills, particularly those referred to as Digital

Humanities (MOSCATI 2023), which can foster collaboration. Repositories such as GitHub are widely used by the archaeological ‘nerd’ community. There are projects such as Pelagios Network (<https://pelagios.org>), which is a long-running initiative that links information online through common references to places (VITALE, DE BEER 2019). Pelagios represents a community of individuals, projects and organizations working with historical data. Part of its work in evolving the LOD (Linked Open Data) ecosystem involves developing open methods and tools. Recogito is a web-based annotation tool developed as part of the Pelagios project. It was created to facilitate the annotation of historical texts and maps, allowing users to mark up place references, entities, events and other elements within documents. Recogito is designed to support collaborative annotation efforts and to enable scholars and enthusiasts to create structured data from unstructured text (<https://recogito.pelagios.org/>; CANTONE, CARVALE 2019).

The importance of the role of communities, including researchers, experts and citizens, in Open Science and archaeology projects can be highlighted through various types of initiatives such as the Scottish Atlantic Maritime Past: Heritage, Investigation, Research and Education Project (McCARTHY, BENJAMIN 2019; <https://www.wessexarch.co.uk/our-work/project-samphire>). It was geographically focused on the West coast of the Scottish mainland and was undertaken between 2013 and 2015, resulting in a large number of new archaeological discoveries, including shipwrecks, aircraft, and other material of a much more varied nature than what is typically found through large-scale hydrographic surveys. This type of initiative exemplifies the need for tailored approaches to specific geographical contexts, demonstrating the importance of localized attention, which enables the discovery of much more varied material compared to traditional methods.

Human-AI (CASINI *et al.* 2023; https://bit.ly/NSR_floodplains) utilizes pre-trained deep learning models to identify archaeological sites in the Mesopotamian floodplains using satellite imagery and vector shapes from annotated data. Integration of domain expertise was crucial in refining dataset construction and evaluating model predictions. The collaboration between humans and AI enables efficient site detection and dataset refinement, enhancing archaeological analysis in the region.

There are also crowdsourcing projects, very common in Digital Humanities projects, such as Micropasts (<https://micropasts.org/>), which saw collaborative participation in the realization of various types of projects, from transcription to tagging. The long-standing ArcheoFOSS community (GROSSI 2019), which began as an Italian initiative in 2006, is increasingly shifting towards international channels, thanks in part to the use of platforms such as Telegram and its embrace of multilingualism. This community

remains tightly knit while continually expanding its focus beyond just technological aspects, engaging deeply with ethical and social dimensions as well. Through this evolution, ArcheoFOSS has become a dynamic space for collaboration and knowledge exchange, enriching both its members and the broader archaeological and digital humanities landscapes.

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