

GREEK AND LATIN DIGITAL EPIGRAPHY

Teaching Materials of the Joint Laboratory
in Digital Epigraphy

ALMA MATER STUDIORUM – UNIVERSITÀ DI BOLOGNA
BROWN UNIVERSITY



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- 6 χρηστή χαῖρε.

EDITED BY _____

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Introduction to Greek and Latin Digital Epigraphy

Teaching materials of the project

JLDE – "Joint Laboratory in Digital Epigraphy"

*in collaboration between Alma Mater Studiorum Università di Bologna and Brown
University (Providence, US)*

With contributions by

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These materials were produced as part of the project *JLDE – "Joint Laboratory in Digital Epigraphy"* – in collaboration with Brown University (Providence, US), coordinated by Alice Bencivenni and Alessandro Cristofori (Alma Mater Studiorum Università di Bologna) and John Bodel (Brown University), funded through the University of Bologna initiative: Innovative Projects within International Cooperation Agreements – financial year 2024 and co-funded by Brown University.

Departments involved:

Alma Mater Studiorum Università di Bologna

Department of History, Cultures and Civilisations

Department of Classical and Italian Philology

Brown University

Department of History

Department of Classics

Cover image: Funerary stele of Iulia Donata, freedwoman of Olympus

2nd century AD, from Kition – Larnaka (Cyprus)

CIL-III, 6731; IG XV.2.1 106

The Met Fifth Avenue, Gallery 162

The Cesnola Collection, Purchased by subscription, 1874–76

Object Number: 74.51.2393

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Introduction

This introduction to Greek and Latin digital epigraphy was developed as part of the Joint Laboratory in Digital Epigraphy (*Joint Laboratory in Digital Epigraphy*, JLDE), an international cooperation project between the University of Bologna – Department of History and Cultures (DISCI) and Department of Classical and Italian Philology (FICLIT) – and Brown University (USA). The project, funded under the University of Bologna's Innovative Projects in International Cooperation Agreements (financial year 2024), aims to strengthen research collaboration in the field of historical and classical studies, with particular attention to digital epigraphy and the production of open data compliant with FAIR principles (*Findable, Accessible, Interoperable, Reusable*). Through the Joint Laboratory, the two institutions share expertise, teaching resources and digital research infrastructures, promoting the training of students and researchers in an international context, with particular attention to the master's and doctoral programmes of the University of Bologna and the initiatives of the *U.S. Epigraphy Project* at Brown University.

This text offers an introduction in English to digital epigraphy, intended primarily for students and researchers enrolled in the programmes involved in the JLDE project – in particular the master's degrees in Historical and Oriental Sciences, Philology, Classical Literature and Tradition, and Digital Humanities and Digital Knowledge, as well as the interdepartmental doctoral programme in Cultural Heritage in the Digital Ecosystem – but open to anyone wishing to approach this discipline.

To explore the individual topics covered in this text in greater depth, we refer the reader to the ENCODE MOOC "Digital tools for the research and study of ancient writing cultures", available on the #dariahTeach platform (<https://teach.dariah.eu/course/view.php?id=80>), developed as part of the European Erasmus+ ENCODE project in collaboration with universities from several European countries and from which this text itself derives: the MOOC allows for a more in-depth exploration of each of the topics presented here through interactive learning materials, videos, exercises and resources in multiple languages.

About these teaching materials

This text offers an introduction with descriptive and ready-to-use examples, presentations, links to projects, bibliography and more, promoting awareness of the importance of digital competences and training in the field of research and study of ancient written cultures. The content is designed to support students and anyone interested in exploring digital epigraphy. The MOOC provides further materials and interactive exercises; the material is also enriched by video content accessible via YouTube links, including interviews with leading experts in the field and specific tutorials illustrating the tools and methodologies of digital epigraphy. For readers interested in deeper engagement with the material, video interviews with scholars working in digital epigraphy are accompanied by transcripts. The materials share the fundamental educational objectives of the MOOC unit while functioning as an independent resource. They provide a coherent overview of digital epigraphic resources, ongoing projects and established standards that facilitate the study and preservation of inscribed materials from the ancient world.

Whether you are an experienced epigraphist looking to enhance your digital toolkit, a student approaching the fascinating world of ancient inscriptions, or a professional seeking to implement digital methods in cultural heritage contexts, this guide provides practical insights into the intersection of traditional epigraphic study and digital humanities. By connecting classical methodologies with innovative digital approaches, these materials support the growing commitment to Open Science practices, FAIR principles and collaborative research in the field of ancient writing cultures.

About the structure of the MOOC

The ENCODE course on the #dariahTeach platform is structured in four distinct units, each covering different aspects of digital approaches to ancient writing cultures:

- **Unit I: Greek and Latin Digital Epigraphy** – This unit provides an overview of digital tools for Greek and Latin epigraphic studies.
- **Unit II: Digital Papyrology** – The unit focuses on how digital techniques have transformed papyrological research.
- **Unit III: Multilingual and Multicultural Digital Infrastructures** – The unit explores the relationship between language, writing cultures and digital platforms.
- **Unit IV: How to Create Linked Open Data (LOD)?** – The unit illustrates the applications of Linked Data in the study of ancient written artefacts.

The course uses a diverse range of hierarchically organised teaching materials:

- **Units** constitute the main divisions of the course, accessible via the navigation bar.
- **Lessons** subdivide units into coherent thematic areas, presented in a logical learning sequence.
- **Pages** provide brief sections on specific topics, comprising text, multimedia content and interactive elements such as image slides, videos and multimedia links to encourage engagement.
- **Exercises** allow for reflection and assessment through quizzes and interactive activities.

About the ENCODE project

ENCODE (*Bridging the gap in ancient writing cultures: ENhance COmpetences in the Digital Era*: <https://site.unibo.it/encode/en>) was a three-year project (2020–2023) funded by the EU as an Erasmus+ Strategic Partnership, bringing together six academic institutions (Alma Mater Studiorum Università di Bologna, Julius Maximilian Universität Würzburg, KU Leuven, Università degli Studi di Parma, Universität Hamburg, Universitetet i Oslo). The project aimed to bridge the existing gap in academic training between the highly specialised humanistic competences provided by traditional curricula in the fields of Ancient History, Archaeology, Classical Philology and Cultural Heritage, and the digital skills required today by research and the labour market.

The aims of the project were:

- to promote collaborative, participatory and intercultural digital approaches to ancient written heritage through new professional profiles and targeted training of qualified graduates;
- to strengthen the crucial cooperation between higher education and cultural heritage institutions, providing teaching and self-learning materials for academics and support services for stakeholders;
- to respond to the training needs of graduates in the field of highly specialised digital skills applied to the study of ancient written documents in European, Asian and African languages through innovative teaching modules.

Among the outputs of the project are: the definition of a shared framework of digital competences necessary for university students in programmes focused on written cultural heritage; the design and testing of innovative and customisable teaching modules; the creation of a comprehensive guide to the teaching modules, including a MOOC; and the development of a platform for the alumni community and for stakeholders/employers. These tools draw on material produced during the numerous events organised by the project, including conferences and practical workshops where experts were invited to discuss recent developments in technologies used in the study of ancient writing cultures.

Competences

The materials represent an access point to further training resources developed in specific workshops held during the ENCODE project and to materials made available online by other projects. The training material produced through ENCODE workshops was developed, collected and organised with the most relevant areas of digital competence in mind.

The competences are listed below and were formulated with explicit reference to the DigComp 3.0 Framework, published by the Joint Research Centre of the European Commission, which provides a common understanding of what digital competence is.

Competence Area 1: Information and data literacy

- Can autonomously and critically use multilingual digital corpora and can evaluate, adapt and vary search strategies to find the most appropriate information and content in digital corpora and databases; can guide others in navigating, searching and filtering digital data, information and content (DigComp3.0: 1.1 level C1).
- Is aware of problems connected with the management of information relating to multicultural contexts, can process and analyse data and content in structured digital environments. Can manage XML files (via an XML editor) and is aware of digital platforms and tools for managing digital publication (EFES, TEI-Publisher, Oxygen XML Editor project) (DigComp3.0 / 1.3 level B2-C1).

Competence Area 2: Communication and collaboration

- Can interact through a variety of digital technologies and use appropriate digital communication tools for a given multicultural context (DigComp3.0 / 2.1 level B2/C1).
- Can share digital information and content in an ethical and responsible manner (knows citation and attribution practices) with others through appropriate digital technologies (DigComp3.0 / 2.2 level B2/C1).
- Can use digital tools and technologies for collaborative purposes and for the co-construction and co-creation of information, resources and knowledge (DigComp3.0 / 2.4 level C1).
- Is aware of behavioural norms and how to act respectfully in the use of digital technologies and in interaction in multicultural digital environments. Can adapt communication strategies to the specific context and is aware of cultural, generational and other diversities in digital environments (DigComp3.0 / 2.5 level C1).

Competence Area 3: Digital content creation

- Understands the structure of digital content in different formats and can use digital technologies in an ethical and responsible manner to create and edit various content (DigComp3.0/3.1 level B2/C1).
- Is aware of copyright relating to reproductions of ancient documents (photographs, museum rights, print and digital editions), and of the legal and ethical issues associated with the dissemination of digital content; knows licences and how to apply them correctly (Creative Commons, OpenAccess, Linked Open Data) (DigComp2.2/3.3 level C1).

Competence Area 5: Problem identification and solving

- Is aware of project-specific guidelines, forums and blogs for problem-solving as a basis for addressing difficulties in operating within digital infrastructures (DigComp3.0/5.1 level B2/C1).
- Can identify, evaluate and select needs to which multicultural digital infrastructures can offer technological responses. Can understand where relationships between

different fields of study can be improved through digital domain methods and tools (DigComp3.0/5.2 level B2/C1).

- Can recognise where one's own digital competence needs to be improved or updated, can support others in developing their digital skills and seek opportunities for self-development, remains informed about technological developments and their implications (DigComp3.0/5.4 level B2/C1).

1. Why Digital Epigraphy?

This lesson aims to explore the current state of the digital transition in the study of Greek and Roman epigraphy, with particular attention to promoting new approaches to teaching and learning in line with advances in research. We will examine the main methodological innovations facilitated by digital methods and assess their impact on the discipline. We will also reflect on the changes affecting both research practices and the educational landscape.

1.1 Digital skills as a complement to epigraphy or as a way to learn to work with inscriptions?

Digital Epigraphy and intercultural and multidisciplinary approaches to written objects

The digital transformation of cultural heritage is bridging disciplinary divides, influencing the study of ancient written objects. Challenges such as digital editions, information retrieval systems, contextualisation, metadata, linguistic analysis and treebanking are shared by the community of epigraphists. These challenges extend beyond Greek and Roman inscriptions to include other pre-modern languages and cultures of the Mediterranean and beyond. Disciplines such as epigraphy, papyrology and codicology generate digital data that are increasingly integrated into broader ecosystems. A notable example is **Trismegistos**, a platform that provides comprehensive information about texts from antiquity. Trismegistos facilitates intercultural and interlinguistic research, breaking down linguistic and disciplinary barriers, particularly for texts from Egypt and the Nile Valley from around 800 BC to 800 AD.

The digital transition and its contribution to research methods

Given the need to raise awareness of interdisciplinary connections and to produce data that can be used by many different scholars, it is necessary to reflect on the **digital transition**, which is contributing to a genuine new methodological development, improving the understanding of the relationship between text, the materiality of the object, and the many different contexts of production and transmission – one of the most important scholarly aspects in the approach to inscriptions, papyri and, in general, written objects of antiquity.

The digital transition brings with it the need to develop systems to represent – within an integrated and coherent environment – information about the text, its linguistic features, its layout, its scripts, its relationship with the monument (i.e. the object bearing the text), its state of preservation, the work of decipherment, the critical edition and interpretation, as well as the original context of production and other contexts of use, preservation, display and transmission. Even more relevant is the potential connection with other sources, which allows for the sharing, selection and reorganisation of information in order to produce historical meaning. The creation of standards for digital editions, in which the information about the text and the relationships mentioned above can be represented and shared, is the precondition for structuring the knowledge we have of the document in a digital environment and for carrying out information retrieval and research through computing systems.

Creating standards for digital editions: EpiDoc

Epigraphists have responded to the need for standards for digital editions of inscriptions and for recording and linking information by developing EpiDoc. EpiDoc is "an international, collaborative effort that provides guidelines and tools for encoding scholarly and educational editions of ancient documents". It is a semantic markup using a subset of the TEI (Text Encoding Initiative) standard for the representation of historical and literary texts in digital form. EpiDoc was initially developed for the publication of digital editions of ancient inscriptions (e.g. *Inscriptions of Aphrodisias*, *Vindolanda Tablets*), but its scope has expanded to include the publication of papyri and manuscripts (e.g. *Papyri.info*). This markup addresses not only the transcription and editorial treatment of the texts themselves, but also the history

and materiality of the objects on which the texts appear (i.e. manuscripts, monuments, tablets, papyri and other objects bearing texts).

Further reading:

De Santis, A., & Rossi, I. (Eds.). (2019). *Crossing Experiences in Digital Epigraphy: From Practice to Discipline*. De Gruyter Open Poland.
<https://doi.org/10.1515/9783110607208>

1.2 Teaching and learning epigraphy alongside digital epigraphy

Digital epigraphist competences are not an addition but a complement to traditional epigraphic skills; for this reason, scholars have shown particular interest in integrating the former into traditional epigraphic teaching. As Bodard and Stoyanova (2016) emphasise, the technical nature of the epigraphic discipline offers numerous parallels with digital technology-related disciplines regarding tools and teaching methods. The two scholars focus in particular on the digital edition of epigraphic texts produced through EpiDoc encoding, arguing that this activity is nothing other than structured thinking about data production.

The structure of a digital edition substantially mirrors that of a printed epigraphic edition, and the hierarchical and rigorous organisation of the different sections of the document compels editors to think carefully about how to organise information and to pay greater attention to individual sections. The translation of epigraphic conventions (i.e. the Leiden system) into the digital environment requires greater reflection on the precise meaning of conventional representations, making them more transparent and fostering the disambiguation of concepts that would remain imprecise in prose descriptions, including responsibility and attribution, thereby promoting a more scientific approach to scholarly publications.

Teaching EpiDoc	Teaching Epigraphy
Presupposes epigraphic/classical knowledge Introduces the use of digital technologies Provides reference materials (Guidelines) and personalised summaries (Cheatsheet) Offers many exercises and hands-on practice	Presupposes knowledge of Greek and Latin Introduces epigraphic practice Provides reference materials (manuals) and personalised summaries (Leiden conventions) Offers many exercises and hands-on practice

Table 1 – Comparison between teaching EpiDoc and teaching Epigraphy. (Bodard–Stoyanova 2016: 62)

Digital epigraphy and a deeper understanding of the discipline

A further advantage arising from the integrated teaching of digital and traditional epigraphy concerns the very way in which the epigraphic discipline is understood. When consulting a printed epigraphic corpus, it can be difficult to find images of inscriptions or indices, which are often found, especially for large corpora, in separate volumes. This complicates the understanding of the document, often capturing only the textual and not the material aspect of the inscription-object. However, through digital tools that also allow for the management of images (3D modelling and imaging) and linking the epigraphic edition to external digital resources and interactive maps, the history of the object and its materiality are brought to the fore, with the effect of understanding epigraphy not only as a philological discipline (as it is still largely understood today due to the legacy of the great epigraphic studies of the 19th century), but also as a historical and archaeological discipline.

Integrating the teaching and learning of epigraphy and digital epigraphy

From a practical standpoint, training in digital epigraphy has often been deferred to a second stage of the epigraphist's formation, frequently delivered in the form of workshops or laboratories attended on a voluntary basis by interested students who have already acquired basic competences in epigraphy. This practice continues, but in recent years digital skills have begun to be integrated into traditional epigraphy courses; this is the case, for example, with the experimentation conducted by Monica Berti in 2010 and 2013 at Tufts University: in her Latin epigraphy module, students were also trained in EpiDoc and practised with texts from the EDR database.

Traditional epigraphic competences and digital editions of Latin inscriptions were also themes of the epigraphy and archaeology programme *The Stones of Ancient Latium*, held in Italy in 2011 and organised by Monica Berti and J. Matthew Harrington. John Bodel was one of the first to integrate the teaching of traditional epigraphy and digital epigraphy, adding an *EpiDoc Practicum* (taught by Elli Mylonas) to his undergraduate seminar in Roman epigraphy at Brown University (2014), where students were asked to produce EpiDoc digital editions of inscriptions from the *U.S. Epigraphy Project*: this practice has continued over the years, also involving doctoral students in Classics within courses in Greek and Latin epigraphy. Through direct involvement in the production of digital editions, students were thereby encouraged and motivated to acquire the basic competences for the decipherment, ecdotic and historical analysis of inscriptions, actively collaborating on the *U.S. Epigraphy Project* by entering epigraphic records into the database.

During the pandemic, Alice Bencivenni in collaboration with Irene Vagionakis integrated several lessons on digital editions of epigraphic texts in EpiDoc into her Greek Epigraphy Course for master's degree programmes in History and Oriental Studies, Philology, Classical Literature and Tradition, and Archaeology and Cultures of the Ancient World at the University of Bologna (2020), replacing the traditional exercise at the epigraphic collection of the Bologna Archaeological Museum with intensive digital EpiDoc training. From this experience, a regular course on the digital encoding of ancient sources was introduced from 2022, included in the curricula of the master's degree programmes in History and Oriental Studies, and Philology, Classical Literature and Tradition (*Digital Laboratory for Classical Sources*).

These experiences began as isolated cases but courses in which digital skills are integrated into the study of traditional epigraphy are becoming increasingly common. The goal of ENCODE is precisely to promote the integration of the now essential digital skills into the domain of teaching and learning ancient writing cultures, through the experience of the numerous workshops and training activities organised within the project and the production of basic and advanced teaching modules collected in the ENCODE Database, which can be reused by teachers in different training and teaching contexts.

Further reading:

Bencivenni, A., & Agrimonti, S. (2014). *The IGCyr Project: Encoding Codes, Translating Rules, Communicating Stones in Ptolemaic Cyrene and in Contemporary Bologna*. In S. Orlandi, R. Santucci, V. Casarosa, & P. Liuzzo (Eds.), *Information Technologies for Epigraphy and Cultural Heritage. Proceedings of the First EAGLE International Conference* (pp. 351–368). Sapienza Università Editrice.
<https://dx.doi.org/10.13133/978-88-98533-42-8>

Bodard, G., & Stoyanova, S. (2016). *Epigraphers and Encoders: Strategies for Teaching and Learning Digital Epigraphy*. In G. Bodard & M. Romanello (Eds.), *Digital*

Classics Outside the Echo-Chamber (pp. 51–68). Ubiquity Press.
<https://doi.org/10.5334/bat.d>

Fogagnolo, M. (2022). *Hands on Workshops. ENCODE report on digital competences, learning outcomes and best practices in teaching and learning.*
<https://doi.org/10.6092/unibo/amsacta/7046>

Sunoikisis Digital Classics. Summer 2021 Session 2. *Teaching epigraphy in a pandemic.*
Convenors: Alice Bencivenni (University of Bologna), Gabriel Bodard (ICS London),
and Irene Vagionakis (University of Bologna). (2021, April 22).
<https://www.youtube.com/watch?v=zerKTMN3FCo>

2. Mapping the Field of Digital Epigraphy

The aim of this lesson is to provide a general overview of the most important resources and tools that have changed the landscape of epigraphic research, with particular attention to the critical aspects of using digital corpora and tools and to the collaborative dimension of these tools.

2.1 Digital epigraphic corpora and databases

In recent decades, the digital environment has profoundly transformed the epigraphic discipline. First and foremost, digital tools have contributed to the creation of **larger databases that bring together different printed corpora and inscriptions of varied geographical origin**. These corpora have very different origins and are sometimes more attentive to the quantity of epigraphic records and the speed of data digitisation than to the quality of content: in some cases, duplicate entries, incorrect readings and misidentified modern editions may be found. Nonetheless, they represent invaluable tools for researchers.

Examples of these are the *Searchable Greek Inscriptions Database* (PHI) for Greek epigraphy and the *Epigraphische Datenbank Clauss-Slaby* (EDCS) for Latin epigraphy. In the *Searchable Greek Inscriptions Database* inscriptions are organised by region and can be searched by text string; however, the database does not include a critical apparatus and offers limited metadata (generally provenance, date and other editions). Similarly, in the *Epigraphische Datenbank Clauss-Slaby* inscriptions are not accompanied by an apparatus, although they can be searched not only by text but also by material, type of inscription and date of origin.

On the other hand, there are also smaller, regionally or thematically oriented corpora that pay greater attention to content quality and information control: these corpora tend to have more advanced search functions, as they can often be queried not only on the basis of text but also by metadata and particular textual features. They are also frequently produced using EpiDoc, the main standard for the semantic encoding of ancient texts in TEI-XML, which allows for the semi-automatic creation of indices and data export. Furthermore, they are often linked to external resources, such as geographical gazetteers, prosopographical repertories and controlled vocabularies in accordance with the principles of Linked Open Data (LOD).

Among **regional databases and corpora** worth mentioning:

- Ancient Inscriptions of the Northern Black Sea (IOSPE)
- Attic Inscriptions Online (AIO)
- Epigraphic Database Roma (EDR)
- Hispania Epigraphica (HE)
- Inscriptions of Aphrodisias Project (InsAph)
- Inscriptions of Greek Cyrenaica / Greek Verse inscriptions of Cyrenaica (IGCyr/GVCyr), first edition 2017, (IGCyr/GVCyr²), second edition 2024
- Inscriptions of Roman Cyrenaica (2020)
- Inscriptions of Roman Tripolitania (IRT), first edition 2009, second edition 2021
- Roman Inscriptions of Britain (RIB)

Some corpora are restricted and regional in character, others are broader, such as the *Epigraphische Datenbank Heidelberg* (EDH), which collects inscriptions from the Roman provinces.

Among **thematic databases and corpora** worth mentioning by way of example:

- Collection of Greek Ritual Norms (CGRN)
- Epigraphic Database Bari (EDB)

- Greek Economic Inscriptions (GEI)
- Practicalities of Hellenistic Ruler Cults (PHRC)
- Mappola

Sometimes regional and thematic criteria are simultaneously present, as in the case of the *Cretan Institutional Inscriptions*, a collection of epigraphic documents relating to Cretan institutions. Some of the databases mentioned above contain **inscriptions in different languages** belonging to a single geographical region. This multilingual approach, characteristic of many digital corpora, makes it possible to eliminate the disciplinary barriers that distinguish not only Greek epigraphy from Latin epigraphy, but also the epigraphic material of the Greco-Roman world from that of other Mediterranean languages. An interesting example is the *I.Sicily* database, which collects inscriptions from ancient Sicily from the archaic period to late antiquity in all the languages spoken in this region, a true crossroads of the Mediterranean (Greek, Latin, Phoenician/Punic, Oscan, Hebrew, Sicel). Among the Brown University projects, the *Ancient Inscriptions from Israel / Palestine* database should also be mentioned, containing inscriptions in Hebrew, Aramaic, Greek and Latin from Israel and Palestine from the Persian period to the Islamic conquest.

For the **websites** of the databases mentioned in this section, see the webography at the end.

2.2 The collaborative dimension of digital epigraphy

Another feature of the digital environment is its **collaborative dimension**: from the very creation of the first digital corpora, scholars felt the need to create a single portal through which all materials could be accessed and searched. To this end, the Europeana Network of Ancient Greek and Latin Epigraphy designed the *EAGLE Inscriptions Search Engine*, an aggregator and search portal for various epigraphic databases, a tool analogous to the Papyrological Navigator of *Papyri.info* in the field of papyrology. In the epigraphic field, the *InsLib* project aims to reproduce on a smaller scale the principle underlying the EAGLE federated database, providing a search portal that brings together all corpora of inscriptions and ostraka from ancient Libya (IGCyr/GVCyr, IGCyr/GVCyr², IRCyr, IRT, Ostraka from Bu Njem). A prerequisite for the creation of this tool was the transformation of texts according to the EpiDoc-XML standard, the assignment of a permanent identifier (a stable URL) to each inscription and the creation of standardised vocabularies for the description of metadata (the EAGLE vocabularies) to enable interoperability between the different projects.

Currently, several databases make their datasets available in EAGLE: the project, however, has experienced slowdowns due to the absence of further funding, but the discussion on the creation of shared digital tools for the study of epigraphy has continued around the international community of **epigraphy.info**, a collaborative environment aimed at facilitating communication and interaction between scholars, serving as a reference point for digital tools, practices and methodologies for the management of inscription collections. Among the goals of epigraphy.info are the identification, creation and dissemination of shared standards and practices, the preservation, reuse and updating of epigraphic datasets and the creation of tools for the research, analysis and editing of inscriptions and their metadata.

The efforts of the digital epigraphists community of epigraphy.info have recently converged in the **FAIR Epigraphy Project**, a project supported by the Arts and Humanities Research Council (AHRC) and the Deutsche Forschungsgemeinschaft (Marietta Horster, Jonathan Prag) from 2022 to 2025. The project, which is based on the FAIR principles of research, aims to support innovative research on epigraphic data and the broader ecosystem of linked data, through the consolidation of standards shared by the community of digital epigraphists, the development of tools for implementing these standards and the creation of a hub that hosts and makes fully accessible the resulting linked open data, published by individual projects. In practice, the project has published various outputs over the years, beginning with the **FAIR Epigraphy Browser**, a continuously expandable tool that allows the visualisation and search of

different aggregated datasets in a single portal through the conversion of XML files into RDF data, the **FAIR Epigraphy Bibliography**, a platform that assigns unique and stable identifiers (URIs) to open and linked bibliographic data relating to the world of epigraphy for the bibliographic items cited in epigraphic studies, and the **FAIR Epigraphic Vocabularies and Ontologies**, tools that allow epigraphists to have stable references that describe precisely and consistently concepts and phenomena recorded in epigraphic studies. These data, standardised and organised, are also structured hierarchically with more general and more specific terms, and are accompanied by definitions and alternative labels in multiple languages, representing an improvement over the **EAGLE Vocabularies** on inscription metadata, the result of the Europeana EAGLE project.

2.3 Digital bibliographic tools and concordances

In addition to corpora and databases, there are other important tools such as **repertories, bibliographic tools and concordances**; some of these represent the digitisation of printed tools that continue to have a life of their own, others are tools conceived as digital from the outset. Among the former, *SEG Online (Supplementum Epigraphicum Graecum Online)* plays a prominent role: its digital version, available only by subscription, allows searching for entries, text, period and place of origin, type of inscription and concordances, and results can also be exported in XML.

Other useful resources

For other resources such as image repertories, prosopographical repertories, geographical gazetteers and controlled vocabularies, see below: *7.1 Structuring data*. A valuable tool, albeit lacking a complete and up-to-date list of digital epigraphic resources, is the list produced by the *Digital Classicists Wiki*. To stay up to date with developments in epigraphy, it is recommended to consult *Current Epigraphy*, a blog that publishes announcements of workshops and conferences, news of discoveries and publications on digital epigraphy projects, *SITEG*, an Italian blog dedicated to activities and publications relating to the world of Greek epigraphy, and the AIEGL website, which reports on events and publications related to the *Association Internationale d'Épigraphie Grecque et Latine*.

3. From User to Creator: Learning by Doing

The aim of this lesson is to illustrate how digital projects and digital infrastructures work and why it is important to move from front-end to back-end experience by actively participating in new or existing projects/infrastructures. This chapter can also be supplemented with MOOC resources, which include video interviews with some coordinators of ongoing digital epigraphic projects.

U.S. Epigraphy Project

The *U.S. Epigraphy Project* is a digital corpus of Greek and Latin inscriptions held in public and private collections in the United States of America, with a single Italian exception represented by the American Academy in Rome. The project, coordinated by Brown University, does not constitute a geographically homogeneous corpus in the strict sense: the inscriptions collected originally come from various areas of the ancient world, primarily from Rome and central-southern Italy, but are today distributed in museums, universities and private collections spread across the United States, from the east coast (Kelsey Museum of Archaeology at the University of Michigan, Metropolitan Museum of Art in New York, Museum of Fine Arts in Boston) to the west coast (Phoebe A. Hearst Museum in Berkeley, J. Paul Getty Museum in Malibu). The specificity of the project therefore lies in the criterion for aggregating the sources, determined not by the ancient provenance of the inscriptions but by their current geographical and institutional location.

The inscriptions are encoded in EpiDoc-XML and the project makes use of a systematic programme of autopsy of the materials, conducted also through university seminars, which has made it possible to integrate and update existing editions. The corpus includes materials of very varied typology – funerary stelae, altars, sarcophagi, *instrumenta domestica*, brick stamps, inscribed gems – on different supports (stone, bronze, lead, terracotta), testimony to the richness and heterogeneity of classical antiquities collections in the United States. The *U.S. Epigraphy Project* is distinguished by the particular attention paid to the history of the documents over the centuries, in order to reconstruct how they made their way from Europe to America and their relationship with each local institution that acquired and preserved them.

InsLib

InsLib (Inscriptions of Libya) is a project that collects documents on different types of materials and objects – inscriptions, ostraka and papyri – in different languages (Greek, Latin, Neo-Punic). The project is born from the collaboration between several institutions: King's College London and the Institute of Classical Studies in London, the University of Bologna, the University of Macerata and the Université de Paris IV Sorbonne (Centre de recherche sur la Libye Antique). *InsLib* does not constitute a homogeneous corpus, but a publication portal and a shared research tool for various publications of inscribed texts from ancient Libya, integrating the datasets of the following corpora: IGCyr/GVCyr (*Inscriptions of Greek Cyrenaica* and *Greek Verse Inscriptions of Cyrenaica*), IRCyr 2020 (*Inscriptions of Roman Cyrenaica*), IRT (*Inscriptions of Roman Tripolitania*) and O.bu.njem (ostraka from Bu Njem). The common denominator among these corpora is the encoding in EpiDoc-XML, which renders the respective datasets interoperable and reusable within *InsLib*, as well as the connection with external resources, such as the *Heritage Gazetteer of Libya* for geographical data. The project aims to reproduce on a smaller scale and for a specific geographical area the model of the federated search portal developed by EAGLE. In this way, it is possible to converge the results of different research towards a single common geographical area across different periods, also fostering a diachronic perspective.

I.Sicily

I.Sicily is a project that concretely exemplifies the overcoming of disciplinary barriers, examining substantially homogeneous materials – mostly inscriptions and ostraka – in all attested languages, including Greek, Latin, Phoenician/Punic, Oscan, Hebrew, Sicel and Elymian, over a chronological range from the 7th century BC to the 7th century AD. This multilingual perspective finds particularly fertile ground in an area like Sicily, considered a genuine cultural crossroads of the ancient Mediterranean. Within the *Crossreads* project, directed by Jonathan Prag (University of Oxford), the corpus aims to incorporate palaeographic, linguistic and petrographic data in the coming years, thus integrating traditionally distinct fields of study. The corpus is realised in EpiDoc-XML and is continuously expanded through the collaboration of numerous scholars (some affiliated with the University of Bologna) and a systematic programme of autopsy of inscriptions held in collections distributed across Sicilian territory.

LARES

LARES (Lexical Change and Variation in Religious Enculturation / Acculturation Phenomena of the Ancient World) is a multidisciplinary project aimed at studying ancient religions within a broader framework that includes social and cultural history, cognitive studies, linguistics and memory studies. The project is coordinated by the University of Bologna, with partners including Helsingin Yliopisto, Universidad Complutense de Madrid and Uniwersytet Jagielloński w Krakowie. The main objective of the project is the creation of a contextual lexicon (*Lexicon of Religious Acculturation in Antiquity*), encoded in XML and published through the EFES (*EpiDoc Front-End Services*) platform. The lexicon contains entries corresponding to religious terms analysed from both a synchronic and diachronic perspective in the light of ancient sources (literary, epigraphic and papyrological) in which they appear. Particular attention in this lexicon is devoted to epigraphic sources and their digital treatment. While the encoding of the various bibliographic entries primarily uses TEI markup, for epigraphic sources a combination with EpiDoc markup has been adopted. The different treatment of epigraphic sources is motivated by the need to highlight the document as an object situated within its context. However, only those aspects particularly relevant for the visualisation of the source are highlighted (document type, basic information on the support and on the ancient/modern history of the object, links to external editions, photographs and geographical repertoires), thus differentiating the treatment of the source from that of the traditional epigraphic record.

3.1 Learning by doing

An overview of digital epigraphic projects

The digital environment has fundamentally changed the way research is conducted, offering new possibilities for presenting and searching data. As we have already seen, the new way in which data are structured has enabled a better understanding of the relationship between text, materiality of the object and the historical context of production and transmission, and has fostered the overcoming of the traditional division between disciplines.

The **transition from user to creator of digital epigraphic resources** implies, on the one hand, an understanding of the innovation of digital epigraphic databases and corpora with respect to traditional printed ones; on the other, knowledge of the digital skills necessary to actively participate in digital projects. While the second aspect is the objective of the *digital epigraphy workshop*, the first can be achieved by examining more closely (or behind the scenes through dialogues with experts) digital epigraphic corpora and digital infrastructures. Starting therefore from the theme of interdisciplinarity, some presentations of digital epigraphic projects are included here, in which innovations will be particularly highlighted.

4. From User to Creator: Principles and Standards

The aim of this lesson is to focus on some essential principles of digital publication and on how their application in the digital environment has changed the way research is conducted. This chapter will focus primarily on epigraphy.

4.1 Principles and standards

Recent years have seen a great proliferation of digital corpora, databases and resources for epigraphy. For this reason, scholars planned to create a tool that would collect all online epigraphic databases, equivalent to *Papyri.info* for digital papyrology. Such a tool was meant to be the EAGLE federation of epigraphic databases, which aggregates data from different epigraphic databases providing a single search portal, but has been taken up by the *FAIR Epigraphy Project*, which has recently developed the *FAIR Epigraphy Browser*, a tool that aims, through the publication of RDF data (which better enables integration, export and alignment), to collect pre-existing epigraphic datasets creating a common visualisation and search interface (see section 2.2). However, the platform is far from collecting all epigraphic datasets, due to the long-term maintenance costs of such a tool that can only be met through new funding. In recent years, the community of digital epigraphists has sought to conform resources to principles that allow the exchange, reuse and interconnection of data. These can be summarised in the paradigm of **Linked Open Data** and Tim Berners-Lee's 5-star implementation scheme for Open Data:

- ★ make your data available on the Web (in any format) with an open licence
- ★★ make it available as structured data (e.g. Excel instead of a scanned table)
- ★★★ make it available in a non-proprietary open format (e.g. CSV instead of Excel)
- ★★★★ use URIs to name things, so that people can point at your data
- ★★★★★ link your data to other data to provide context

The scheme represents a model of increasing behaviour to which one is expected to conform when publishing data online. These behaviours also comply with FAIR principles. **FAIR** is an acronym standing for *Findability, Accessibility, Interoperability, Reuse*; according to these principles data must be:

- **findable** both by humans and computers, by assigning a stable URI to each resource
- **accessible** because retrievable via their identifier using an open, free and implementable protocol
- **interoperable** because they can be exported and integrated with other data thanks to their machine-readable format (XML, JSON, CSV, RDF)
- **reusable** because released with a Creative Commons Licence

In order to align data with these principles, the epigraphic community has gradually adopted open-access publication formats and produced a standard for a machine-readable representation of epigraphic texts: *EpiDoc-XML*. The need to standardise digital editions of ancient texts, and of inscriptions in particular, developed from the second half of the 1990s, when the EAGLE Commission (*Electronic Archive of Greek and Latin Epigraphy*) drew up a series of recommendations on how to bring together all existing epigraphic databases. The Commission produced a document (Panciera 1999) in which scholars were invited to use a markup language to produce digital epigraphic editions, namely semantic encoding in XML.

In the few years that followed, a group of scholars from the *Ancient World Mapping Center* at the University of North Carolina at Chapel Hill took up this recommendation and drew up the *EpiDoc Guidelines 1.0* (2000). Since then, EpiDoc has been the main standard for the encoding of ancient documents. The new way of structuring epigraphic data directly linked to the use of

EpiDoc, combined with Linked Open Data (LOD), has produced not only new ways of presenting materials but also a new model of interpretation.

Further reading:

Wilkinson, M. D. et al. (2016). *The FAIR Guiding Principles for scientific data management and stewardship*. *Scientific Data*, 3(1), Article 1.
<https://doi.org/10.1038/sdata.2016.18>

Cayless, H., Roueché, C., Elliott, T., & Bodard, G. (2009). *Epigraphy in 2017*. *Digital Humanities Quarterly*, 3(1).
<https://www.digitalhumanities.org/dhq/vol/3/1/000030/000030.html>

Daquino, M. (2021). *Linked Open Data native cataloguing and archival description*. *JLIS*, 12(3). <https://doi.org/10.4403/jlis.it-12703>

5. From User to Creator: Effective Pedagogies

This section presents the main training pathways through which digital skills applied to the study of ancient writing cultures can be acquired, with particular attention to epigraphy. Through the analysis of various experiences, we will focus on some pedagogical principles and approaches that are now widely adopted: learning by doing, the resolution of real problems and working in interdisciplinary contexts.

5.1 Effective pedagogies

Available training opportunities

The development of digital tools for the study and research of ancient texts has prompted the scholarly community to reflect on how to integrate these competences into the training of epigraphists, papyrologists and ancient historians. Today, the result is a rich and varied training landscape, offering opportunities suited to different starting levels and levels of commitment.

The earliest experiences date back to the early 2000s, when workshops dedicated to EpiDoc and Leiden+ tools were organised as part of projects such as *Inscriptions of Aphrodisias* and *Integrating Digital Papyrology*. Since then, workshops and intensive schools have been regularly offered at universities and institutions across Europe and beyond.

Bodard and Stoyanova (2016) identify at least three main types of training pathways:

- **Short workshops and summer schools** – lasting one or two days, often linked to conferences, or intensive weeks. They represent an ideal entry point for those approaching digital tools applied to ancient writing cultures for the first time, with the primary objective of stimulating interest in this field. In this category fall the workshops organised as part of the ENCODE project, which also aims to promote the modular integration of digital competences into university curricula in different forms: distance learning, blended learning, e-learning.
- **Internships and short research experiences** – dedicated to those already involved in an EpiDoc-based project who wish to put acquired competences into practice by working directly on real materials.
- **Modules integrated into university courses** – digital competences are embedded within digital humanities or other disciplinary courses. A significant example is the experimentation conducted at the University of Leipzig, where a 90-minute EpiDoc module was integrated into a master's course in *Digital Scholarly Editing and Textual Criticism*, attended by students in Computer Science and the humanities.

A fourth type, today increasingly relevant, should be added to these three:

- **Fully online courses** – open to anyone, often free and accessible from anywhere in the world. The best-known example is **Sunoikisis Digital Classics**, an international consortium founded in 2015 as a programme of the University of Leipzig in collaboration with the *Center for Hellenic Studies* at Harvard and the *Institute of Classical Studies* in London. It now involves a global community of over 90 institutions worldwide. Sessions are broadcast live on YouTube and all materials are freely available on GitHub.

Why invest in this training?

Whatever pathway is chosen, the advantages are concrete and transferable. Digital skills applied to epigraphy foster the development of a more structured approach to the organisation and interpretation of data, the ability to manage complex sets of information and an increasingly interdisciplinary perspective that is much in demand in the research world. As

illustrated in section 1.2, such skills do not replace traditional ones: they complement them, enriching the profile of those who study ancient writing cultures.

Further reading:

Bodard, G., & Stoyanova, S. (2016). *Epigraphers and Encoders: Strategies for Teaching and Learning Digital Epigraphy*. In G. Bodard & M. Romanello (Eds.), *Digital Classics Outside the Echo-Chamber* (pp. 51–68). Ubiquity Press.

<https://doi.org/10.5334/bat.d>

Bodard, G., & Vagionakis, I. (2022). *EpiDoc and Epigraphic Training in the Era of Remote and Hybrid Teaching*. *Digital Classics Online*, 106–121.

<https://dx.doi.org/10.11588/dco.2022.8.90358>

6. Put it into Practice! How to Produce a Digital Edition

This lesson focuses on the creation of digital critical editions, emphasising the importance of markup. It explores digital editions of ancient inscriptions and introduces EpiDoc, a standard for the encoding of these texts. The chapter also addresses the encoding of metadata, text and relevant semantic features, providing participants with the skills to produce detailed and meaningful digital representations of historically significant inscriptions.

6.1 What is a digital critical edition? What do we mean by markup?

A **digital critical edition** is not simply the reproduction of a printed critical edition, but, to cite Patrick Sahle:

"a digital edition cannot be rendered as a print edition without a significant loss of content and functionality" (Sahle 2016).

This means that it should exploit the opportunities of the digital environment to provide a surplus of information and/or functionality, such as new possibilities for flexible indexing when working on a corpus, or the addition of dynamic information on the different possible interpretations of the written object itself.

Digital critical editions usually make maximum use of descriptive or semantic markup. **Descriptive markup** (also called "encoding" or "annotation") is a way of making explicit to the computer what is implicit to a reader: it is a way of telling the computer what we think a thing represents (in a written document or in our understanding of metadata). It differs from presentational markup, which mainly represents a layout but not the meaning associated with it.

To make this clearer we can look at the following example.



Presentational markup is as follows:

```

<p><span style="color:black">YOU ARE NOT WHAT YOU OWN</span></p>
<p>
<span style="color:white">YOU ARE</span>
<span style="color:black">X</span>
<span style="color:white">NOT WHAT YOU OWN</span>
</p>

```

It can be seen how the markup tags (which are always inserted at the beginning and end of the part of text being encoded) make it explicit to the computer that the text is divided into two paragraphs (<p></p>) and that the first is written in black (), while the second is written in white (), with the exception of one letter (x) which is written in black.

Presentational markup therefore describes the colours and graphic layout of the text, while **semantic markup** would look like this:

```

<p>YOU ARE NOT WHAT YOU OWN</p>
<p>YOU ARE <del rend="striketthrough">NOT</del> WHAT YOU OWN</p>

```

It can be seen how through this markup one is describing the presence of two paragraphs, each enclosed by <p></p>, and how in the second paragraph the meaning of the black letter is made explicit, namely that its function is to cancel with another sign (<del rend="striketthrough">) a part of the text (NOT). In this case, one is not concerned with explaining the different colour of the two lines, which would nonetheless be possible to do, but rather with clarifying that the second line has a different meaning thanks to the cancellation of a part of the text. Through semantic markup it is therefore possible to make explicit what one considers semantically relevant. The choice of markup to use, since it implies an interpretation, depends on the research questions that the digital editor wishes to make explicit. Semantic markup thus describes the meaning of elements instead: for example, that a part of the text has been deleted (<del rend="striketthrough"/>). Deciding which markup to use depends on the research questions that the digital editor wishes to make explicit.

In the digital epigraphists community, as well as among most scholars dealing with different types of texts, the most widely used markup language is **XML** (*Extensible Markup Language*), a highly flexible tool now widely used in electronic publishing and data exchange. Because XML is highly customisable, to describe many textual and other types of data phenomena, many vocabularies and standards have been created by communities of best practice. Scholars working with written documents make use of **TEI** (*Text Encoding Initiative*), a consortium that has developed a specific standard for the encoding of historical and literary documents via XML. More specifically, digital epigraphists as well as papyrologists have created a subset of markup declarations within TEI called **EpiDoc**.

References:

Sahle, P. (2017). *What is a Scholarly Digital Edition?* In M. J. Driscoll & E. Pierazzo (Eds.), *Digital Scholarly Editing: Theories and Practices* (pp. 19–39). Open Book Publishers. <http://books.openedition.org/obp/3397>

Further reading:

Babeu, A. (2011). *'Rome Wasn't Digitized in a Day': Building a Cyberinfrastructure for Digital Classicists*. Council on Library and Information Resources.

<https://www.clir.org/pubs/reports/pub150/>

Roued, H. (2009). *Textual Analysis using XML: Understanding Ancient Textual Corpora*. 5th IEEE Conference on E-Science. Oxford.

<http://esad.classics.ox.ac.uk/index5ccc.html>

6.2 Digital editions of ancient inscriptions and EpiDoc

One of the most important tasks of epigraphists is to produce the edition of the inscriptions they work on. Building the edition of ancient written sources means not only providing the transcription and interpretation of the text, but also the study of the monumental support, its topographical and historical context. Scholars have emphasised that the digital environment succeeds in enhancing the multidimensionality of the inscription-object (Lasagni 2020: 206) – text, support and context – by juxtaposing, comparing and rapidly bringing into relation different types of information: this new way of structuring data has the advantage of creating new investigative perspectives on the ancient document, changing the way the discipline has traditionally been understood.

As we have seen previously, EpiDoc is a subset of TEI, an XML language for the encoding of literary and linguistic texts, and as an XML language it makes use of XML syntax, based on elements composed of components (code fragments enclosed in angle brackets).

Example of two EpiDoc-XML elements and their components:

`<supplied reason="lost">ἔδοξε</supplied>` → element

This means that the word ἔδοξε has been restored by the editor as it is no longer visible on the stone, thus lost.

– supplied: element name

– reason: attribute name

– lost: attribute value

– ἔδοξε: element content

`<supplied>`: opening tag

`</supplied>`: closing tag (distinguished by a slash after the opening bracket)

`<lb n="1"/>` → empty element (i.e. without any content, used to mark a punctual phenomenon in the text and not a portion of it), distinguished by a slash before the closing bracket.

This indicates the beginning of line 1 of a text.

– lb: element name

– n: attribute name

– 1: attribute value

`<lb/>`: single opening and closing tag

The attribute and value are found only in the opening tag and are not repeated in the closing tag. From the first example it is fairly clear that XML markup has a rather transparent meaning. According to the Leiden conventions, square brackets express a lacuna restored by the editor – [ἔδοξε]: the same phenomenon is expressed in EpiDoc through a `<supplied>` element followed by an attribute and a value, which explain why the original text cannot be read on the support. In other words, EpiDoc-XML markup is a language that is not only machine-readable but also human-readable.

The semantic nature of this language makes it possible not only to efficiently encode the traditional components of a printed epigraphic critical edition (metadata, text, apparatus, translation, commentary and bibliography), but also specific interpretive features, such as historical, topographical, prosopographical and linguistic data, which may appear in inscriptions and which one wishes to highlight for specific project purposes. The digital edition thus presents the same structure as the printed edition, but the rigid division into specific sections enables epigraphists to reflect even more on how to address all these aspects and to ensure consistency in data management.

Further reading:

- Lasagni, C. (2020a). *Introduzione alla sezione tematica. Dimensioni digitali dell'epigrafia*. *Historikà*, 10, 205–206. <https://doi.org/10.13135/2039-4985/6405>
- Bodard, G. (2008). *The Inscriptions of Aphrodisias as electronic publication: A user's perspective and a proposed paradigm*. *Digital Medievalist*, 4. <https://doi.org/10.16995/dm.19>
- Cayless, H., Roueché, C., Elliott, T., & Bodard, G. (2009). *Epigraphy in 2017*. *Digital Humanities Quarterly*, 3(1). <https://www.digitalhumanities.org/dhq/vol/3/1/000030/000030.html>
- Elliott, T. (2014). *Epigraphy and Digital Resources*. In C. Bruun & J. Edmondson (Eds.), *The Oxford Handbook of Roman Epigraphy* (pp. 78–86). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780195336467.013.005>
- Steiner, K., & Mahony, S. (2016). *How are digital methods changing research in the study of the classical world? An EpiDoc case study*. *Panta Rei*, 10, 125–148. <https://doi.org/10.6018/pantarei/2016/8>

7. Put it into Practice! How to Structure Data

The aim of this lesson is to explain how digital tools can improve our capacity to structure and categorise data in order to manage and integrate different types of information. A starting point could be to reflect on the difference between including information in a structured relational database or marking it up following a semi-structured hierarchical content model. Another important aspect is the integration of external resources, such as links to controlled vocabularies, geographical gazetteers, prosopographical and bibliographic repertoires, and the creation of indices and concordances.

7.1 Structuring data

Semi-structured and structured data: XML and relational databases

In the field of Digital Humanities (and more generally in the world of computing) there are no right or wrong data formats or models: the central issue is to ask what purpose we wish to achieve and which format or data model is most appropriate for accomplishing it.

For the purposes of digital epigraphy, it is usually more appropriate to work with **semi-structured data**, and in particular with data following a hierarchical tree structure. This is the case with the **XML language**, in which all the contents of a file are included in a so-called root element, within which all other elements are nested. This type of data model makes it possible to locate each element with great precision based on its relationships with other elements, which are conventionally defined in terms of "kinship": an element can in fact be the ancestor, parent, sibling, child or descendant of another element. To give a practical example, this type of structure makes it possible, for instance, to find and extract all bibliographical references mentioned in the commentary of an epigraphic edition but not those cited in its own bibliography, and more precisely only those for which a page range has been specified.

Another possibility would be to digitise inscriptions through **relational databases** containing fully structured data. Relational databases are collections of data following a relational model, based on one or more tables consisting of rows and columns that can be related to each other. An example of a relational model applied to epigraphy could be a table in which each row contains a different inscription and each column contains a particular type of epigraphic information, such as title, unique identifier, provenance, date, type of inscription, type of support and so on. Although this approach may be sufficient for the management of epigraphic metadata, it is perhaps not the best way to handle ancient texts and the other non-schematic parts of an epigraphic edition.

A third possibility, increasingly practised in digital epigraphy, is to structure data according to the **RDF** (*Resource Description Framework*) model, which forms the technical basis of Linked Open Data (see also section 4.1). In this model, information is organised not in tables or hierarchical trees, but as networks of *triples* (each statement is decomposed into a subject, a predicate and an object). Each entity is identified by a unique URI, which makes the data queryable, exportable and linkable to other online resources. Based on this principle is **Wikidata**, the open and collaborative database of the Wikimedia Foundation: data can be queried here using the SPARQL language and visualised in the form of maps, graphs and genealogical trees, with links to controlled vocabularies and external resources on a multilingual, editable and collaborative platform. An example of an epigraphic project realised through this tool is the project **Altinum** (Anna Clara Maniero Azzolini), which collects the inscriptions of the Roman municipium of Altinum and offers the first digital prosopographical corpus of this city. The project also aims to align the EAGLE vocabularies with the requirements of Wikidata, opening new perspectives for interdisciplinary epigraphic research and the enhancement of epigraphic heritage in an open digital ecosystem.

8. Put it into Practice! Tips for Contextualisation

This lesson aims to teach how to manage information about the context in which sources were produced and preserved. In particular, we will consider 3D reconstructions of objects and archaeological contexts used to visualise or reconstruct inscribed objects and their original and modern locations, as well as thick mapping to reconstruct their history of movement. This theme is closely linked to the problem of the decolonisation of cultural heritage (to which the digital environment with its many tools can offer a solution), since it is an ethical obligation to reconstruct the movements and history of ancient objects.

8.1 Reconstructing contexts and objects: 3D technologies and thick mapping

To be correctly interpreted, the inscription must be analysed taking into account its context of production, use and any relocation due to reuse. For example, particular attention to the geographical location of inscriptions is paid by *LatEpig*, a tool that allows querying all inscriptions in the *Epigraphic Database Clausi Slaby* in a reproducible manner, saving results in a TSV and JSON file and reproducing them on an interactive map of the Roman Empire.

In recent years, the practice of **3D modelling and digital reconstruction of archaeological contexts** has spread in archaeology for research and dissemination purposes. In particular, 3D modelling or visualisation (and other techniques such as Augmented Reality, AR) is used for the reconstruction of damaged or lost objects and archaeological contexts. For this reason, this technique is particularly used for the digital preservation of cultural heritage sites, provided that the reconstructive models follow a scientific approach.

An example of this practice is *Ancient Olympia: Common Grounds*, a collaboration between the Greek Ministry of Culture and Sport and Microsoft, which uses AI and 3D modelling to recreate the ancient city of Olympia with guided tours among monuments and buildings. Furthermore, the use of 3D reconstructions can also have the ethical function of reviving our cultural heritage damaged by natural disasters or human intervention. This is the objective of *Rekrei*, a participatory project that collects photographs of damaged monuments, museums and artefacts and creates 3D representations through photogrammetric techniques.

More common in the epigraphic field is **3D imaging or scanning**, which recreates a three-dimensional digital copy of the inscribed object. Several projects make use of 3D imaging, such as *Epigraphia.3D* and some projects of the *Digital Epigraphy and Archaeology Project* at the University of Florida. The advantage of having 3D images of inscriptions is particularly evident in the case of damaged inscribed surfaces that are difficult to read with the naked eye. An accurate digital reproduction of the object can enable, for example, an exact categorisation of ancient inscriptions by providing information on epigraphic workshops.

Other projects make use of **Reflectance Transformation Imaging (RTI)**, a computational photography technique that captures the surface shape and colour of the artefact, allowing interactive re-lighting of the subject from any direction and improving the legibility of the written document. RTI images of a small collection of inscriptions are used on the website of the *Ashmolean Latin Inscriptions Project*.

Moreover, many image repertories make use of the **International Image Interoperability Framework (IIIF)**, a set of application programming interfaces that provides a standardised method for integrating textual data with images of documents bearing texts (including manuscripts, inscriptions, cultural heritage objects) and their metadata.

8.2 Objects on the move

In addition to the reconstruction of archaeological contexts and objects, it is important to **record the history of movements of the object**, highlighting its connection with different places and its possible different functions in relation to those places. EpiDoc markup with its template provides structured sections in which the different locations of the inscribed object can

be recorded, from its place of origin (<origPlace>) to the discovery context and subsequent modern observations. The modern locations of the object are encoded by a <provenance> element: by adding a @type attribute to the element, it is possible to specify through different values the circumstances of findings ("found"), scholarly observations ("observed") and any relocations ("transferred").

This is an example from *I.Sicily* (ISic000477):

```

93 <history>
94 <origin>
95 <origPlace><region>Sicilia</region>
96 <placeName type="ancient" cert="low"/>
97 <placeName type="modern" ref="http://pleiades.stoa.org/places/816414429">Castronuovo di Sicilia</placeName>
98 <geo>37.67894, 13.60346</geo>
99 </origPlace>
100 <origDate datingMethod="#julian" notBefore-custom="0570" notAfter-custom="0570" evidence="internal-date">570 CE (cos. date)</origDate>
101 </origin>
102 <provenance type="observed">Known since the 17th century; previously in the church of S. Maria dell'Udienza on Colle S. Vitale; Subsequently transferred to the
103 Chiesa Madre of the Holy Trinity in Castronuovo, where it is built into the wall.</provenance>
104 <provenance type="observed" subtype="autopsied">None</provenance>
105 <acquisition/>
106 </history>

```

EpiDoc markup thus allows the digital editor to record with great care the details of the spatial location of the object over time, but it is not the only way to record its history of movement. **Thick mapping**, for example, visualises different data on a geographical map, taking into account the different movements and moments in the life of the object, adding different layers of information and different types of data. This is the objective of the project *Deep-mapping Sanctuaries*, funded by the Dutch Research Council (NWO), which aims to create a "spatial narrative" of festive centres in the Hellenistic world through thick mapping.

Furthermore, some digital epigraphic projects have maps that **geolocate inscriptions** and other written artefacts using a **Geographic Information System (GIS)**. An example is the tool provided by the *LatinNow* project, *LatinNow GIS Data*, a freely available online web GIS that allows the visualisation of a large epigraphic dataset alongside a range of data from collaborating projects. A project that uses GIS software is *Poeti Vaganti* (Prof. A. Cinalli, funded by the European Union Horizon 2020 programme), to produce a cartographic representation of the mobility of performers in the Hellenistic period.

Further reading:

Lasagni, C. (2020b). *The Places of the Inscriptions: From Epigraphy to Digital Epigraphy*. *Historikà*, 10, 233–250. <https://doi.org/10.13135/2039-4985/5185>

8.3 Decolonising ancient cultural heritage

The digital reconstruction of archaeological contexts and the digital reproduction of artefacts have considerably furthered the **decolonisation of ancient cultural heritage**: it is not uncommon for many inscribed objects found primarily in the south-eastern Mediterranean to have been brought to light by archaeological explorations connected to a colonial context and transferred to European museums and institutions, thus being torn from their places of origin. The digital environment, on the other hand, allows for the reproduction of the inscribed object through images and the reconstruction of its history from discovery to transfer, thereby fostering its reappropriation by the inhabitants of the countries of origin.

This is, for example, the objective of a corpus such as *IGCyr* (*Inscriptions of Greek Cyrenaica*), as indicated in the preface edited by Alice Bencivenni (2017), which emphasises how the project was launched with the intent to make the Libyan epigraphic heritage accessible to Libyan scholars themselves, in a moment of great political uncertainty and impossibility of conducting archaeological expeditions in the territory.

Further reading:

Kenrick, P. M. (2013). *Cyrenaica*. Silphium Press. <https://www.bilnas.org/ebook/libya-archaeological-guides-cyrenaica/>

Traina, G. et al. (2006). *Sur le concept de romanisation. Paradigmes Historiographiques et perspectives de recherche. MEFRA*, 118(1), 71–166.

9. Put it into Practice! Dissemination

This lesson aims to present issues, teaching materials and projects related to the scientific dissemination of epigraphic knowledge and public engagement with digitised heritage. We will consider, on the one hand, the active participation of digital epigraphists in digital infrastructures and, on the other, the tools employed to engage the general public in scientific research and for cultural heritage organisations addressing the broader community.

9.1 Scientific dissemination: international digital infrastructures

As already mentioned, one of the most important aspects of digital epigraphy is the possibility of **exchanging and reusing data** according to the principles of Linked Open Data. Exchange and reuse are possible because resources are identified and disambiguated through a unique URI; moreover, data are published in Open Access and structured according to specific encoding formats. Scientific dissemination in the digital environment is therefore based on these principles and is also made possible by the existence of international digital infrastructures that make datasets freely available by aggregating different projects. Among these it is worth mentioning:

- **Trismegistos**
- **Europeana**, a platform offering tools with the aim of improving access to cultural heritage for education, research, creativity and leisure (among its projects is EAGLE);
- **DARIAH-EU**, an international network whose objective is to enhance and support digitally enabled research and teaching in the arts and humanities (among its projects is #dariahTeach).

For the **websites** of these digital infrastructures, see the webography at the end.

9.2 Scientific dissemination: publication tools

For the publication of individual corpora of inscriptions in XML there are several tools, including TEI Publisher, CETEIcean, TAPAS (*TEI Archiving, Publishing, and Access Service*) and Kiln; here we focus on the two tools most directly designed for digital epigraphy: EFES and EDEp.

EFES (*EpiDoc Front-End Services*) is a customisable platform specifically designed to publish ancient texts in EpiDoc XML, developed from Kiln by the King's Digital Lab at King's College London. The platform enables the creation of multiple indices, search and navigation interfaces, concordances and integration with Linked Open Data. Many of the epigraphic projects mentioned in previous chapters are published via EFES.

A complementary approach is offered by **EDEp** (*Editing tools for digital epigraphy*), a project funded by the Deutsche Forschungsgemeinschaft and developed in collaboration between the Johannes Gutenberg-Universität of Mainz and the Heidelberger Akademie der Wissenschaften. Unlike EFES, which is primarily a publication and search tool, EDEp focuses on the **redaction** phase of the digital edition, offering an editor with an intuitive front-end interface, designed to be accessible even to users with little experience in digital encoding. The editor allows the entry not only of the text of the inscription with an integrated EpiDoc converter but also information on the materiality and the ancient and recent history of the object. In keeping with FAIR principles, both the data produced and the editing tools are freely available for reuse: a further point of interest is the possibility of producing diversified outputs from the same data, such as online digital editions and print or e-book publications.

9.3 Digital tools for public engagement

Digital Epigraphic Storytelling

An important tool is **storytelling**, i.e. the creation of **multimedia narratives on epigraphic content**. The practice of storytelling starts from the assumption that behind every document there are stories of people and/or communities and that every document requires historical contextualisation to be correctly read and interpreted. Trying to give voice to ancient documents and to inscriptions in particular can have multiple purposes and involve different domains, from education (storytelling as a way to support training activities), to research (storytelling as a way for scholars to inform the public about ongoing research) and museum curation (storytelling as a way to promote archaeological heritage and facilitate broader access to ancient artefacts).

A storytelling platform is offered by EAGLE, the *Flagship Storytelling Application*. Through this platform, users can read published stories and publish new ones by accompanying them with epigraphic texts, images, videos, maps of ancient places and other resources provided by EAGLE and other providers (Perseus, Wikimedia Commons) according to LOD principles.

An example of a story published on the EAGLE platform is *Le due Paresie – GVCyr 8, 9* by Giulio Iovine.

– Quanti anni hai, piccolina?

– Oh, nemmeno quattro.

– Apperò. Come parli bene.

– Credo perché sono morta, rispose tristemente la bimba. – Prima era diverso.

– Ciao, disse la signora.

– Ciao, rispose la bimba.

E si sedettero su una roccia, mentre sul sentiero calava il tramonto. La signora aveva i capelli come la panna, bianchi e morbidi; la bambina i boccoli castani.

– Come ti chiami?, chiese la signora.

– Paresia, rispose la bimba.

– Pure tu? Anch'io mi chiamo Paresia.

– Dai, stai scherzando.

– No no, giuro. E tua mamma?

– Efaistò.

– Scherzi? Anche la mia.

– Non possiamo essere la stessa persona. Tu sei una signora e io sono una bimba.

– Ma infatti non lo siamo. Come si chiama tuo babbo?

– Acrisio.

– Vedi? Il mio era Lisidamo.

– Fiuuu. Mi ero presa un colpo.

– Quanti anni hai, piccolina?

– Oh, nemmeno quattro.

– Apperò. Come parli bene.

– Credo perché sono morta, rispose tristemente la bimba. – Prima era diverso. Non so se è successo anche a te.

– In un certo senso, rispose la signora. – Da viva mi faceva un male assassino l'anca. Adesso no.

– Non è una brutta cosa, questa.

– No, per me no. Figurati, a sessant'anni suonati, con tutti i nipoti e tutti i dolori del mondo, mi ero già bella che stancata. Meritavo un po' di riposo. Ma tu, piccolina, che tristezza.

Andarsene a soli quattro anni.

La bambina fece spallucce.

– Non saprei. Ero al mondo da così poco che francamente non ho idea di cosa mi sia persa.

La Paresia coi capelli color panna non rispose, perché la Paresia coi boccoli non aveva torto.

Si alzò in piedi, e:

– Andiamo? C'è ancora un po' di strada da fare.

- Mi tieni per mano? La mamma lo faceva sempre.
- Ma certo.
- Tu sai dove stiamo andando?
- No. So solo che dobbiamo andarci. Ti dispiace?
- No.
- Non ti fa nemmeno un po' paura? A me sì.
- No. Come potrebbe? Non l'ho mai vissuto.
- Anche questo è vero, rispose la Paresia bianca, e presa per mano la bimba, se la portò dietro delicatamente lungo il sentiero, verso il sole che tramontava.

The story is inspired by two Greek verse inscriptions on stone found in Cyrene and dated to the 2nd century AD, published in the corpus *Greek Verse Inscriptions of Cyrenaica*:

*GV*Cyr 8: "I am the daughter of Hephaistous and Akrisios is my father, my name is Paresia. While still a child I descended to the gates of Hades and for not even four full years did I see the sweet light of the sun. In my house I did not hear the joyful well-rhythmed sound of songs, nor did the aulos beneath my porticoes make its clear sound vibrate, nor did the hymenaios in procession make the sweet melody of the Muses resound. But the kingdom of silence took hold of me, an unknowing child, who now speaks of her family through the inscribed letters of a stele, no longer with my own voice."

*GV*Cyr 9: "I was the daughter of Hephaistous and I had Agathangelos as my husband, I inspired respect in all. My name is Paresia. I gave myself to many occupations, in all worthy of trust. For this reason my husband placed this stele here as a prize for me, to show that I received the crown for all virtues: indeed in all I carried off first prize. And on the occasion of the choruses in my honour beneath the porticoes I heard in my house the joyful well-rhythmed sound of songs, the aulos in my porticoes made its clear sound vibrate, Hymenaeus in wedding procession made his sweet melody resound. At more than sixty years I descended into Hades, and now, a perfect woman, incomparable in all, reduced to silence I lie, I speak through the stele. Who I am, where I come from, the stele says, my mouth is silent."

Not only international digital infrastructures promote storytelling, but also individual museums: a wonderful example of this practice is the storytelling initiative promoted by the Museo Nazionale Romano *#ilMuseoTiRacconta*. An ongoing digital storytelling project worth mentioning is *Telling Stones* (Department of Historical Studies, University of Turin), which aims to make some Athenian public inscriptions accessible to the public by emphasising the connection with their original context. This is made possible through the *Izy.Travel* app, which offers the possibility of listening to and downloading user-created geolocated audio guides.

School engagement

The EAGLE project was responsible for organising a workshop *Laboratorio di epigrafia romana a scuola. Il progetto EAGLE e alcune esperienze didattiche con i licei classici e scientifici di Roma, 2015–2016*. During this workshop, students were given an introduction to Roman epigraphy and the EAGLE project, with practical exercises in editing epigraphic texts and entering translations on MediaWiki.

Other digital epigraphic projects are very active in engaging schools, such as the *Ashmolean Latin Inscriptions Project* (AshLi), which provides various teaching resources including texts, images and videos, and *Roman Inscriptions of Britain in Schools*, an open learning collaboration between *LatinNow* and *Classics For All*. The projects *I.Sicily* and *EPICUM* have also collaborated with the Liceo Artistico Statale M.M. Lazzaro within a school-work alternation programme, producing digital editions of inscriptions from Catania held in the Museo Civico di Castello Ursino.

Virtual exhibitions

Another area aimed at promoting public dissemination is that of **digital and virtual exhibitions**, which offer an immersive and interactive experience using animations to reproduce original artefacts and archaeological contexts. Such exhibitions usually aggregate different types of content (digital libraries of 3D models, texts, images, geospatial data, audio, video, etc.) and are useful for temporarily or permanently displaying tangible and intangible cultural heritage: the techniques employed – Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), etc. – can also contribute to the preservation or reconstruction (in case of loss) of damaged archaeological heritage.

Video games

Finally, another way of bringing the past closer to the general public is through **video games**, which represent an important participatory form of public history, offering interpretations of the past in the form of simulations and can be used for educational and academic purposes. Worth mentioning is the first example of an epigraphic video game, *VALETE VOS VIATORES*, a project funded by the European Union Creative Europe programme and produced by the University of Navarra, the University of Coimbra, the University of Bordeaux and the University of Rome La Sapienza. The project provides a virtual museum and a video game created through 3D modelling, following in the footsteps of a stone-carver in the Roman Empire: by playing the video game, users learn the rudiments of Roman stone-craft and the epigraphic culture of the western regions of the Roman Empire.

Another EAGLE digital tool is a **mobile app**, the *EAGLE Mobile App*, which uses an image-based recognition system to provide the text and metadata of inscriptions from photographs: users can take a photo of an inscription with a mobile device, send it to the EAGLE server, which matches the image to inscriptions stored in the EAGLE database. Translations of inscriptions are provided via *EAGLE MediaWiki*, a software installed on the EAGLE website that uses the additional Wikibase extension, with the aim of producing multilingual translations of ancient inscriptions.

10. AI and Ancient Inscriptions

This lesson illustrates individual projects based on the application of AI to the study of ancient epigraphy, providing an up-to-date list of the most recent studies and projects. The critical aspects and best practices in the use of AI applied to this field of study will also be discussed.

10.1 The application of AI in epigraphy: the example of some projects

Machine learning is the branch of **Artificial Intelligence** that teaches computers patterns and models by analysing examples from already provided datasets; these models are incorporated by computers and applied to other new datasets. In recent years, many projects in the field of ancient cultural heritage have made use of machine learning to carry out various automated tasks such as the translation of ancient texts, the restoration of damaged texts, the identification of ancient artisan workshops and hands, the attribution of ancient written artefacts to their original place of discovery, 3D representations of damaged archaeological sites etc. In the epigraphic field in particular, several interesting tools can be mentioned:

- **Ithaca** (Thea Sommerschild, University of Oxford; Yannis Assael, DeepMind et al.): this is an implementation of **Pythia**, an algorithm that aims to integrate Greek inscriptions based on missing characters, to attribute them to a precise geographical context and to place them within a defined chronological horizon. A counterpart for Latin inscriptions is **Aeneas**;
- **Fabricius** (Google Arts and Culture): a machine learning tool that offers translations of Egyptian hieroglyphs into modern languages;
- **Classifying Latin Inscriptions of the Roman Empire: A Machine-Learning Approach** (Vojtěch Kaše, Petra Heřmánková and Adéla Sobotková, SDAM project): a machine-learning-based classification model that uses the EDH inscription categories to label EDCS inscriptions with the aim of standardising inscription categories in shared vocabularies (EAGLE);
- **AGILe** (*The First Lemmatizer for Ancient Greek Inscriptions*): open-source software that applies Machine Learning for the lemmatisation of epigraphic texts, developed by a team at the University of Groningen. The model is trained on epigraphic data because these are very different from literary texts, being characterised by many different local alphabets, great dialectal variation and a lack of standardised spelling.

These tools are the product of projects that have involved the collaboration of different scholars and comprise multiple phases. Another important example is the project *Reconsidering the Roman workshop: examining the process behind the making of inscribed texts*, funded by the *Institute for Data Science and Artificial Intelligence* (Charlotte Tupman and Jacqueline Christmas, University of Exeter), which in a first phase used text recognition software to detect words in an image with the aim of obtaining information on patterns in the design and creation of epigraphic texts in the Roman world and of possibly identifying the work of individual workshops.

10.2 Challenges and best practices

However sensational these tools may be, there are some **challenges** that scholars must face in the use of AI and ancient writing cultures. First of all, the **predictive capacity of the software** can be distorted by the type of data we use during training: for example, if we provide the software with documents from a single geographical area or historical period, we will obtain very different results from those that would be obtained by broadening the scope or modifying the parameters. Another important issue in using machine learning for the study of inscriptions is **the need to create large, standardised and consistent datasets for software training**: the data must be numerous because, unlike humans, machines can only learn from large datasets

that are standardised and consistent as they must be processed by computers. Not all epigraphic databases available online have these characteristics, although in recent years the spread of semantic encoding in EpiDoc-XML has contributed to creating standardised and potentially reusable data.

Another recent challenge involving the use of AI in the study and publication of ancient epigraphic documents is the automatic encoding in EpiDoc through the automatic training of LLMs (*Large Language Models*). This is a still experimental area of research: while tools like Ithaca or Pythia operate on the text as a sequence of characters, these projects aim at the creation of semantically correct EpiDoc XML files through the processing of interpretive choices of a philological and epigraphic nature and relating to the structuring of metadata concerning the provenance and chronology of the inscription. To do this, some projects (such as the aforementioned *Ancient Inscriptions from Israel / Palestine*) have developed an automated pipeline based on artificial intelligence models such as Claude, ChatGPT or Gemini capable of automatically marking up texts in XML-EpiDoc and comparing the different results to identify a more effective LLM for these purposes. In all these cases, the provision of detailed instructions with transcription and markup examples has significantly improved the correctness of attributes, confirming that the quality of prompting is decisive for the reliability of the output: fundamental nonetheless remains the quality and homogeneity of training data, which is still a *desideratum* among existing digital epigraphic corpora, which reflect different editorial choices that are difficult for the algorithm to reduce to a single coherent standard.

These experiences raise important methodological questions for the discipline: how to evaluate the quality of encoding produced in part by an algorithm? How to guarantee transparency and scientific accountability in the attribution of editorial choices? And how to avoid automation reproducing and amplifying the inconsistencies already present in training data? These are questions that the community of digital epigraphists is called upon to address in the coming years, in dialogue with computer scientists and artificial intelligence specialists, in the awareness that, as already observed with regard to other AI tools applied to epigraphy, the objective is not to replace the work of the specialist, but to provide them with more powerful tools for carrying it out.

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Web Resources

Websites of databases mentioned in sections 2.1 and 9.1 (links updated to 31 March 2026):

Ancient Inscriptions of the Northern Black Sea (IOSPE):

<https://iospe.kcl.ac.uk/index.html>

Attic Inscriptions Online (AIO): <https://www.atticinscriptions.com/>

Collection of Greek Ritual Norms (CGRN): <http://cgrn.ulg.ac.be/>

Digital Research Infrastructure for the Arts and Humanities (DARIAH-EU):

<https://www.dariah.eu/>

Epigraphic Database Bari (EDB): <https://www.edb.uniba.it/>

Epigraphic Database Roma (EDR): <http://www.edr-edr.it/default/index.php>

Europeana Eagle Project: <https://www.eagle-network.eu/>

Greek Economic Inscriptions (GEI): <https://saet.sns.it/en/gei-greek-economic-inscriptions/>

Hispania Epigraphica (HE): <https://hepol.uah.es/>

Inscriptions of Aphrodisias Project (InsAph): <https://insaph.kcl.ac.uk/iaph2007/>

Inscriptions of Greek Cyrenaica / Greek Verse inscriptions of Cyrenaica (IGCyr/GVCyr²), second edition 2024: <https://igcyr2.unibo.it/en/>

Inscriptions of Roman Cyrenaica (IRCyr 2020): <https://ircyr2020.inslib.kcl.ac.uk/en/>

Inscriptions of Roman Tripolitania (IRT), second edition 2021:

<https://irt2021.inslib.kcl.ac.uk/en/>

Mappola: <https://mappola.eu/>

Practicalities of Hellenistic Ruler Cults (PHRC): <https://phrc.it/index.php>

Roman Inscriptions of Britain (RIB): <https://romaninscriptionsofbritain.org/>

Trismegistos: <https://www.trismegistos.org/>

