

**Heritage science** delivers cutting edge knowledge and skills to enable the appreciation and management of cultural heritage

**E-RIHS** is a world-leading European infrastructure delivering cross-disciplinary innovation in heritage science

## **Mission**

Heritage science responds to pressing global challenges impacting on European science and society. Through studies of our past, heritage science contributes to social identity and a sense of place. Through research into heritage management, science contributes to sustainable tourism and preservation of cultural and natural heritage.

By developing and utilizing cutting edge science, heritage science delivers a broad range of cross-disciplinary skills, from engineering to digital, from physical sciences to humanities.

The mission of the *European Research Infrastructure for Heritage Science* (E-RIHS) is to ambitiously stretch the boundaries and the impact of heritage science by developing the most comprehensive and advanced scientific and technological capabilities. We will enable researchers, organizations and industry to develop skills, knowledge and innovation to enable the appreciation and preservation of heritage.

E-RIHS will deliver integrated access to expertise, data and technologies through a standardized approach. We will promote a culture of cross-disciplinary collaboration and training. We will integrate world-leading European resources and create an organisation with a clear identity and a strong cohesive role within the global heritage science community.

E-RIHS will promote best practice and develop or advance methods designed to respond to the specific needs of heritage assets, whether material or digital, based on the extensive experience of its founding members. Our pillars are *excellence, transnational collaboration, innovation, communication and ethical science*.

## Scientific vision – How?

E-RIHS will be the flagship **European Research Infrastructure for Heritage Science**. The exceptional collections in European museums, galleries, libraries and archives means that there are literally uncounted objects that need to be studied, interpreted and preserved. Monuments, buildings, archaeological and palaeontological sites can now be scientifically probed using innovative techniques that require complementary skills and knowledge from a range of disciplines. This calls for thousands of **object-specific studies** and **major international projects** requiring the collaboration of a large number of research laboratories and institutions from all over Europe.

These projects raise crucial research questions related to cultural and natural heritage materials. A first set of questions regards the **origin** of heritage materials and the necessity of understanding their history, their technical background, their circulation and use, their political, cultural, symbolic or other values they embody, and their alteration over time. A second set of questions addresses the **diagnosis** of the current state of those materials. A third set concerns their **future**: their conservation and restoration for the benefit of coming generations. From the material constituents point of view, heritage objects and sites are intrinsically heterogeneous and complex. Indeed, heritage materials are not model materials for which the analytical parameters are known a priori. In addition, they have been subject to decay through use and ageing under diverse and often unknown conditions over many decades, centuries or even millennia. Heritage materials are fragile and their integrity must be preserved. Safety must be guaranteed throughout the analysis process, from sampling to adapted analysis protocols. As a consequence, experiments on heritage materials cannot be easily reproduced. The scientific study of heritage materials is therefore especially challenging. These domain-specific research requirements will be met by E-RIHS and its unexplored heritage science potential.

E-RIHS will support **the most advanced scientific investigation of heritage** when the synergy of collaboration between national facilities makes it possible to address extraordinary cross-disciplinary research questions related to the history, interpretation, diagnosis and preservation of cultural and natural heritage. Through a concerted procedure, E-RIHS will deliver **integrated access to cutting-edge analytical technologies** and **scientific archives**, namely to four platforms:

- **FIXLAB** for large-scale analytical facilities and **MOLAB**, a fleet of advanced mobile instruments that travel to a site, and,
- **DIGILAB** for online scientific data and tools, and **ARCHLAB** for physical archives.

E-RIHS will support both object-specific studies and large-scale projects, especially those requiring analytical support through multiple visits to the same facilities, to different facilities from the same platforms or to different platforms. Such projects will be granted long-term access to E-RIHS and its capabilities.

E-RIHS will promote excellence through best practice by implementing a quality management system, independent project selection and data policies guided by principles that are inherent to all world-class research infrastructures. In addition, E-RIHS will develop practices designed to respond to the specific character of heritage science, based on the **extensive experience** of its founding members. The scientific strategy of E-RIHS builds upon ten core values:

1. **Competencies first** – Considering skills as central
2. **Interdisciplinarity** – Optimising work for teams with complementary culture and practices
3. **Co-creation** – Building on a paradigm that balances contributions from all participants
4. **Communication** – Exploiting the public-facing nature of heritage institutions and sites
5. **Excellence** – Supporting outstanding projects
6. **Interoperability** – Promoting good data management, intelligent instruments and open access policies
7. **Innovation** – Stimulating evolution of instruments and practices through cutting-edge research
8. **International recognition** – Collaborating at global level
9. **Ethics** – Promoting respect for heritage values and encouraging responsible research
10. **Quality** – Guaranteeing the best user experience

These ten values will be at the heart of E-RIHS.

Collaboration is essential to avoid duplication of investments and fragmentation of research efforts. E-RIHS will foster a **culture of interdisciplinarity, exchange and cooperation** associating researchers from the required disciplines **on equal level** (experimental sciences, arts, humanities and social sciences or digital sciences). Newly generated knowledge will be co-created by users and platform scientists. Multidisciplinary interactions within E-RIHS will be an intrinsic element of its identity, as it is of defining importance to heritage science. E-RIHS will provide access to expertise and competences as well as to instruments or databases.

E-RIHS will contribute to the **development and adoption of new research methodologies**. New instruments, new protocols and new techniques have a decisive impact on heritage science research, enabling improved understanding of heritage objects and sites. Digital technologies are rapidly expanding and leading to uncharted research territories. E-RIHS will extend the formal frameworks for data interpretation and management developed by digital humanities (e.g. DARIAH<sup>1</sup>). E-RIHS will promote the re-use of information, such as experimental schemes, raw data, metadata, algorithms and their applications, to foster replicability and innovation. Internal research activities will ensure that E-RIHS pushes the boundaries of innovation to offer the best possible infrastructure to the research community. E-RIHS will stimulate innovation in large-scale instrumentation, non-invasive portable technologies and data science. E-RIHS will foster multimodal approaches where coupled techniques enable improved studies and understanding of heritage materials. An exciting example is the rise of new imaging methods that allow the extreme complexity of heterogeneous, chemically complex and multi-scale heritage materials to be studied. E-RIHS will integrate the full power of novel imaging techniques within its instruments, competencies, and training.

Building on the leading international standing of European heritage science, E-RIHS will establish an infrastructure of global interest that will integrate partners and facilities outside the EU and reach its worldwide community of users.

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<sup>1</sup> DARIAH, Digital Research Infrastructure for the Arts and the Humanities, <https://www.dariah.eu/>

## Impact and benefits – Why?

### Introduction

E-RIHS will integrate national science facilities of internationally leading excellence across its broad remit. Through joint development and shared access to these facilities and the associated expertise, E-RIHS will become the driving force for cutting edge science, skills development, innovation and engagement in heritage science, with a lasting European legacy.

### Cutting edge heritage science

E-RIHS members will pool their expertise, resources and infrastructure. This will enable the Partnership to offer access to the widest range of state-of-the-art scientific instruments, data and knowledge, which will lead to unprecedented advances in heritage science and engineering. E-RIHS will specifically deliver cross-disciplinary innovation and provide integration throughout the diverse strands of physical, digital and scholarly research.

### Strategy and policy

E-RIHS will provide global leadership in the field of heritage science. Through its world-leading research, training and dissemination activities, it will provide the go-to address for strategic advice to institutions and funders. By developing a long-term vision for the field, and through collaboration with expert and professional bodies, it will be able to develop policies that will support and influence national, European and international scientific innovation in the field.

### Benefits to researchers

Researchers will be supported throughout the research process, as in order for E-RIHS to achieve impact, it is essential that it provides advice, training, support as well as access to infrastructure and to dissemination opportunities. We will help projects build truly cross-disciplinary partnerships and will assist in the development of state-of-the-art heritage science and engineering. We will achieve this through (i) a mutually supportive expert community; (ii) free access to a globally leading heritage science infrastructure, and (iii) own digital deposits of information on objects of study (E-RIHS DIGILAB).

### Benefits to institutions

Research institutions, whether partners or not, will benefit through better coordination of collaborative cross-disciplinary research, leading to efficient use of resources and intensified international impact. E-RIHS will benefit partners through (i) its strategic leadership, (ii) its pool of experts, (iii) through development of innovative and supportive partnerships, (iv) through intensive dissemination and promotion of E-RIHS research. Heritage and art institutions will benefit through significantly improved access to cutting edge science, leading to a step change in the understanding and management of European cultural heritage.

### Innovation

E-RIHS will continuously innovate developing instrumental and digital technologies while also introducing novel scientific methodologies in the study and preservation of heritage. And in doing so, it will boost the development of associated heritage industries. Heritage tourism and creative industries will benefit through improved engagement of visitors with heritage. Conservation and analytical services will benefit through innovation in characterisation, monitoring, documentation, conservation and visualisation of heritage. Construction industry will benefit through the introduction of new materials or novel methods of surveying, testing and digital imaging including augmented and virtual reality, and AI.

### Skills development

Training will represent the core enabling activity within E-RIHS. Access to state-of-the-art heritage science infrastructure will require skills development in specific scientific, technical, digital and cross-disciplinary skills. Further skills development will be required to enable institutions to manage and develop infrastructure. These activities will encompass hands-on courses, remotely delivered training, as well as hybrid delivery of training programmes, both within higher-education environments and in research institutions, thus providing essential transferrable skills.

### Digital leadership

In a fast developing digital world, a vast majority of heritage data is nowadays produced, analysed and transmitted in a digital form. E-RIHS will provide leadership through the development of common standards and databases that will enable researchers and institutions to deposit, retrieve, query, reuse and repurpose data. Perhaps even more importantly, it will lead the way in the development of methods of understanding, visualisation and use of digital data through improved augmented and virtual reality methods and through open access DIGILAB platforms.

### Funding opportunities

As a legal body, E-RIHS will use its reputation and innovative potential to develop funding for research, training and dissemination. Such funding will benefit partners nationally and internationally through contracted activities. This will fully support the EU policy to aggregate research efforts within ERICs, and it possible to expect that E-RIHS Partnership could become a decisive advantage in the development of funding in the field of heritage science in the future.

### Public engagement

Heritage science engages the public through heritage and through science. Through intensive dissemination, we intend to fully explore the potential of heritage science to enthuse the public in what we do, and to engage

layers of the broader community that do not usually take part in heritage or science activities. This will contribute to community building, social wellbeing and social cohesion in Europe.

### European Legacy

E-RIHS will provide decisive support for the establishment of *European Legacy* for tangible and digital cultural assets in European countries. This will include collections, buildings and sites, including art, historical documents, industrial heritage and design, as well as digital collections, that provide identity to European countries in relation to history, art, technological development or fashion of transnational relevance.

### **Concluding note**

If having read these notes, you have come to the conclusion that E-RIHS could help you deliver your institutional or national strategies to the full potential, then please enquire with us about the opportunity to become a member.

E-RIHS will be run for an experimental transitional period of five years, during which its defining concepts will be tested and improved upon. All member countries will have the opportunity to contribute to this development. We trust that this will enable the national hubs and local communities to feel that the benefits of membership outweigh the costs.

The opportunity to support this development and to influence, contribute and excel within the E-RIHS partnership is unique.