E-RIHS

EUROPEAN RESEARCH INFRASTRUCTURE
FOR HERITAGE SCIENCE

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E-RIHS DIGILAB: a Data and Service Infrastructure

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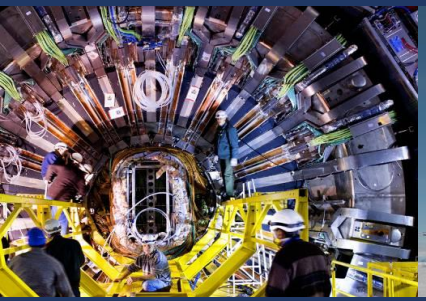
ISGC 2018 – International Symposium on Grids & Clouds

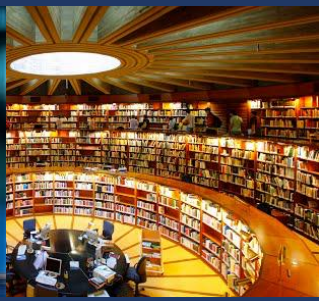
a European research infrastructure…

…is based on sharing the best resources available to enable top-level research in specific scientific domains

- any researcher can apply to be a user of a RI
- any resource for cutting-edge research can be a facility in a RI
- the EU strategy forum for RIs (www.esfri.eu) defines which RIs are strategic for EU development, and publishes a Roadmap



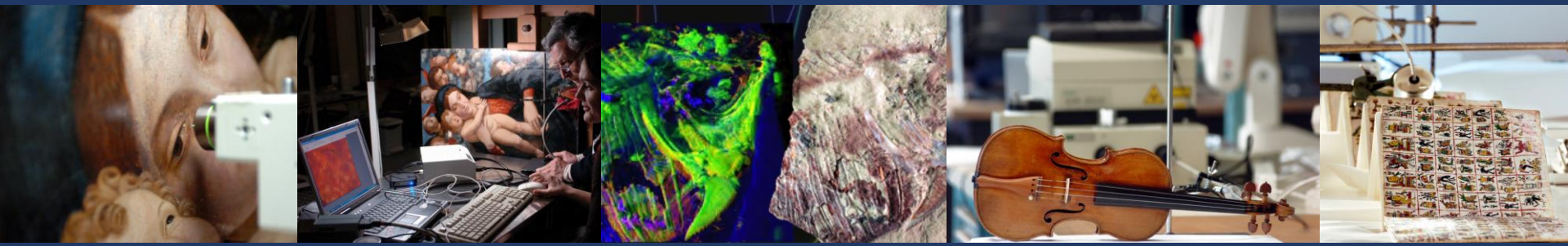


heritage science is…

…a transdisciplinary scientific domain founded on the combination of knowledge from arts, humanities, science and technology

- providing a holistic approach to cultural and natural heritage preservation, documentation, interpretation and management
- heritage science approach leads to the co-creation of knowledge



E-RIHS ['ɪris] European Research Infrastructure for Heritage Science

- ESFRI Project for the implementation of the EU RI for heritage science – in ESFRI Roadmap since 2016 – coordinated by CNR, IT
- a distributed research infrastructure – about 100 facilities, currently involving 23 Countries (and counting…)
- a collection of advanced tools and services for a cross-disciplinary community of researchers

E-RIHS access platforms

ARCHLAB

access heritage archives and collections

DIGILAB

data and tools for heritage research

FIXLAB

access LSF and advanced laboratories

MOLAB

mobile instruments for in-situ diagnostics

access to all services but DIGILAB will be provided via periodic calls (every six months)

E-RIHS challenges

- support the establishment of the research area of heritage science, fostering a transdisciplinary culture of exchange and cooperation
- pursue the integration of world-class facilities to play a prominent role at the global level
- carry out alignment of diagnostic approaches and use of best practices
- establish a common infrastructure of open data and services

E-RIHS state of the art

- **E-RIHS** is in its preparatory phase, receiving funds by the EU project **E-RIHS PP**, also coordinated by CNR, IT
- some of **E-RIHS** services (access, training, dissemination) are provided by the EU project IPERION CH (www.iperionch.eu) and by some national E-RIHS RIs

- **E-RIHS PP** is expected to deliver in 2019 all documents needed to start **E-RIHS** as a stable organization (ERIC)
- start of **E-RIHS ERIC** implementation phase is scheduled in 2021

Pan-European dimension of the E-RIHS

E-RIHS PP Partner Countries (16)

Italy (coordinating)
Belgium
Cyprus
Czech Republic
France
Germany
Greece
Hungary
Ireland
Israel
Poland
Portugal
Slovenia
Spain
The Netherlands
United Kingdom

Observers

ICCROM
Romania
Russian Fed.

Austria
Brazil
Denmark
Sweden
USA

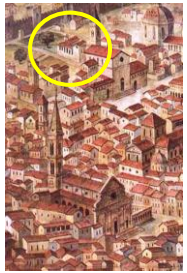
Scientific contacts in:

Argentina
Australia
Canada
Cap Vert
China
Egypt
India
Lithuania
Mexico
Singapore
Taiwan

Approaching (E-)RIHS global dimension

- while working to establish the **E-RIHS** Consortium in 2021 for EU Members and Associated Countries…
- …partners are cooperating with ICCROM (www.iccrom.org) to:
  - promote **E-RIHS** outside Europe
  - explore the potential of **E-RIHS** at global level
  - find suitable forms to grow **E-RIHS** into a distributed Global Research Infrastructure

E-RIHS structure



- a Central Hub – to be seated in Florence – will be the unique access point of the RI
- National Hubs will organise facilities at national level
- only NHs will liaise with CH
- NHs will be responsible for committing the national in-kind contribution to **E-RIHS**

Discovering the research potential of **E-RIHS**

ARCHLAB

access heritage archives and collections

DIGILAB

data and tools for heritage research

FIXLAB

access LSF and advanced laboratories

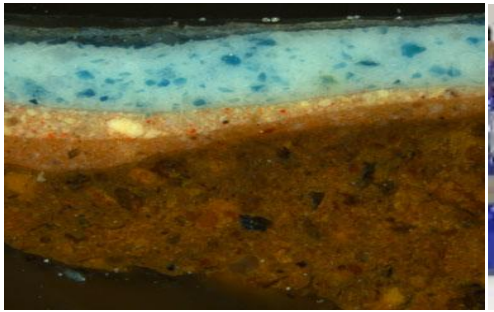
MOLAB

mobile instruments for in-situ diagnostics

Highlights of access projects supporting research for heritage

ARCHLAB

scientific archives for heritage science



ARCHLAB highlights - I

IPERION CH

Scope of the access:
Indirect lost-wax casting and fusion welding: did Egyptian craftsmen master these two techniques to manufacture their large-scale bronze statues of the early first millennium BC?

Heritage object:
Egyptian statue (BM EA60719)
height 83 cm, ~X century BC

Major research activities:
Access to the object and to reports and data at the BM

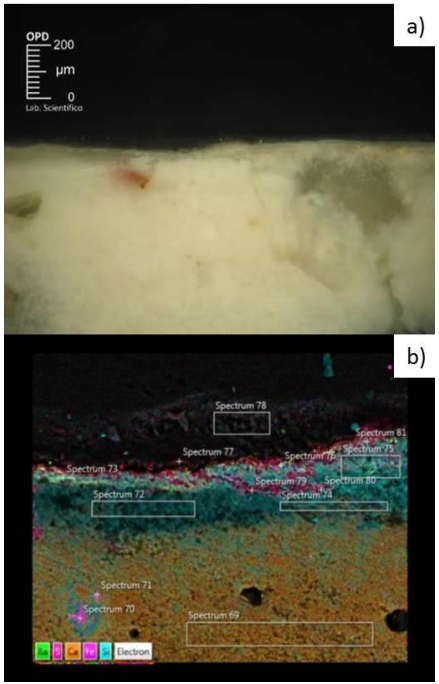
Research outcome:
The project helped to better understand the beginnings of direct and indirect lost-wax casting of sculpture, predating large-scale Greek sculpture

ARCHLAB highlights - II

IPERION CH

Scope of the access:

Assessing causes of yellowish gypsum efflorescence on wall paintings



Heritage object:

Dome of Schleswig Germany,
XIII century

Major research activities:

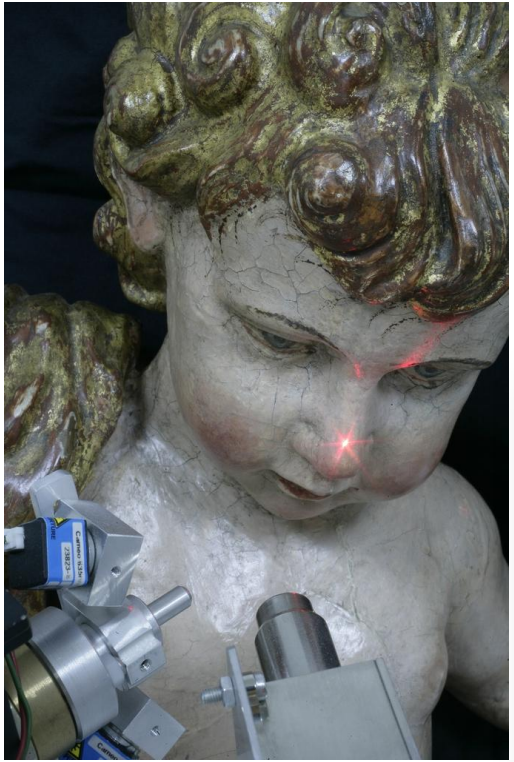
Consultation of reports and data at OPD on similar cases of efflorescence; analytical measurements of samples

Research outcome:

The nature of the deterioration of the wall paintings was discovered. Yellowish patinas can be attributed to organic materials present in the pore structure, originating from conservation interventions using fixatives or varnishes.

FIXLAB

access to LSF and advanced laboratory facilities

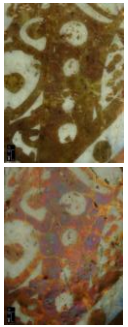


FIXLAB highlights - I

IPERION CH

Scope of the access:

Understanding the lustre optical properties in relation to their composition – the observed dichroic behaviour is due to Ag/Cu nano-particles in the glaze



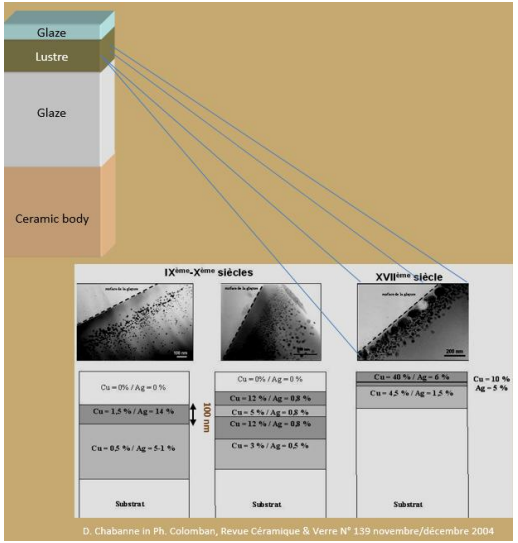
Heritage objects:

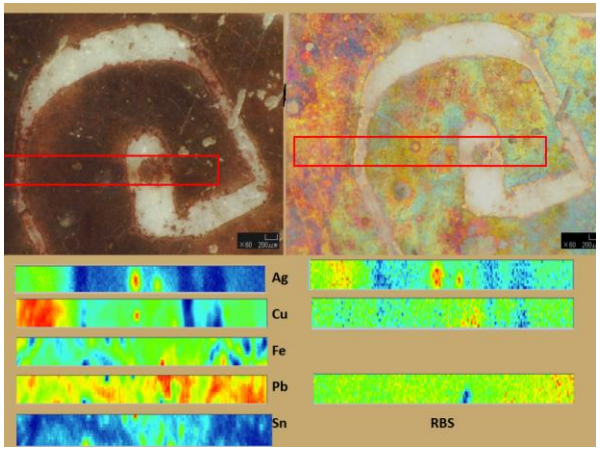
Unique Iranian lustre tiles from the British Museum

XIV century

Major research activities:

PIXE and RBS at AGLAE





Research outcomes:

Enrichment of the database of lustre recipes (>150 pieces measured).

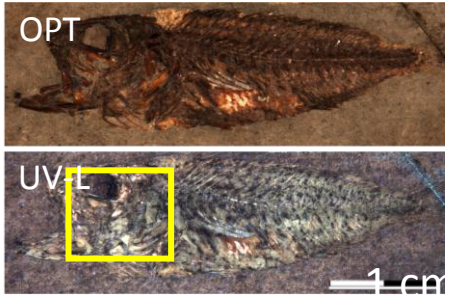
New protocol and data treatment for this type of analyses – PIXE and RBS mapping – at AGLAE.

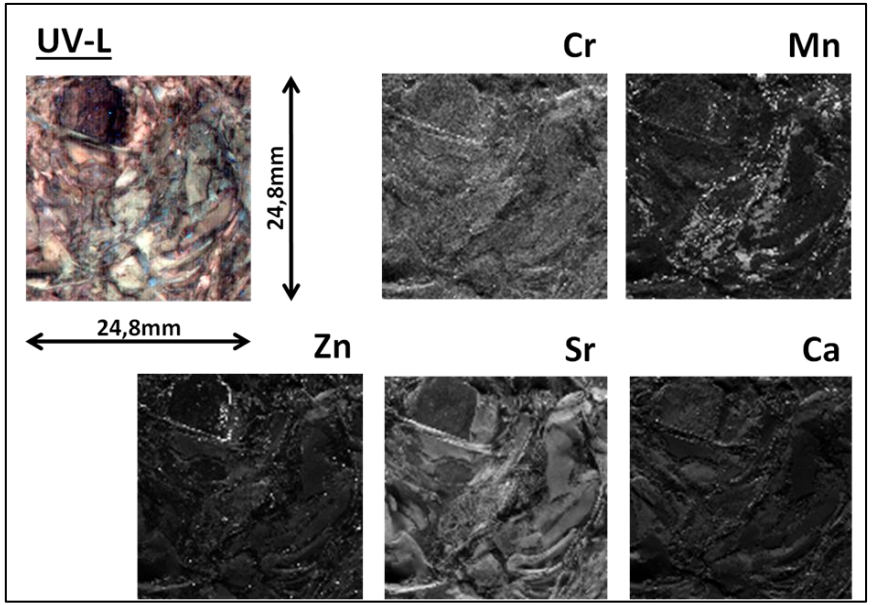
FIXLAB highlights - II

IPERION CH

Scope of the access:
Deciphering exceptional fossilization process of 50 Myrs fossils from Italy

Heritage object:
Fossil actinopterygians from the Eocene *~50 Myrs BC*



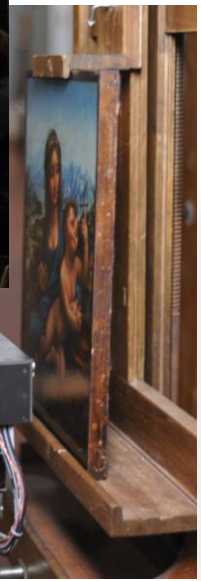


Major research activities:
Coupled synchrotron-X-ray fluorescence imaging and UV luminescence imaging at SOLEIL

Research outcome:
Revealed the spatial distribution of trace elements within mineralized soft tissues and bones.

MOLAB

mobile instruments for *in-situ* diagnostics



MOLAB highlights - I

EU-ARTECH
Access, Research and Technology for the conservation of the European Cultural Heritage

Scope of the access:

Revealing a hidden underdrawing previously discovered by low-resolution instruments

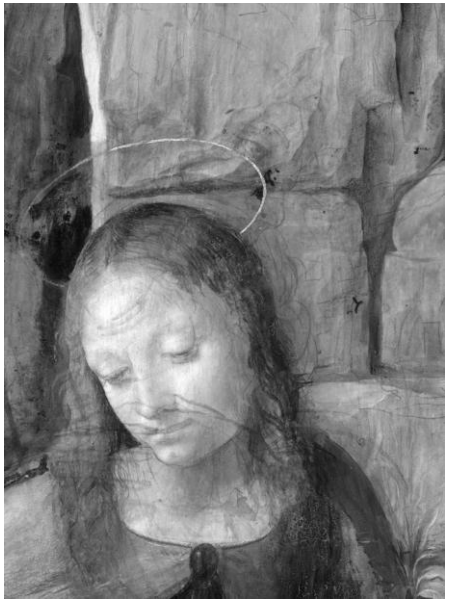


Photo © The National Gallery, London.

Heritage object:

Virgin of the Rocks by Leonardo ~1484
@The National Gallery of London

Major research activities:

Scanning Infrared and RGB imaging of the painting

Research outcomes:

A fully sketched original Leonardo underdrawing was revealed thanks to the higher resolution of the MOLAB instrument. Resonance in international media was huge.

MOLAB highlights - II

EU-ARTECH
Access, Research and Technology for the conservation of the European Cultural Heritage

Scope of the access:

Assessing the possible – and widely disputed – use of the *underdrawing* by Caravaggio

Heritage object:

Amor vincit omnia by Caravaggio ~1602
@Gemäldegalerie Berlin

Major research activities:

Scanning Infrared and RGB imaging of the painting

Research outcome:

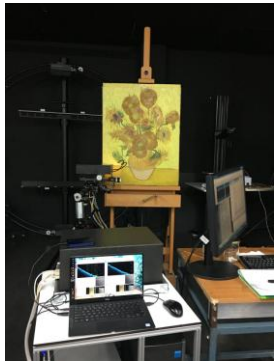
Experimental evidence of the use of *underdrawing* by Caravaggio, ending a 400-year-long dispute.

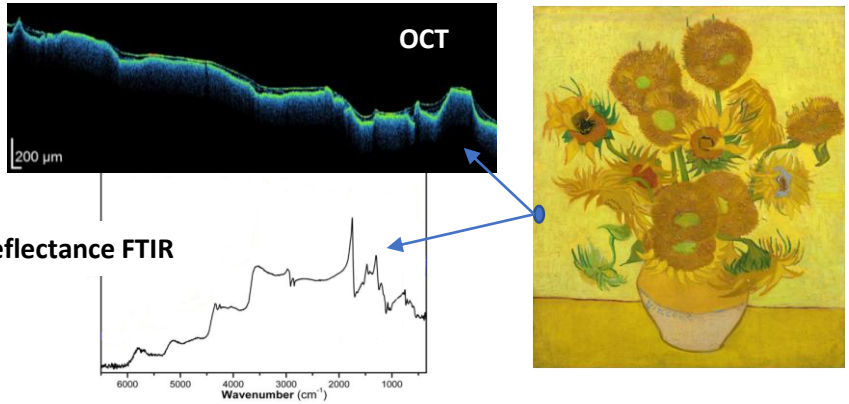
MOLAB highlights - III

IPERION CH

Scopes of the access:

Shedding light on the **darkening of yellow paint areas** coupled with signs of physical deterioration; **monitoring cleaning tests of the synthetic varnish**.





Heritage object:

Sunflowers by Van Gogh 1889

@ Van Gogh Museum, Amsterdam, The Netherlands

Major research activities:

Investigate pigments by non invasive multi-analytical techniques

Cleaning tests for varnish removal monitored by Optical Coherence Tomography (OCT) and Reflectance FTIR

Research outcomes:

Understanding of color alteration processes.

Demonstration of feasibility of controlled varnish removal.

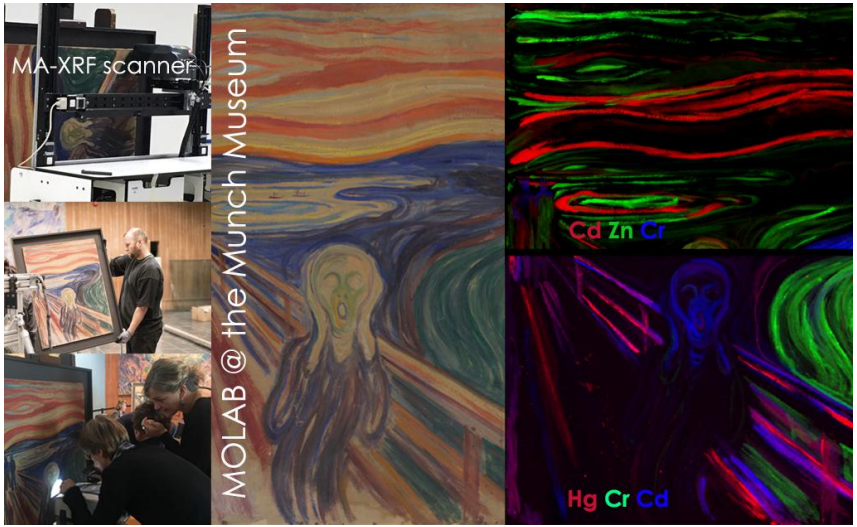
Of great interest to scholars and general public alike.

MOLAB highlights - IV

IPERION CH

Scope of the access:

Investigation of the **painting, printing and drawing techniques** in 6 versions of Scream to understand the material characteristics of Munch's artistic experimentation and contribution to Modern art.



Heritage object:

Scream by Edvard Munch 1893
@ The Munch Museum, Oslo, Norway.

Major research activities:

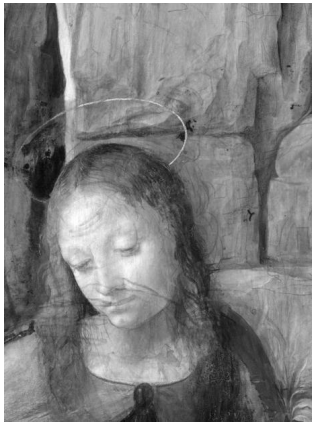
Multi-analytical non invasive techniques for the characterization of supports, organic and inorganic media in paint, drawing and printing layers
Multi/hyperspectral imaging to map the materials and their conservation state

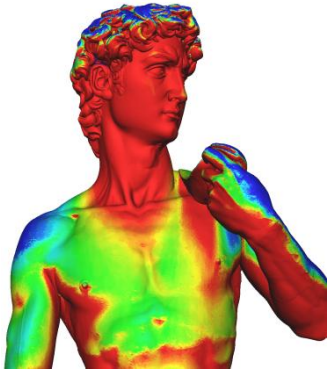
Research outcome(s):

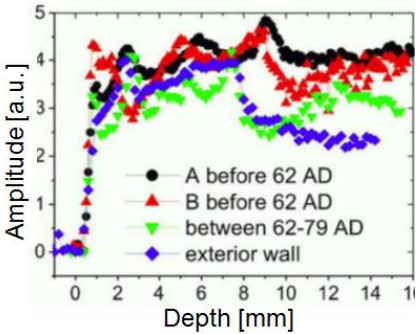
Innovative and interdisciplinary way of looking at the "Scream" in its different versions.
This iconic image of Modern art was studied and displayed in all its material and technical details, bridging scientific knowledge and artistic illustration in a public-oriented approach.

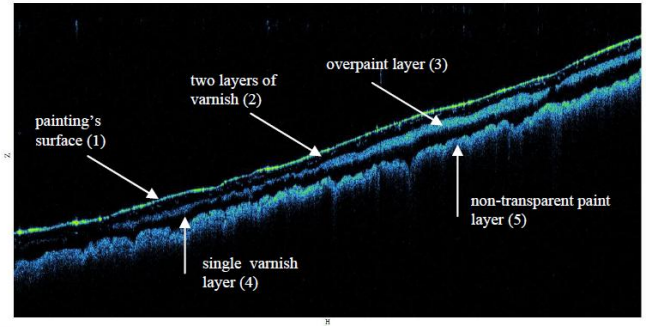
DIGILAB

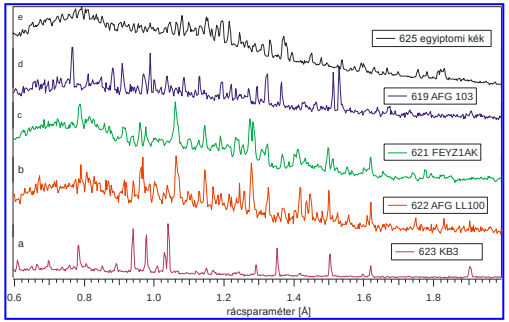
digital datasets and tools for heritage science











DIGILAB - the new access platform

- **E-RIHS** adopts the FAIR, Open Data and Open Science principles
- **DIGILAB** will be the cloud-based heritage science data and service infrastructure provided by **E-RIHS** to the research community
- **E-RIHS** is working to open its **DIGILAB** services in cooperation with:
  - **DARIAH ERIC** - the Digital Research Infrastructure for Arts and Humanities, an ESFRI Landmark
  - **PARTHENOS** - EU project supporting digital development of all SSH RI
  - **ARIADNE** - the EU community of digital archaeology

DARIAH-ERIC

PARTHENOS
Pooling Activities, Resources and Tools for Heritage E-research Networking, Optimization and Synergies

ARIADNE

DIGILAB – opening data in heritage science

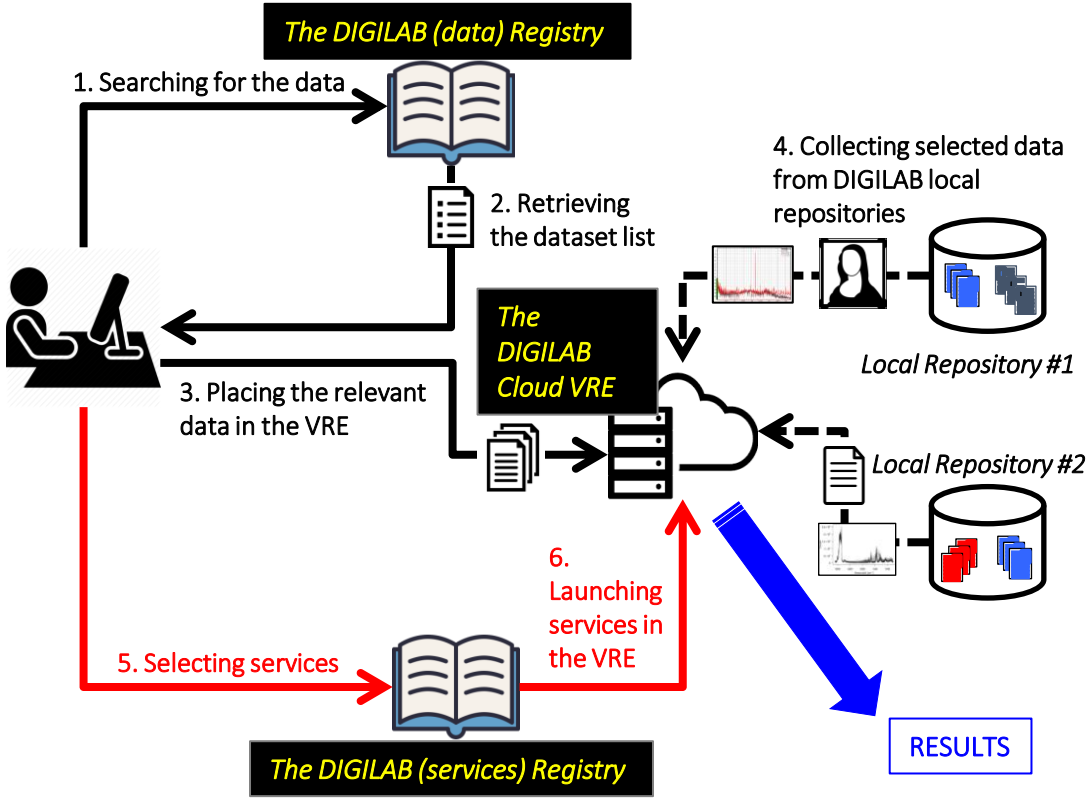
- heritage data are often closed…
- **open by definition** but actually **restricted by necessity**
- capillary IPR management very hard to handle
- to overcome this situation, **DIGILAB** will start by creating registries of heritage data (opening the metadata, following the ARIADNE approach)
- at the same time, registries of **tools** will be created

DIGILAB in the EU Open Science Cloud

- **E-RIHS** is at work to put all the key **DIGILAB** services in the new EOSC
- the **DIGILAB** VRE will be cloud-based
- data repositories will remain local
- IPR management demanded to the user-provider relationship (the “last mile” approach)

DIGILAB

Master plan…



…coming soon on: ***digilab.e-rihs.eu***

Growing **DIGILAB…**

- **DIGILAB** will start as a cloud-based VRE linking heritage science data with services/applications
- **DIGILAB** will evolve in a system having both internal data repositories and applications and services…
- …providing access to research data and other scientific documentation for professionals, practitioners and heritage managers

International cooperation through **DIGILAB**

- **DIGILAB** VRE will grow by linking more and more data and services/applications
- both **DIGILAB** apps and data will be provided by contributors in the **E-RIHS** network
- non-EU providers will easily be able to contribute both applications and datasets to **DIGILAB**
- **DIGILAB** is the **E-RIHS** platform with the capacity to establish a true international cooperation

E-RIHS

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...thank you for your attention!

E-RIHS

EUROPEAN RESEARCH INFRASTRUCTURE FOR HERITAGE SCIENCE

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