Understanding Written Artefacts with the CSMC Mobile Lab – Projects, Possibilities and Perspectives

Claudia Colini, Sebastian Bosch, Shervin Farridnejad

Workshop

Bridging Natural Science and Heritage in the Middle East:

German Institutions, Archaeology, Artefacts, and SESAME - 3-4 December 2024 in Jordan

DESY. HZDR HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF SESAME

In cooperation with متحف الأردن THE JORDAN MUSEUM

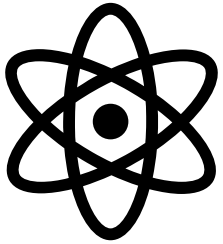
Centre for the Study of Manuscript Cultures (CSMC)

- Established in 2012 at Uni Hamburg
- Cluster of Excellence 'Understanding Written Artefacts' (since 2019)
- More than 150 junior and senior researcher from more than 40 different countries and from over 40 disciplines
- 60 current projects (+ 30 completed) most of which are cross-disciplinary and cross-cultural
- Worldwide cooperations
- Branches in Bamako (Mali) and Kathmandu (Nepal)
- 3-fold laboratory system (Mobile Lab, Stationary Lab, Container Lab)

Mobile Lab

→ **portable** equipment for worldwide **non-invasive** analyses of written artefacts

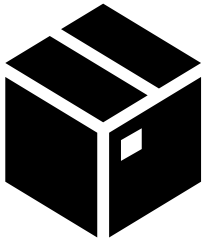
High Performance Labs



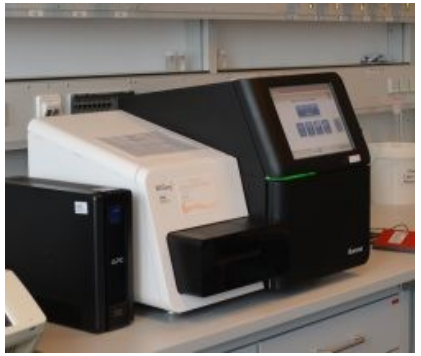
→ highly effective stationary equipment at:

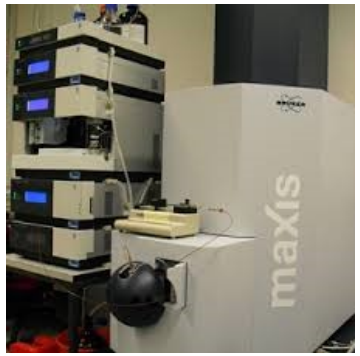
Universität Hamburg, TUHH, DESY.

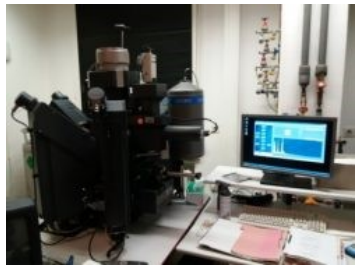
Container Lab



→ fills the gap between high performance and in situ analysis using portable equipment





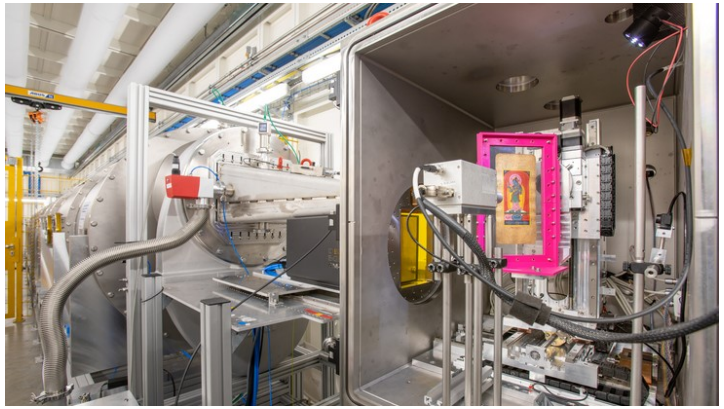


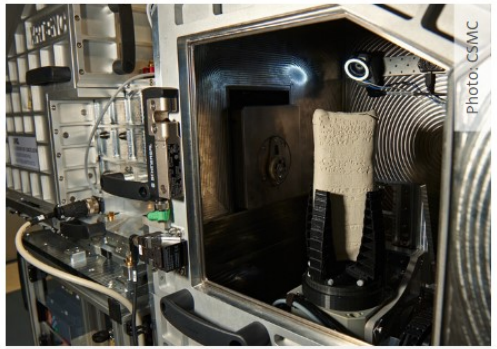
High Performance Labs

→ highly effective stationary equipment at:

TUHH

DESY.





UWA-DESY Cooperation

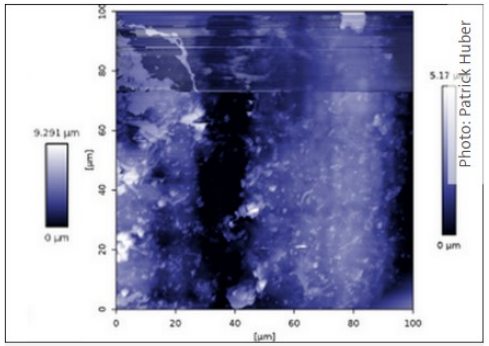
Reading Closed Cuneiform Tablets

The X-ray tomograph 'ENCI' is the first mobile device that makes it possible to read enclosed cuneiform letters without breaking the cover or altering the artefact in any way.

UWA-DESY Cooperation

Material Characterisation of Cuneiform Tablets

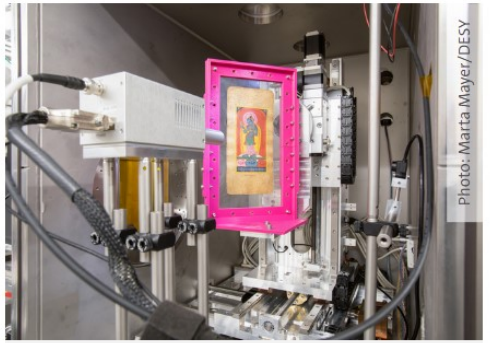
Using the powder diffraction method, we investigate the origins of ancient Mesopotamian clay tablets together with our colleagues at DESY.



UWA-DESY Cooperation

The Structure of Palm-Leaf Manuscripts

Microscopy techniques are applied to unveil the multiscale structural features of palm-leaves manuscripts, one of the most widespread types of manuscript in history.



UWA-DESY Cooperation

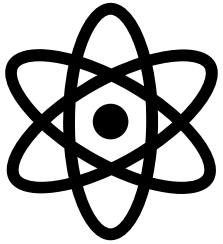
Measurements of Paper Components

In this pilot study, we use Small-Angle X-ray Scattering (SAXS) and Wide-Angle X-ray Scattering (WAXS) to retrieve the material fingerprints of historical Asian manuscripts.

Mobile Lab

→ **portable** equipment for worldwide **non-invasive** analyses of written artefacts

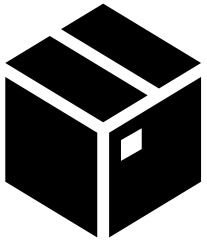
High Performance Labs



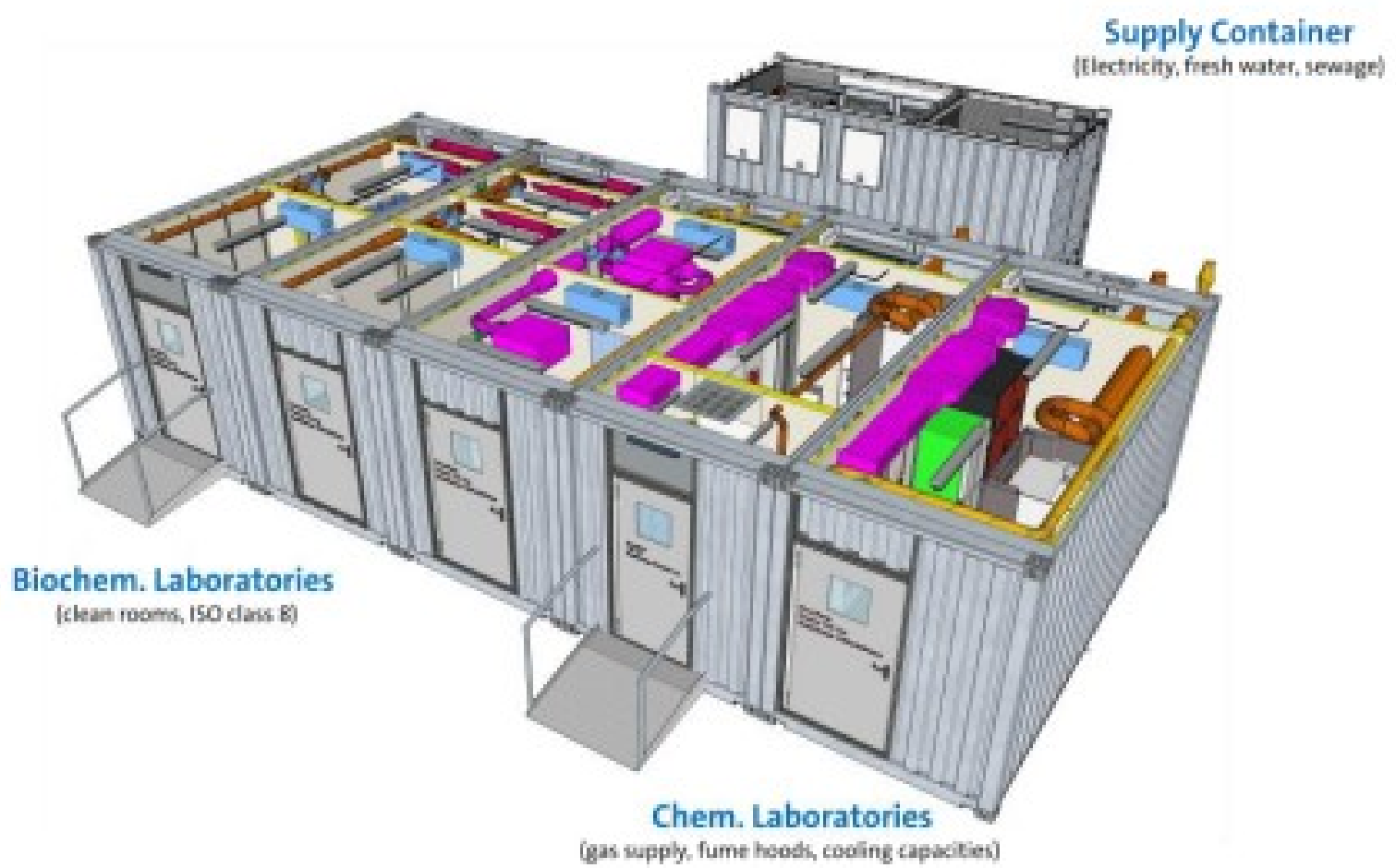
→ highly effective stationary equipment at:

Universität Hamburg · TUHH · DESY

Container Lab

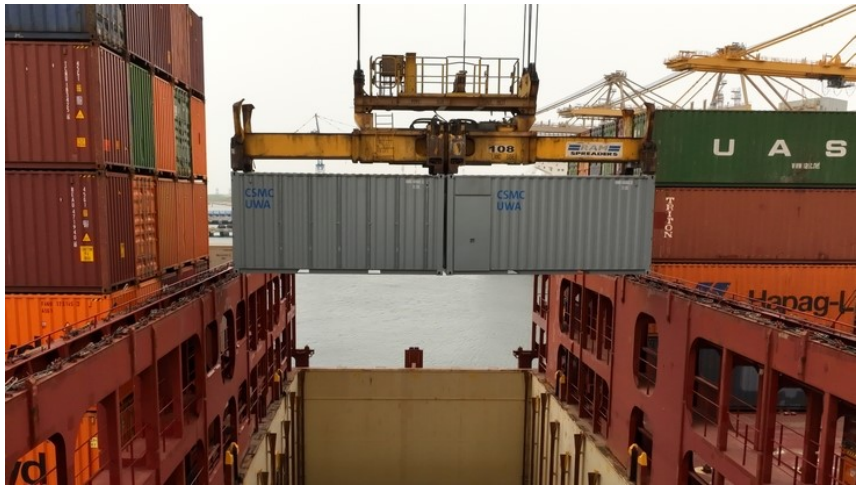


→ fills the gap between high performance and in situ analysis using portable equipment



Container Lab

→ fills the gap between high performance and in situ analysis using portable equipment



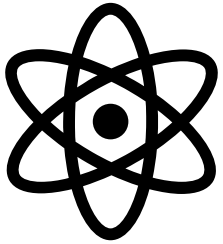
Container Lab

→ fills the gap between high performance and in situ analysis using portable equipment

Mobile Lab

→ **portable** equipment for worldwide **non-invasive** analyses of written artefacts

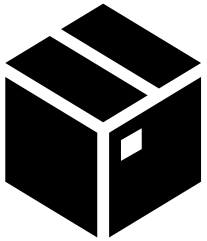
High Performance Labs



→ highly effective stationary equipment at:

Universität Hamburg · TUHH · DESY.

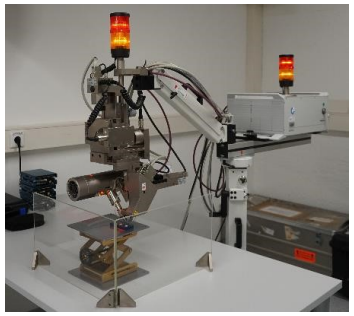
Container Lab

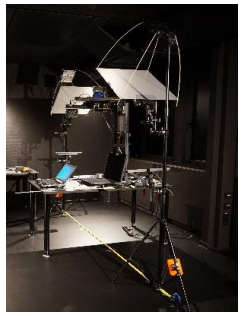
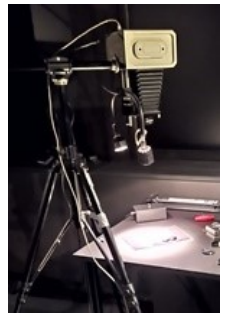


→ fills the gap between high performance and in situ analysis using portable equipment

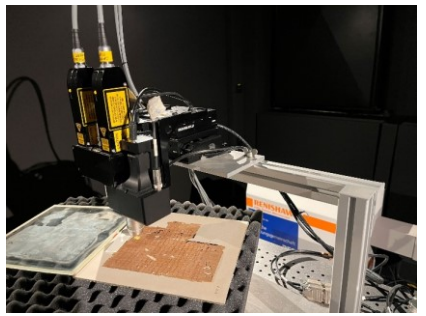
Mobile Lab

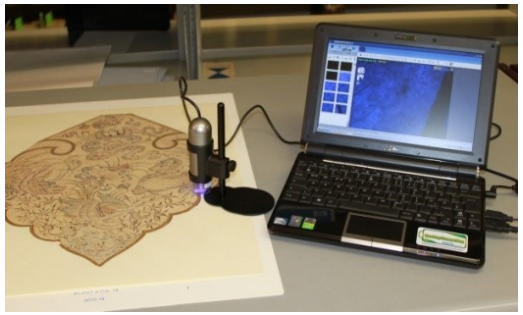
→ **portable** equipment for worldwide **non-invasive** analyses of written artefacts

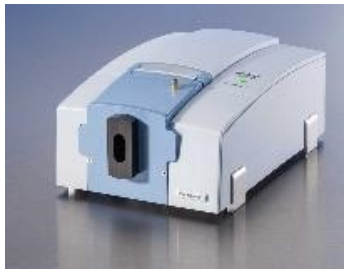





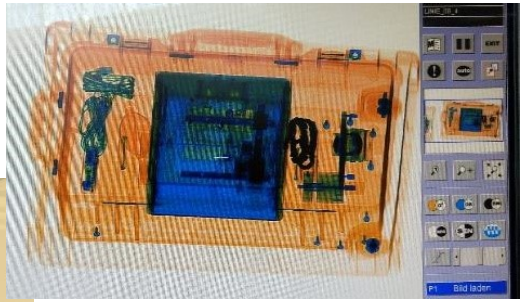





Mobile Lab

→ **portable** equipment for worldwide **non-invasive** analyses of written artefacts

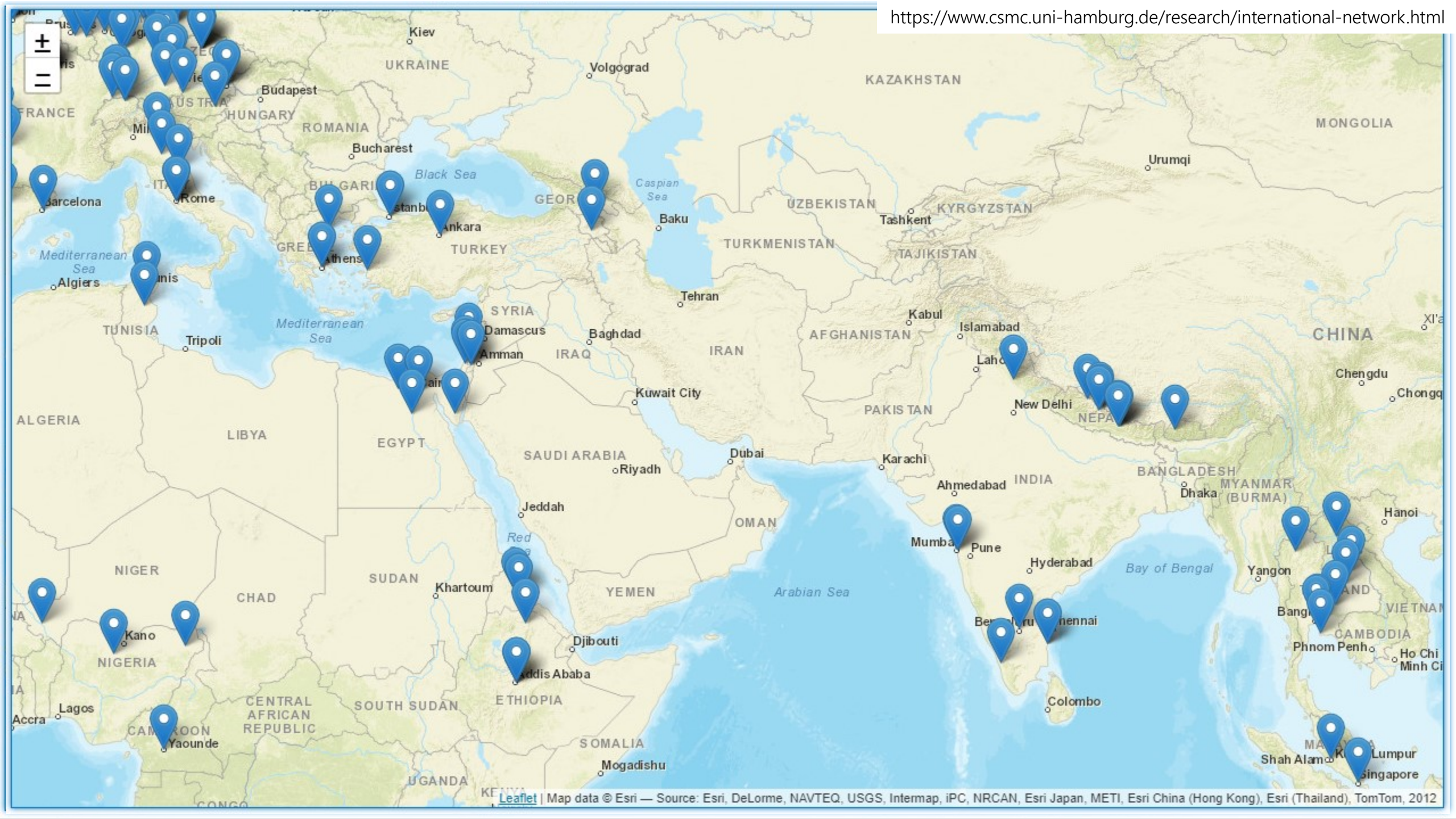


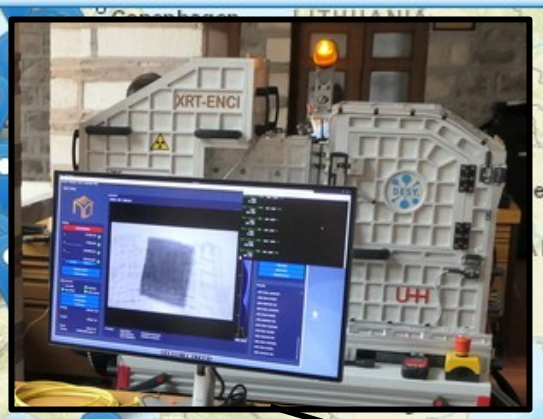
Mobile Lab

→ **portable** equipment for worldwide **non-invasive** analyses of written artefacts

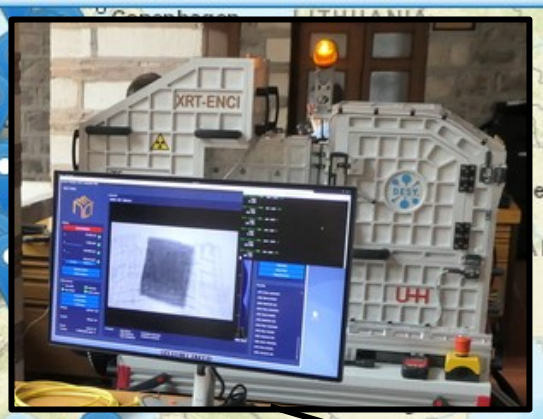
https://www.csmc.uni-hamburg.de/research/international-network.html

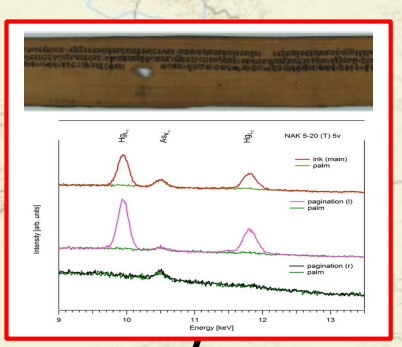
https://www.csmc.uni-hamburg.de/research/international-network.html

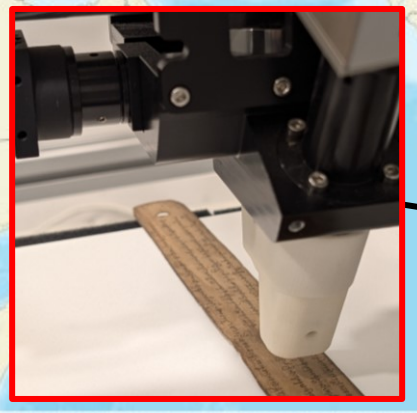




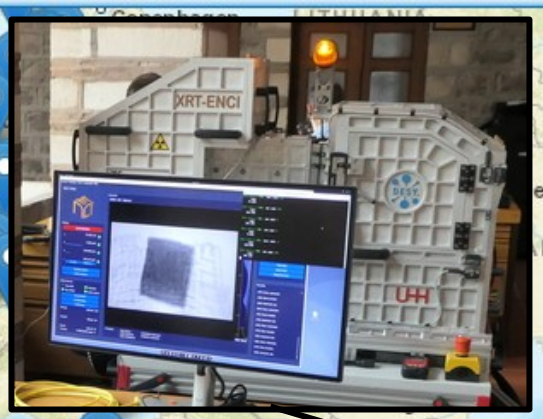
Novosibirsk
Astana
Volgograd
KAZAKHSTAN
Urumqi
Black Sea
Caspian Sea
GEORGIA
Baku
UZBEKISTAN
KYRGYZSTAN
Tashkent
TURKMENISTAN
TAJIKISTAN
Barcelona
Madrid
SPAIN
Lisbon
Mediterranean Sea
Algiers
Rome
Athens
TURKEY
Ankara
Tehran
SYRIA
Damascus
Amman
Baghdad
IRAQ
IRAN
AFGHANISTAN
Kabul
Islamabad
Casablanca
TUNISIA
Tripoli
MOROCCO
ALGERIA
LIBYA
EGYPT
Kuwait City
PAKISTAN
New Delhi
NEPAL
SAUDI ARABIA
Riyadh
Dubai
Karachi
Ahmedabad
INDIA
BANGLADESH
Dhaka
MYANMAR (BURMA)
Jeddah
Red Sea
OMAN
Mumbai
Pune
Hyderabad
Bay of Bengal
Yangon
SUDAN
Khartoum
YEMEN
Arabian Sea
Djibouti
Addis Ababa
ETHIOPIA
Colombo
Lagos
Accra
Abidjan
COTE D'IVOIRE
CENTRAL AFRICAN
SOUTH SUDAN



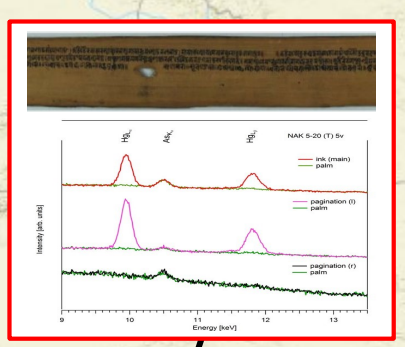


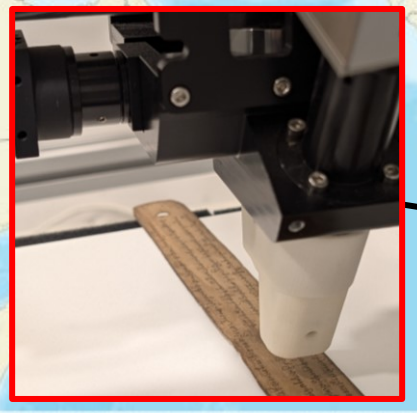


Novosibirsk
Astana
KAZAKHSTAN
Black Sea
Caspian Sea
GEORGIA
Baku
UZBEKISTAN
Tashkent
KYRGYZSTAN
TURKMENISTAN
TAJIKISTAN
Madrid
Barcelona
Rome
Istanbul
Ankara
TURKEY
Athens
Tunis
TUNISIA
Tripoli
Mediterranean Sea
Tehran
SYRIA
Damascus
Amman
Baghdad
IRAQ
IRAN
AFGHANISTAN
Kabul
Islamabad
Lahore
New Delhi
NEPAL
PAKISTAN
Kuwait City
LIBYA
EGYPT
SAUDI ARABIA
Riyadh
Dubai
Karachi
Jeddah
Red Sea
Khartoum
YEMEN
Djibouti
Addis Ababa
ETHIOPIA
SOUTH SUDAN
CENTRAL AFRICAN
Ahmedabad
INDIA
BANGLADESH
Dhaka
MYANMAR (BURMA)
Mumbai
Pune
Hyderabad
Bay of Bengal
Yangon
Chennai
Colombo
MALI
BURKINA FASO
Bamako
GHANA
COTE D'IVOIRE
Abidjan
Accra
Lagos



Iran (future)





Leaflet | Map data © Esri — Source: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2012

Case Studies

- **Identifying hazards** (material analysis prior to conservation/restoration)
- **Making the invisible visible** (recovery of writing/drawing/painting)
- **Tracing the history** (manufacturing process, provenance, date)

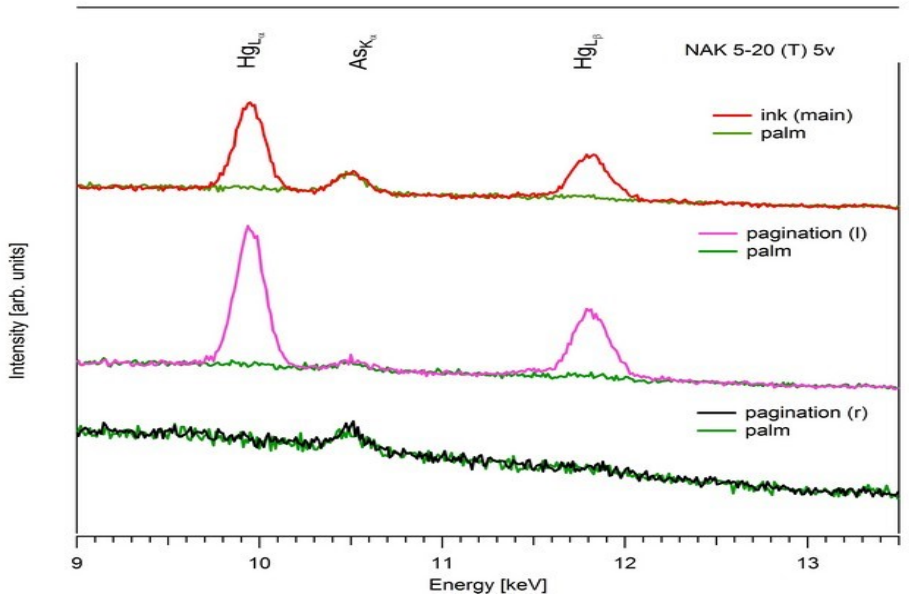
Case Studies

➢ Identifying hazards

Sanskrit palm leaves manuscripts, 12th c CE, Vikramaśīla monastery (India), now preserved in Nepal

Detection of As and Hg with XRF

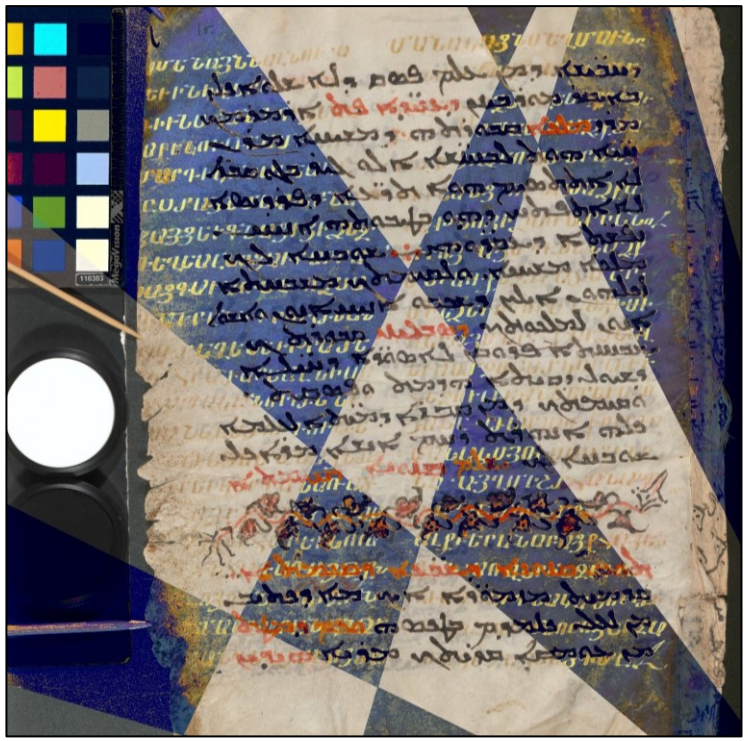
- As: possibly orpiment or realgar spread on the surface of the palm leaves
- Hg: addition of cinnabar to the carbon inks
- Both serving as biocide/insecticides
- Extra attention for the handling and conservation



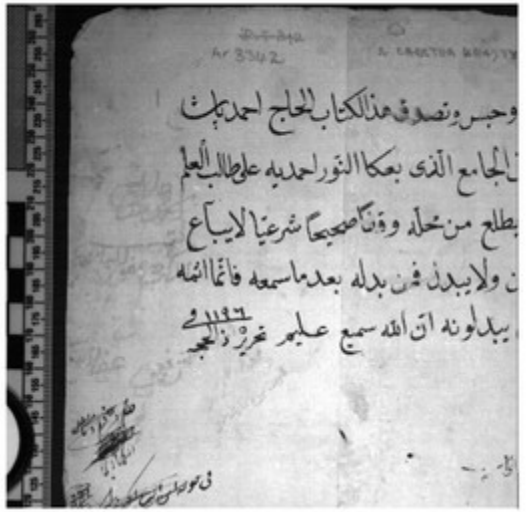
Martin Delhey, Emanuel Kindzorra, Oliver Hahn, Ira Rabin (2015), Material Analysis of Sanskrit Palm-Leaf Manuscripts Preserved in Nepal, JIABS 36 / 37, 119-151

Case Studies

➢ Making the invisible visible



Recovery with MSI of Armenian and Georgian undertext from palimpsested manuscripts from Sinai, Georgian, Armenian and European collections

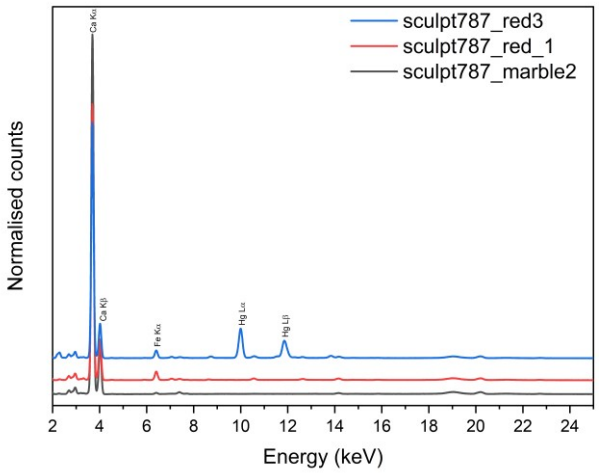


Recovery with IRR of ownership notes from Arabic manuscripts – within the framework al-Jazzar Library project

Case Studies: ongoing projects

➢ **Tracing the history** (manufacturing process)

Identification of pigments used on inscriptions, statues, wall-paintings and other archaeological material from the ancient city of Miletus, Turkey, with XRF, FTIR and UV-Vis-NIR reflectance spectroscopies

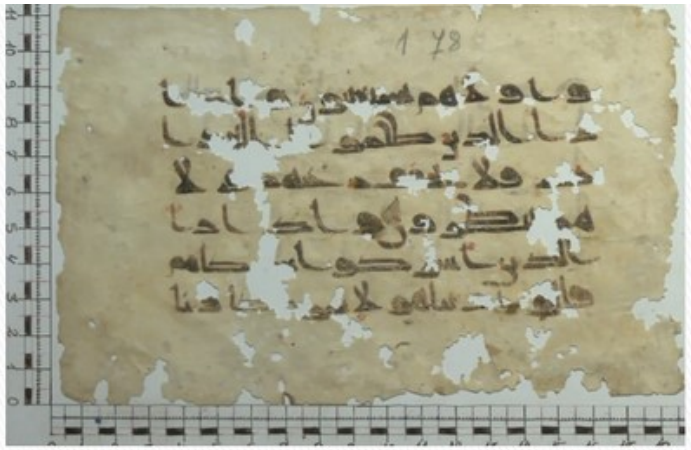


Case Studies: ongoing projects

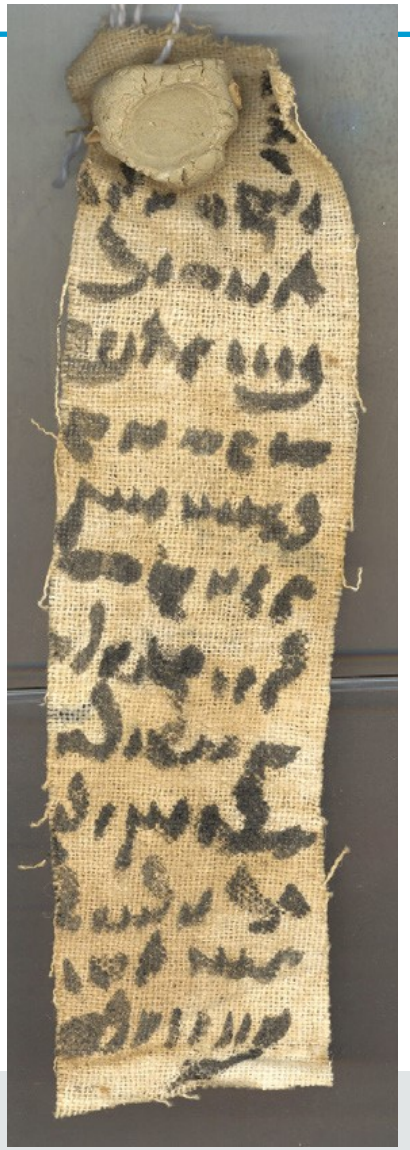
➢ **Tracing the history** (conservation and collection)

Material analysis of the manuscripts from Kaiouan, Tunisia

- Assessment of the causes of a damage process that is irreversibly destroying parchment manuscripts
- Identification of production processes



Case Studies: future projects



➢ Tracing the history

Middle Persian/Pahlavi Document from the late Sasanian and early Islamic periods

Philological, codicological, palaeographical and material analysis of the Pahlavi Archive of Hastijan, Markazi province, Iran.

The Pahlavi Archive of Hastijan is a collection of Middle Persian documents consisting of 412 manuscripts, including both intact and fragmentary documents, from the late Sasanian and early Islamic periods (ca. 6th to 8th cent. CE).

These documents are written on various materials, including textile, parchment, and leather. Additionally, there are some Arabic documents written on paper.

Case Studies: future projects

➢ Making the invisible visible

Old Persian Cuneiform Living Rock Inscription

Behistun Inscription

A trilingual (Old Persian, Elamite, and Babylonian) Achaemenid royal inscription and a large rock relief on a limestone cliff at Mount Behistun in the Kermanshah Province of Iran, near the city of Kermanshah in western Iran, established by Darius the Great (r. 522–486 BC).

The inscription is approximately 15 m high by 25 m wide and 100 m up a limestone cliff.

- Weathering (Biological, Chemical, Physical)
- Colours
- Carving techniques

Foto © Shervin Farridnejad

Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

CENTRE FOR THE STUDY OF MANUSCRIPT CULTURES

CLUSTER OF EXCELLENCE
UNDERSTANDING WRITTEN ARTEFACTS

Foto © Shervin Farridnejad

DFG

Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

CENTRE FOR THE STUDY OF MANUSCRIPT CULTURES

CLUSTER OF EXCELLENCE
UNDERSTANDING WRITTEN ARTEFACTS

Foto © Shervin Farridnejad

DFG

Challenges and Future Perspective

UNIVERSITY OF TORONTO

Hidden Stories

- Movimentation of equipment or objects: challenging!
- Embassies and consulate offices: precious allies
- Absence or limited number of mobile equipment and labs in the Middle East

- Cooperation partner in Toronto, Canada
  - Research collaboration and equipment exchange for projects in the respective influence areas

- **Would SESAME become a mobile HUB too?**

SESAME

Contacts
claudia.colini@uni-hamburg.de
sebastian.bosch@uni-hamburg.de
shervin.farridnejad@uni-hamburg.de