

On the way E-RIHS.DE / Auf dem Weg zu E-RIHS.DE

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Abstracts

Organized by Deutsches Archäologisches Institut (DAI) and
Rathgen-Forschungslabor, Staatliche Museen zu Berlin –
Preußischer Kulturbesitz (RF/SPK)



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Scope

Since March 2016, the E-RIHS initiative (<http://www.e-rihs.eu>) has been included as a project in the ESFRI (European Strategy Forum on Research Infrastructures) roadmap. ESFRI roadmap projects have a compulsory preparatory phase. The approved application has a term from 01.02.2017 to 31.01.2020. German representatives are the German Archaeological Institute in conjunction with the Rathgen-Forschungslabor of the Staatliche Museen zu Berlin - Preußischer Kulturbesitz.

E-RIHS defines itself as: »E-RIHS supports research on heritage interpretation, preservation, documentation and management. It comprises: E-RIHS headquarters and national hubs, fixed and mobile national infrastructures of recognized excellence (FIXLAB & MOLAB), physically accessible collections / archives (ARCHLAB) and virtually accessible heritage data (DIGILAB).

The aim of this preparatory phase in Germany is, of course, to carry out the tasks assigned in the application. Much more, however, is the attempt to explore the possibilities of forming and structuring a community that supports E-RIHS with its activities in the medium to long term.

On the one hand, the meeting should provide information about E-RIHS, but on the other hand provide a first and in no way conclusive overview of the German stakeholders and key figures in the narrower range of scientific data that is reflective of human activities and derived from human and cultural artefacts.

European Networks

European – Research Infrastructure for Heritage Science (E-RIHS)

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Heritage is a key component of the European identity. The study and preservation of cultural and natural heritage is a global challenge for science and the European society at large. The European Research Infrastructure for Heritage Science (E-RIHS) supports research on heritage interpretation, preservation, documentation and management. State-of-the-art tools and services will be provided by cross-disciplinary groups of researchers to cross-disciplinary users and scientific communities working to advance knowledge about heritage and to devise innovative strategies for its preservation. E-RIHS connects researchers in the humanities and natural sciences and fosters a trans-disciplinary culture of exchange and cooperation. E-RIHS pursues the integration of European world-class facilities to create a cohesive entity playing a connecting role in the global community of heritage science.

Fragmentation, duplication of efforts, isolation of small research groups put at risk the competitive advantage of European heritage science research, spearheaded so well in the past by its unique cultural heritage. The long-term tradition of this field of research, the ability to combine science with innovation, and the support provided by EU-funded projects and integrating activities such as EU-ARTECH, CHARISMA and IPERION CH in conservation science, and ARIADNE in archaeology, represent the background of E-RIHS. E-RIHS exploits the synergy of the cooperation among the academy, research centers, museums and cultural institutions. Both the scientific and the socio-economic importance connected with heritage science are nowadays evident.

The research community has achieved the maturity necessary to make the leap towards a permanent European research infrastructure that will impact broadly on society and economy.

E-RIHS advanced services to the scientific community will be provided by coupling cutting-edge tools with human resources holding first-class capacities in both heritage diagnostics and data interpretation. E-RIHS will provide four types of access to its users: ARCHLAB – access to heritage archives and collections; DIGILAB– remote access to data and tools for heritage research; FIXLAB - access to large-scale facilities and advanced laboratories; MOLAB – collections of mobile instruments providing in-situ diagnostics.



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E-RIHS is a pan-European distributed infrastructure supported by 15 Member States plus Israel and participated by six more EU and associated countries. E-RIHS star-design structure has its Central Hub and headquarters in Florence (IT) and comprises National Hubs – possibly organized in Regional Hubs in some countries – encompassing specialized knowledge, fixed and mobile national facilities of recognized excellence, physically accessible collections/archives and remotely accessible heritage data.

The global lead that the EU holds in this research field, supported today by an unstable combination of national and EU measures, requires a joint and resolved effort. The potential global role of E-RIHS is under discussion within the GSO, Group of Senior Officials on Global Research Infrastructures, since 2014.

International initiatives are carried on for connecting and including partners and facilities outside EU, in cooperation with the intergovernmental organization ICCROM (www.iccrom.org).

E-RIHS is in its preparatory phase until January 2020 under the project E-RIHS PP. E-RIHS is expected to deliver all documents necessary to start the ERIC application in springtime 2019. E-RIHS ERIC will hopefully be launched in 2021.

The European network IPERION-CH shortly presented

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IPERION CH (Integrated Platform for the European Infrastructure Research ON Culture Heritage) is a European network that brings together 24 national institutions from various European countries and the Getty Institute in the US as an associate partner with recognized excellence in the field of interdisciplinary cultural heritage research. The project was approved as part of the EU call Horizon 2020 INFRAIA-1-2014 / 2015 "Integrating and opening existing national and regional research infrastructures of European interest".

The program aims to establish a permanent research infrastructure (RI) with sustainable, robust and long-term planning. The integrated institutions use a wide range of high-tech tools, scientific methods and databases to promote knowledge and innovation in the preservation of cultural heritage. IPERION CH connects researchers from the humanities and natural sciences and promotes the transdisciplinary exchange of science that serves to collaborate throughout the European Research Area (ERA).

The IPERION CH program thus creates a stable integration of European world-class institutions and resources in cultural heritage research.

Three German institutions are involved in the network: the Doerner Institut, the Rathgen-Forschungsinstitut as a scientific institution of the Staatliche Museen zu Berlin-Preußischer Kulturbesitz and the Rheinisch-Westfälische Technische Hochschule Aachen. They strive for active participation in this European initiative, the transfer of knowledge at national and European level.

German contribution on E-RIHS PP

German contribution on E-RIHS PP

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E-RIHS PP is corresponding to the preparation of E-RIHS, the European Research Infrastructure for Heritage Science (HS). E-RIHS will help the preservation of the World's Heritage by enabling cutting-edge research in HS, liaising with governments and heritage institutions to promote its constant development and, finally, raising the appreciation of the large public for cultural and natural heritage and the recognition of its historic, social and economic significance. The Deutsche Archäologische Institut (German Archaeological Institute, DAI) is, together with the Stiftung Preußischer Kulturbesitz (Prussian heritage foundation, SPK) as a third party, member of the European program consortium. Specific project objectives of E-RIHS PP are directed towards strategic challenges in setting up the E-RIHS, considering the requirements for its successful implementation, and following the recommendations of the ESFRI reviewers. Among others, E-RIHS PP will define common data policies and procedures for data management. DAI (and SPK) will especially take part in this objective by leading a task "Standardization and interoperability". The task addresses a core objective of E-RIHS, the construction of a pan-European access called DIGILAB. DIGILAB will consist of distributed cloud-based repositories and will provide access to research information as well as high-quality services for working with the data. This requires that results, both raw and processed data, are obtained on well-defined, common and standardized procedures and are stored in a way enabling their interoperability.

Current German Networks

Archaeological Heritage Network (ArcHerNet)

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The Archaeological Heritage Network (ArcHerNet) is a network of German cultural heritage institutions that aims at pooling their wide range of expertise in the protection and conservation of heritage, and at building a platform for collaboration and exchange on national and international levels. ArcHerNet was officially founded in April 2016, is supported by the German Federal Foreign Office, and coordinated at the German Archaeological Institute in Berlin.

ArcHerNet works towards creating synergies between the various partner institutions in Germany and making their competences better accessible internationally. It works towards international co-production and collaborative solutions that are needed to face the growing challenges in the preservation of cultural heritage worldwide.

To achieve these goals, ArcHerNet organizes and supports international workshops and conferences, training and capacity building programmes, and exchange between experts nationally and internationally.

In response to the ongoing crisis in Syria and neighboring countries in the region, the first joint project of ArcHerNet is “Stunde Null – A Future for the Time after the Crisis”, as a platform to bring together Syrian specialists, students and future decision makers to support them in enhancing the skills and resources needed to plan their country’s future themselves.

<https://www.dainst.org/project/2187035>

<http://www.archernet.org/index.php/2017/03/20/iraqi-german-expert-forum-on-cultural-heritage/>

ArchäometrieNetzwerk Berlin / Brandenburg (ANBB)

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The ArchäometrieNetzwerk Berlin-Brandenburg was founded in 2015 under the umbrella of the Berliner-Antike-Kolleg. The network unites more than 20 institutions and laboratories of various disciplines of Natural Sciences and Conservation and Restoration Sciences. Our members operate in university and extramural research. In addition to the universities and colleges, also renowned museums and research institutions are belonging to the network: Such as the Rathgen Research Laboratory of the Staatliche Museen zu Berlin and the German Archaeological Institute. Furthermore various private companies are counting to our members. Recently we notice a growing interest of our archaeological working colleagues in the ArchäometrieNetzwerk Berlin-Brandenburg, hence we are pleased to a steadily increasing number of following researchers.

The network promotes the interdisciplinary dialogue to prepare the ground for the implementation of innovative research projects and cooperations. The scientific landscape of Berlin-Brandenburg with its high density of various research facilities offers an outstanding environment for the development of new ideas and research structures.



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Gesellschaft Deutscher Chemiker e.V. – Fachgruppe Analytische Chemie – Arbeitskreis Archäometrie

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The Arbeitskreis Archäometrie (Research Group Archaeometry) is an association of individuals from humanities, natural sciences, engineering sciences and conservation, who are interested in the study of cultural heritage objects and monuments out of academic interest or for preservation and restoration. The working group is part of the Fachgruppe Analytische Chemie (Section Analytical Chemistry) of the Gesellschaft Deutscher Chemiker (GDCh, German Chemical Society).

The Arbeitskreis Archäometrie seeks to deepen the trans-disciplinary understanding, to promote contacts and exchange of experiences among the members, to arrange partnerships for the trans-disciplinary cooperation and to inform about activities in the field of activity of the research group.

Together with two other German associations for archaeometry and heritage science, annual conferences on archaeometry and preservation of historic monuments ("Jahrestagung Archäometrie und Denkmalpflege") are organized at an 18-month interval and their program is peer-reviewed. Furthermore, project groups and workshops on specific topics are part of the activities of the working group. More recently, the focus has been on investigating the photosensitivity of objects through the micro-fading test. In the near future, the work will be continued by a workshop on the interpretation of data from hand-held X-ray fluorescence devices.

Gesellschaft für Naturwissenschaftliche Archäologie ARCHAEOMETRIE e.V. (GNAA)

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The Gesellschaft für Naturwissenschaftliche Archäologie ARCHAEOMETRIE e.V. (Society for Natural Archeology ARCHAEOMETRIE e.V.) seeks the interdisciplinary dialogue between researchers interested in the development and application of scientific methods to study cultural history objects with the aim to contribute to the solution of archaeological, art historical and monument preservation issues. For this purpose, the society organizes specialist conferences, publishes scientific texts and provides relevant information, e.g. by distributing the "Archäometrisches Nachrichtenblatt" twice a year with relevant information on teaching and research as well as on conferences. The Society is also co-editor of the international journal Archaeometry that can be obtained by members of the society at a reduced price. It promotes the cooperation of institutions of similar goals and pursues a relevant public relations work. The society is the contact point for research funding institutions, publishers, other professional societies, foreign partners and academic questions. It is open for all those, who are committed to modern science-based archaeology (archaeometry) and promotes especially students.

KultSam: Cultural historic collections as a digital repository for research, teaching, and public mediation

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KultSam focuses on the development, installation and operation of an inter- and transdisciplinary virtual research environment for the study of human material culture and the knowledge stored in such objects. Utilizing a wide range of methods, effective tools and information services will be developed and provided, thus supporting both individual and collaborative cutting-edge research in social and cultural sciences as well as the digitization, preservation and crosslinking of collection based knowledge for a variety of different users.

Forschungsallianz Kulturerbe / Research Alliance Cultural Heritage

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In October 2008, the Fraunhofer-Gesellschaft, the Leibniz-Gemeinschaft and the Stiftung Preußischer Kulturbesitz founded the „Forschungsallianz Kulturerbe (Research Alliance Cultural Heritage)“. The highest priority of this interdisciplinary cooperation is the preservation of our cultural heritage using the results of research and innovation in materials science.

Documents, paintings, sculpture and historic buildings are essential elements of our cultural identity. Such treasures are not only a manifestation of the achievements of our civilization, but also have considerable economic value, for example, for tourism.

Cultural heritage is, however, ephemeral and cannot be regarded as a renewable commodity. Preserving it requires a sustainable approach as well as a commitment made by society as a whole. Environmentally induced damage to works of art and other cultural objects is extremely complex, so that their protection and preservation require an interdisciplinary approach. Specific research projects as well as the development of innovative and sustainable technologies are the most important elements in preserving our cultural heritage.

The Research Alliance aims at coordinating the activities of its member organizations in this area and promotes knowledge transfer between research and practice. The Research Alliance and further associated partners campaigns in a concerted way for the permanent preservation of works of art and other cultural objects.

<http://www.forschungsallianz-kulturerbe.de/>

Beyond numbers or words – How do researchers in digital heritage perform research?

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With my contribution I would like to focus on researchers in the field of digital heritage as target group of an infrastructure on heritage science. In particular a scientific community, usage and information practices as well as epistemic cultures will be mentioned.

A community perspective: *Who are stakeholders of cultural heritage? What are topics of scientific discourse? Who funds digital heritage research?* Main approaches of my research group are bibliometrics, text mining and social network analysis. What are findings of our research? Even if Digital Heritage is a relatively new subject and a still emergent community, several protagonists as individuals and institutions are visible and continuously involved in an academic discourse since decades. Most of the researchers in the field of cultural heritage are Europeans and have a disciplinary background in the humanities and in particular archaeology. With regards to topics addressed by publications, a discourse is primarily driven by technologies and the most common keywords indicate the technologies used [1]. Most of these are around data in terms of data acquisition and management, visualization or analysis. Moreover, a scientific discourse is closely related to practical work in terms of projects [2]. Both indications lead to the assumption that a scientific community is primarily a *community of practice* [3].

A usage perspective: *How do researchers in digital heritage practice research? How does they cope with information and digital data and tools? What are needs and challenges?* We monitor these aspects on micro and macro levels via surveys, case study research and user observation. What are findings? Investigations on information behavior in the field of digital heritage carried out during the 2000's examined major discrepancies between researchers' needs as well as digital tools and repositories available at that time. Even if some of the deficits have been improved nowadays, challenges such as low data quality, problematic access and poor availability of information in certain areas of interest to scholars along with usability problems are still issues encountered when searching for or interacting with specialized image

repositories. As Google has become a favorite image search tool amongst research in art history studies, further concerns such as legal issues or questions of long-term preservation arise. Against this background, one contribution of this research is to have proven empirically that most of the issues named as crucial nearly a decade ago are still not fully solved. With regards to current challenges [4], money is named as biggest obstacle, including lacking funding opportunities for digital activities, costs for hardware and software as well as budget priorities for non-digital activities within organizations. Another big problem is a missing awareness such as a generation gap or digital divide in terms of digital literacy and frequency of use of digital tools as well as a general fear of or resistance to digital methods or – vice versa – missing awareness of limitations and requirements in the digital world. Moreover, the lack of competency and skills especially in technical domains is frequently named. Finally, several participants see no obstacles for employing digital approaches in their organization.

An epistemic view: *How does digitization changes research approaches in the field of cultural heritage? What marks a disciplinary culture of “digital” cultural heritage? We investigate several fields by employing empirical and theoretical approaches. What are findings?* While there is a wide scope of topics addressed, data access seems to be the most crucial point. Both data acquisition and management are the most prominent research areas. Topics are widely influenced by current trends in technology and society, which may be caused by the opportunities to gather money for projects by referring to up- to-date issues. Moreover, visual digital heritage topics are not merely a movement to “redefine traditional humanities scholarship through digital means” [5]. Beside the “technology-enabled” use of computational technologies to answer new types of research questions and the “technology-facilitated” employment of computational technologies as medium “for new research practices without necessarily transforming researchers’ methods” [6, p. 42] a third type got visible: “humanities-enabled” research as trading in humanities techniques to answer technology related questions like user-engagement, research ethic or to perform a comprehensive explanation of technical results. A key aspect of visual digital heritage is cross disciplinary cooperation. Even if many researchers argue that digital heritage are (...or should be...) a “Two-Way Street” [eg. 7], it occurs in practice often as an adoption of digital skills by humanities scholars or as crossoperational projects. With regards to De Solla Price, digital heritage could be seen as a mode 2 science [8] with an emphasis on cross-disciplinary teamwork, the use of machines and a joint intellectual property. Since a disciplinary culture on that type of research is widely common in engineering

but less in humanities that may explain why humanities scholars report about the need to qualify to enter the field of digital heritage much more than engineers.

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Important German initiatives and institutions

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The Department of Natural Sciences at the DAI comprises four different disciplines: archaeozoology, archaeobotany, dendrochronology, and anthropology. Many excavations from all across the world have provided various data types, including documentation and large collections of samples, which are of great scientific value.

Whereas, for example, the data from archaeobotanical research has culminated in several books and has also been made available as an online database of The Digital Plant Atlas, solutions for the storage of, and access to, anthropological data are still needed. In this case, the aim is not just the storage of acquired data but, in particular, the subsequent processing with the use of various scientific techniques (e.g. computer tomography). This should provide a basis for the combination of anthropological data with other archaeological and biological data from different sites to build an overall picture of ancient people within their environment. Another important aim is the establishment of methods which might aid in further investigations in anthropology, e.g. in the improvement of identification of heavily fragmented human remains or the assessment of age at death. For this, the interaction of large collections of human remains, the accessibility of computer tomography and the programming of a recognition tool is needed.

Rathgen Research Laboratory at the Stiftung Preußischer Kulturbesitz (SPK)

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At the Rathgen-Forschungslabor, Staatliche Museen zu Berlin-Preußischer Kulturbesitz (SMB-SPK), chemists, physicists, biologists and conservation scientists work collaboratively on interdisciplinary projects in the field of cultural heritage research. Our overarching objective is to understand and preserve our cultural heritage as a limitless resource of knowledge. The Rathgen-Forschungslabor seeks to meaningfully contribute to this vision. It carries out investigations on a broad variety of materials within the museum collections and focuses its research on scientific issues related to art and archaeological objects in close cooperation with curators, archaeologists, conservation scientists and conservators. It carries forward the tradition of the world's oldest scientific museum laboratory, the Chemical Laboratory of the Royal Museums in Berlin, which was founded on April 1st, 1888 and bears today the name of its first director, Friedrich Rathgen.

Thanks to the many competencies at the disposal of the Rathgen-Forschungslabor, the institute has always been well-connected to both national and international research networks. Some noteworthy collaborations include the recently established Archäometrie-Netzwerk Berlin-Brandenburg of the Berliner Antike Kolleg, the Forschungsallianz Kulturerbe (together with the Leibniz-Gesellschaft and the Fraunhofer-Institut), and the European research infrastructure IPERION-CH (2015-19). In the framework of the IPERION-CH infrastructure the RF is providing access to its archives via the ARCHLAB infrastructure.

The Rathgen-Forschungslabor also makes its expertise available to international bodies such as ICOMOS, ICOM-CC and ICCROM.



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Neutrons for Cultural Heritage at MLZ

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The Heinz Maier-Leibnitz Zentrum (MLZ) is a scientific collaboration between the Technische Universität München (TUM), Forschungszentrum Jülich (FZJ) and Helmholtz-Zentrum Geesthacht (HZG) established for the exploitation of the scientific use of the research reactor FRM II, operated by TUM.

MLZ offers a unique suite of high-performance neutron scattering instruments, which enables state-of-the-art research using neutrons in diverse fields as physics, chemistry, biology, earth sciences, engineering, as well as material science and cultural heritage.

Beam time is offered free of charge to non-proprietary research. To this respect, proposals are submitted, usually twice a year, and evaluated on their scientific merit by an external international review panel.

The following MLZ instruments can provide an important contribution to cultural heritage research:

- The cold neutron imaging facility **ANTARES**
- The small-angle neutron scattering diffractometers **KWS-1**, **KWS-2**, **KWS-3** and **SANS-1**
- The fast fission neutron imaging facility **NECTAR**
- The prompt gamma activation analysis facility **PGAA**
- The diffractometer **STRESS-SPEC**

Neutrons have a unique set of properties that qualify them as ideal probes to investigate almost all kind of matter. Neutrons carry no electric charge and interact solely with the nuclei of atoms, not with their electron shell. Interaction depends on the internal structure of nuclei (absorption, incoherent scattering), or their arrangement into crystal lattices (coherent scattering), so their interaction is fundamentally different compared to X-rays. This allows neutrons to penetrate deep into matter.

Neutron Imaging

Hydrogen delivers huge contrast by equal-mass scattering, lead and most metals are rather transparent, while many light elements deliver significant contrast. Often, contrast differs between neighboring elements in the periodic system, and even between isotopes of the same element. Neutrons can penetrate metal casings (like relics) and reveal organic substances (bones, plant seeds) contained within, they show clear contrast between fossilized bones and chalk beds or even ferrous red beds that cannot be penetrated with X-rays, even allow distinction of enamel and dentine in hominid teeth where even synchrotron radiation fails, depending on the mineral exchange during the fossilization process. Cold neutrons (**ANTARES**) can even reveal Bragg edges in transmission through metals, and thus reveal different metal phases in medieval weapons that allow inference about the smithing technique. Fast fission neutrons (**NECTAR**) can penetrate huge blocks of fossils and were recently used for huge fossilized dinosaur skulls.

Small-angle neutron scattering

MLZ have three conventional and one ultra small-angle neutron scattering diffractometers. Small-angle neutron scattering is an effective technique to investigate in a non-destructive way the structure of old materials, as it is sensitive to inhomogeneities, such as, for example, cavity, nano-particles or precipitates in metals, alloys, ceramics and marbles. Due to the high neutron penetration in materials, neutron can investigate also bulky specimen, providing quantitative information on the size, density and shape of the present inhomogeneities. The small-angle neutron scattering technique can easily detect inhomogeneities from nm to the μm range, by using the ultra small-angle neutron diffractometer KWS-3.

Prompt Gamma Activation Analysis

Almost all elements absorb neutrons. A nucleus absorbing a neutron achieves an excited state, which relaxes with the emission of a cascade of gamma quanta. These cascades are characteristic for each nucleus and allow analyzing the elemental composition of a sample after the de-excitation (PGAA). Certain isotopes become radioactive, and emit characteristic gamma quanta again, which also can be used for elemental analysis (neutron activation analysis, NAA). In PGAA at MLZ, a sample is exposed to a cold neutron beam, and two high-purity germanium detectors placed in 90° to the neutron beam detect the released gamma radiation of the

sample. Elements can be detected in a wide range of concentration – major components are detectable as well as trace elements down to ppm or less.

This non-destructive method is particularly useful for various materials and for the applications in cultural heritage research, such as chlorine content of iron (conservation-restoration research), provenance studies of e.g. pottery and stone materials, composition of coins, beads or pigments in paintings and much more.

At MLZ, NAA and PGAA can be combined to increase the number of detectable elements. It is also possible to get a spatially resolved map of the elemental composition (prompt gamma activation imaging, PGAI) or a concentration depth profile of certain elements of near surface layers (neutron depth profiling, NDP).

A variation of this method is standard activation analysis, where samples are analyzed offline after irradiation, detecting radioactive isotopes with longer lifetimes.

Neutron diffraction

High resolution neutron diffraction can reveal, in a non-destructive way, the structure of the sample which yields to the identification of the constituent phases, and their proportion, present in the investigated material. Moreover, it can also provide the strain (and stress) field inside the sample, and the crystallographic texture of the abundant phases that is strongly related to the fabrication process, providing hence additional information on the dating and provenance of the investigated artefacts. The STRESS-SPEC instrument allows also a mapping over the whole sample volume by reducing the gauge volume down to few mm³.

In particular, the combination of neutron diffraction and imaging offers a unique non-destructive investigation of materials relevant for cultural heritage.

Doerner Institut, Bavarian State Painting Collections

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Virtually invisible to the public, the Doerner Institut is situated in the heart of the Munich art district (“Kunstareal”). As an integral part of the Bavarian State Painting Collections since 1946, this institution is in charge of the rich collections of the Pinakotheken in Bavaria with more than 25.000 works of art, which range from the 14th century to contemporary art. Founded in 1937, the institute has from the start been committed to research artistic techniques and materials as well as to develop physical-chemical methods for examining cultural heritage. Already the founder of the institute, Max Doerner – professor at the Academy of Fine Arts and a well-known specialist in painting techniques –, understood that a close multidisciplinary cooperation of specialists in painting techniques – nowadays art technologists –, science and art history essentially contributes to the understanding and preservation of works of art.

There are between 50 and 60 conservators, scientists as well as museum and exhibition technicians who work closely together at the Doerner Institut. They are in close contact with colleagues within national and international networks and associations. The institute is focused on the long-term preservation of cultural heritage entrusted to our care, on conservation and restoration, on art-technological research, the research and development of analytical methods, to handle art and to install exhibitions. In this context, preventive conservation is of central importance. Each restoration is based on art-technological observations and a preliminary conservation investigation. Thereby, our own as well as external conservators sustainably contribute to preserve the valuable collections we are in charge of. Additionally, the institute is responsible for the complex supervision of assembling and re-assembling exhibitions. Its museum and exhibition technicians set up the numerous exhibitions in the Pinakotheken in Munich and 14 more branch galleries in Bavaria.

The expressiveness of works of art often depends on their specific materials and individual techniques of creation. Pigments, binding media and other artist’s materials and techniques are analysed by our scientific department, often in national and international cooperation. The institute’s laboratory uses state-of-the-art methods of digital imaging and a wide range of spectroscopic and chromatographic techniques. The knowledge gained does also help to detect art forgeries: In this field, the Doerner Institut acts as a clearing center providing advice and expert opinions in controversial cases.

The broad range of the institute's activities is reflected not only in comprehensive archives for art-technological issues, X-ray and infrared images, restoration documents, analytical reports a well-stocked collection of artists' materials, artists' estates and other realia, which are accessible for research reasons after request, but also in art-technological exhibitions, which appeal to a broad public as well as its close involvement in the academic education of interns as well as conservation students at the Technical University of Munich.

Curt-Engelhorn-Zentrum Archäometrie gGmbH (CEZA)

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The Curt-Engelhorn-Centre Archaeometry (CEZA) in Mannheim (Germany) is a nationally and internationally operating research institute in the field of science-based studies of cultural heritage. Founded in 2004, the institute comprises the Laboratory for Material Analysis and the Klaus-Tschira-Archaeometry-Centre for physical dating methods. The former is mainly based on various methods for microscopy, major and trace element analysis as well as isotope analysis with various types of mass spectrometers. The latter is based on an accelerator for AMS radiocarbon dating, various techniques for luminescence dating and dendrochronological dating. The research focuses on production technologies and provenance of cultural heritage objects of inorganic materials, as well as subsistence and mobility of humans and animals. We provide radiocarbon dating by AMS, dendrochronology and luminescence methods. The material characterization and determination of the origins of inorganic materials like metals, glass or ceramics are performed by analyses of chemical and isotopic compositions, whereas classical anthropology and isotope systematics are used to reconstruct age, sex, health status; food and mobility of humans and animals. Besides its research activities CEZA also provides services for contact research in the field of archaeology and the history of art as well as for authenticity investigations.



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The Competence Center Archaeometry – Baden Wuerttemberg (CCA-BW) at the University of Tübingen

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In October 2016 the „Competence Center Archaeometry - Baden-Wuerttemberg (CCA-BW)“ has been established at the University of Tübingen. It is jointly sponsored by the Baden-Wuerttemberg Ministry of Science, Research, and Arts, the Helmut Fischer GmbH Institut für Elektronik und Messtechnik and the University of Tübingen funding from the government's Excellence Initiative. The CCA-BW is interdisciplinary and will strengthen the position of Archaeometry not only among Tübingen's established archaeological disciplines but also nationally and internationally. Additionally the CCA-BW built bridges within Mineralogy, Physics and Chemistry at the university of Tübingen and joint institutions and enterprises.

The center aims to use its broad range of stationary and mobile analytical methods, such as local highly resolved X-ray analytics, vibrational spectroscopy (Raman, IR, ..), optical methods (3D-Videomicroscopy, Laserscanningmicroscopy, ...) not only for questions of material culture, “chaine opératoire” in ancient times and cultural heritage preservation but also for current materials science questions, such as industrial process control, development of materials, and damage analysis.

Together with its industrial partner, Helmut Fischer GmbH Institut für Elektronik und Messtechnik, the CCA-BW is developing a mobile high-resolution, non-destructive, multimethod analysis unit, which will enable archaeologists to carry out key analyses on the spot especially during excavations at remote places, but also in collections and at historic and prehistoric monuments which cannot be moved.

A brief overview of possible contributions of the CCA-BW to FIXLAB and MOLAB will be given in the presentation.