

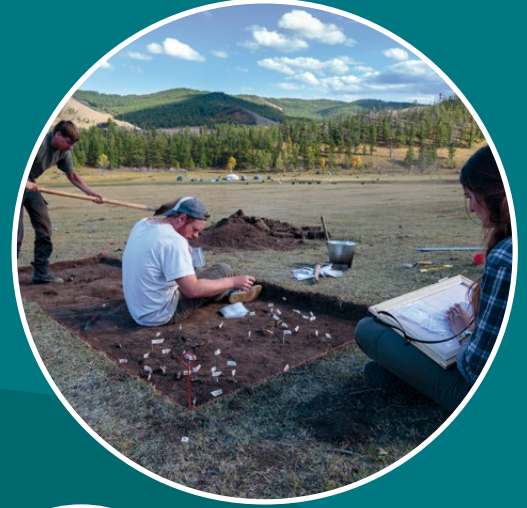
ROOTS
Cluster of Excellence

Social, Environmental, and Cultural Connectivity in Past Societies

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Mid-Term Report

2019-2022



Mid-Term Report

2019-2022

Cluster of Excellence ROOTS
Social, Environmental, and Cultural Connectivity in Past Societies

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View of the acropolis (front left) of ancient Stymphalos on the shore of the lake of the same name on the Greek peninsula Peloponnese (photo: Ingmar Unkel).

Preface

With the Midterm Report of the Cluster of Excellence “ROOTS - Social, Environmental, and Cultural Connectivity in Past Societies”, we inform you about the first years of the cluster established in 2019. The Midterm Report was prepared under the special conditions of the last pandemic and thus under extraordinary circumstances, which also applies to the first years of our research. Above all, the report gives you a broad impression of the new and interesting research activities of the cluster, which have developed in many ways in our research space.

The joint research on past societies is determined by excavations, laboratory work, archival studies and source interpretations. The diversity of the archives – from soil sediments to human skeletons and from architecture to written evidence – is targeted in our six subclusters. Reconstructing the ROOTS of hazards, diet, knowledge, urbanity, inequality, and conflict and conciliation took us to different areas of the world and very different laboratory depths. The joint research on connectivity started from the basic hypothesis that the degree of connectivity within and between societies, but also between societies and the environment, is crucial for the possibilities to develop resilient and sustainable structures. This is where past societies and environments provide us with a mirror for current and future developments.

The Midterm Report, which is available to you here in abbreviated form, covers the ROOTS term from 2019 to mid-2022. In the scientific excellence competition, only two core-research areas were successful. Apart from the medical field, it was the archaeological-palaeoecological research at Kiel University and in Schleswig-Holstein that received the label “excellent” from international review panels. We hope to live up to this distinction. As you will notice when reading the report, numerous other projects, which exhibit a very high rate of third-party funding, have meanwhile emerged from this ROOTS environment. In this respect, an extremely dynamic and productive process is emerging.

Johannes Müller

ROOTS Speaker



Mesolithic and Neolithic rock engravings,
Naemfosen, Northern Sweden (photo:
Sara Jagiolla).

1 Introduction

1.1 General information

Cluster of Excellence ROOTS – Social, Environmental, and Cultural Connectivity in Past Societies

ROOTS aims to explore the roots of social, environmental, and cultural phenomena and processes that substantially marked past human development in a broad interdisciplinary conceptual framework. Archaeological and historical ‘laboratories’ will be investigated under the basic assumption that humans and environments have deeply shaped each other, creating socio-environmental connectivities which still persist today. A better understanding of interwoven past socio-environmental dynamics will shed light on the ‘roots’ of current challenges and crises under diverse economic, ecological, and social conditions. Currently, society and the environment are subject to events and characterised by structures and processes, which give rise to essential questions about our own role and fragility in the global system, and how to deal with consequences of climate and environmental change, increasing urbanization, social developments, conflict potentials, and the role of stability and mobility in identity processes. The ROOTS research objectives will cover six foci: (1) Environmental hazards and impacts; (2) Dietary constraints and impacts; (3) Knowledge production, technology, and innovation; (4) Population agglomeration and urbanisation; (5) Social differentiation and inequalities; and (6) Conflict and conciliation. The ‘reflective turn’ will enable cross-disciplinary dialogue and enquiries within and between research foci, providing an overarching theoretical frame.

New research perspectives within the overall topical framework will be achieved through six new professorships (Geoarchaeology, Knowledge Studies, Social Archaeology, Urban Archaeology, Historical Linguistic Studies, and Socio-Environmental Modelling) oriented within innovative research fields at the interface of humanities, natural, and life sciences. They will expand the already existing broad interdisciplinary expertise of the applicants, providing new bridges between the outlined research field(s) and Kiel University’s priority research area Social, Environmental and Cultural Change (SECC). A ROOTS Young Academy (YA) will enhance research activities, communication, and international collaborations. It will provide excellent young researchers with an attractive space to develop independent and innovative profiles across disciplinary boundaries. Moreover, new research positions will be introduced for Physical Anthropology, Dendroarchaeology, Theories on Human Behaviour, and Integrative Archaeological Survey and Excavation

Methodology. New “laboratories” are designed to enable research directions embracing empirical and theoretical approaches. Infrastructural advances will extend existing platforms to support the realisation of novel research. The outlined concept builds on the longstanding experience of the research-oriented GSC 208 ‘Human Development in Landscapes’, and will continue to make Kiel a leading centre for socio-environmental research on past societies.

University	Location
Kiel University	Kiel

Names of spokespersons

Speaker: Johannes Müller, Prof. Dr. (speaker);

Wolfgang Rabbell, Prof. Dr. (co-speaker);

Ilka Parchmann, Prof. Dr. (co-speaker)

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Makarewicz, Cheryl, Prof. Dr.	Full Professor (W2)	Kiel/Kiel University, Institute of Pre- and Protohistoric Archaeology
Nebel, Almut, Prof. Dr.	Full Professor (W2)	Kiel/Kiel University, Institute of Clinical Molecular Biology
Parchmann, Ilka, Prof. Dr.	Full Professor (W3)	Kiel/Kiel University, IPN, Department of Chemistry Education
Piezonka, Henny, Prof. Dr.	Junior Professor (W1)	Kiel/Kiel University, Institute of Pre- and Protohistoric Archaeology
Stukenbrock, Eva H., Prof. Dr.	Full Professor (W3)	Kiel/Kiel University, Botanical Institute, Plön/MPI, Group Environmental Genomics
Weinelt, Mara, PD Dr.	Senior Scientist	Kiel/Kiel University, Institute of Pre- and Protohistoric Archaeology

Principal Investigators (men)	Function/Contract type	Location/Institution
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Käppel, Lutz, Prof. Dr.	Full Professor (C4)	Kiel/Kiel University, Institute of Classical Studies, Classical Philology
Kienle, Lorenz, Prof. Dr.	Full Professor (W2)	Kiel/Kiel University, Institute for Material Science
Klinkott, Hilmar, Prof. Dr.	Full Professor (W2)	Kiel/Kiel University, Institute of Classical Studies, Ancient History
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Krause-Kyora, Ben, Prof. Dr.	Full Professor (W2)	Kiel/Kiel University, Institute of Clinical Molecular Biology, aDNA
Müller, Johannes, Prof. Dr.	Full Professor (C4)	Kiel/Kiel University, Institute of Pre- and Protohistoric Archaeology
Müller, Ulrich, Prof. Dr.	Full Professor (C3)	Kiel/Kiel University, Institute of Pre- and Protohistoric Archaeology
Ott, Konrad, Prof. Dr.	Full Professor (W3)	Kiel/Kiel University, Institute of Philosophy
Peterson, John Michael, Prof. Dr.	Full Professor (W3)	Kiel/Kiel University, Institute of Scandinavian, Frisian and General Linguistics
Quaas, Martin, Prof. Dr.	Head of Research Group Biodiversity Economics	German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig University
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Schneider, Ralph, Prof. Dr.	Full Professor (W3)	Kiel/Kiel University, Institute for Geosciences
Unkel, Ingmar, Prof. Dr.	Full Professor (W2)	Kiel/Kiel University, Institute for Ecosystem Research

Name(s) of other participating institution(s) in Germany

Other participating institutions Germany	Location
IPN	Kiel
ZBSA	Schleswig
ALM	Schleswig
MPI	Plön

Name(s) of cooperation partner(s)

Institution as cooperation partners	Location
German Archaeological Institute	Berlin, Germany
Prussian Cultural Heritage Foundation (National Museums Berlin)	Berlin, Germany
MPI for the Science of Human History	Jena, Germany
Lower Saxony Institute for Historical Coastal Research (NIhK)	Wilhelmshaven, Germany
Collaborative Research Centre "Our Way to Europe", University of Cologne	Cologne, Germany
Collaborative Research Centre "ResourceCultures", Tübingen University Tübingen, Germany	Tübingen, Germany
Aarhus University (Depts. of Archaeology and Heritage Studies, Geoscience, and Centre for Urban Network Evolutions) and Moesgaard Museum	Aarhus, Denmark

Institution as cooperation partners	Location
Universitat Autònoma de Barcelona (Depts. of Prehistory, Environmental Science and Technology, and Sociology)	Barcelona, Spain
University College London (Institute of Archaeology, Dept. of Geography)	London, UK
Archaeological Institute, Russian Academy of Science, Moscow	Moscow, Russia
University of Oslo (Dept. of Archaeology, Conservation and History) and National Museum of Norway	Oslo, Norway
Adam Mickiewicz University Poznan (Institute of Archaeology) and Museum Poznan	Poznan, Poland

1.2 Scientific Concept

In a broad interdisciplinary conceptual framework, ROOTS explores archaeological and historical “laboratories” in a diachronic perspective, covering a wide range of socio-environmental constellations. The Cluster brings together expertise from the arts and humanities, social sciences, and natural and life sciences. It is anticipated that ROOTS research output, generating new knowledge on the longue durée patterns of socio-environmental connectivity, will provide fresh impetus to broad international efforts in the vigorously evolving field of “global change”.

The framework follows the basic assumption that humans and environments deeply shaped each other, creating social, environmental and cultural connectivities. These connectivities concern the mutual links between individuals, groups, and societies, as well as their physical and biological environments. The application of the concept of connectivity provides an overarching brace for the entire ROOTS multidimensional research space and highlights human action. The extent and velocity of connections are closely linked to environmental conditions, access to food and other resources, conflicts and social tension, together with the production, access, and distribution of knowledge and innovation. Society and the environment are subjected to events and characterised by structures and processes, which give rise to essential questions about our own role and fragility in local to regional contexts and global systems.

Socio-environmental phenomena are explored as evolving at different spatio-temporal scales by integrating approaches from the humanities, and the life and natural sciences, thus stimulating cross-disciplinary dialogue. The extent, rate, and nature of past social, environmental and cultural interactions are reconstructed and assessed, as well as their impulse for the development of past environments and societies. The outlined topic is of high relevance against the background of global challenges in the areas of climate and energy, health and nutrition, spread of knowledge and innovation, urbanity, social inequality, conflict, mobility, and communication and security.

Aims

The Cluster of Excellence explores the roots of social, environmental, and cultural phenomena and processes that substantially marked past human development.

Overarching goals include:

- (1) the development of an archaeological and historical 'tomography' of connectivities
- (2) detailed reconstructions of selected regional case studies ('biographies') as historical incidents with their particular developments, diagnostics, triggers, and consequences
- (3) the discrimination of environmental and social scales of connectivities in a *longue durée* perspective
- (4) a sound narrative of the environmental, cultural and social history of change by abstracting general patterns of connectivities from mainly the Palaeolithic to pre-industrial periods.

Main research aims are:

- (1) to explore the roots of social, environmental, and cultural phenomena and processes that substantially marked past human development, in a broad interdisciplinary conceptual framework
- (2) to investigate archaeological and historical "laboratories" under the basic assumption that humans and environments deeply shaped each other, creating socio-environmental connectivities which still persist today
- (3) to gain a better understanding of interwoven past socio-environmental dynamics and thus to shed light on the "roots" of current challenges and crises under diverse economic, ecological, and social conditions
- (4) to answer the essential questions about our own role and fragility in the global system, and how to deal with consequences of climate and environmental change, increasing urbanisation, social developments, conflict potentials, and the role of stability and mobility in identity processes
- (5) to infer general patterns of human behaviour and coping strategies in response to changing conditions from diachronically explored patterns
- (6) to enable a re-assessment of modern phenomena on an amended knowledge base taking into account past changes
- (7) to more closely liaise research cultures predominantly using empirical analyses or theoretical concepts

- (8) to establish new research fields thriving at the interfaces of humanities, natural and life sciences.

Research Approach

The Cluster brings together expertise from the arts and humanities, social sciences, and natural and life sciences. External impetus, additional expertise and international exchange is provided by a dense network of international partners and is, in particular, enhanced through ROOTS guest chairs (i.e. professorships to be temporarily occupied by international experts hosted at the Johanna Mestorf Academy).

ROOTS research objectives are pursued under six topical foci: (1) Environmental hazards and impacts; (2) Dietary constraints and impacts; (3) Knowledge production, technology, and innovation; (4) Population agglomeration and urbanisation; (5) Social differentiation and inequalities; (6) Conflict and conciliation. Accordingly, Subclusters assembling pertinent expertise will pursue specific topical research agendas addressing specific questions.

Subcluster 1 – ROOTS of Socio-environmental Hazards explores the role of environmental threats for past societies, identifies human responses and coping strategies with regard to environmental stress, and investigates the impact of human activities on environments over the course of the Holocene.

Subcluster 2 – Dietary ROOTS addresses shifts in dietary strategies in the frame of changing socio-environmental conditions, highlighting the roles of food traits, food cultural aspects, and diseases.

Subcluster 3 – Knowledge ROOTS addresses questions concerning the roles of production, accumulation, the spread of knowledge, and technical innovations in governing mental concepts, specific skills, and socio-economic practices.

Subcluster 4 – Urban ROOTS validates the relevance of agency and perception for socio-environmental urban processes related to urbanity and urbanism. The environmental, economic, and social changes triggered by towns and cities will be explored through history.

Subcluster 5 – ROOTS of Inequality aims at a systematic scrutiny of the evidence for and the measurement of inequality and its spatial and temporal variation.

Subcluster 6 – ROOTS of Conflict and Conciliation studies conflict potentials and their impacts on past societies in order to inform about the conciliatory ability of humans to

overcome or transform conflicts. Moreover, it will provide more complete patterns of conflict distributions and their regional biographies.

To assess social, environmental, and cultural connectivities in past societies on different temporal and spatial scales, high-quality environmental, anthropological, archaeological and historical archives are explored ranging across different landscapes, from the Mediterranean to the Arctic, from archives little to widely transformed through human activities, and across different social constellations – from Greek poleis to Palaeolithic camp sites. Combined archaeological and paleo-environmental methods are employed to reconstruct past socio-environmental interactions on local to global scales. New multidisciplinary ‘laboratories’ are designed to enable research directions embracing empirical and theoretical approaches.

Jointly, the subclusters address questions about mobility and migration, resources and economy, ideology and identity. Accordingly, workgroups particularly benefit from the external impetus of international partners and guest chairs. Internal collaboration among subclusters is carried by joint research interests that are highly reliant on the exchange of research products. The operationalisation of such concerted efforts are supported through a priori broadly consented research designs, commitment to pertinent research deliverables, and suitable exchange formats as organized by ROOTS data management.

The integrative Reflective Turn Forum provides an overarching theoretical frame, and pursues a twofold aim: Primarily, it will reflect ROOTS research output across disciplinary research cultures and thus elevate cross-disciplinary dialogue to a new integrative level as well as enabling enquiries within and between research foci. Secondly, it will take up the challenge to transfer the explanatory potential of generalized patterns deduced from past socio-environmental reconstructions at disposal for current global challenge debates.

The three ROOTS Platforms – i.e. Technical, Communication, and Humanities Platforms – support the cluster research by bundling infrastructures and scientific expertise and they facilitate bridging the cultural gaps between the different disciplines.

The three platforms provide high-end field support, including a range of archaeological and scientific sampling strategies applied to document field data. This is comprised of cutting edge, non-invasive techniques for landscape and site mapping as well as for artefact documentation. Platforms also provide stable isotope and aDNA lab facilities to enable the identification of mobility, heritage and diseases on the basis of whole populations. Wet lab and bio-informatic pipelines for the screening and analyses of ancient genomes are established and used on a regular basis. Tools are provided, for example, to test agency and perception research jointly with ‘hard core’ environmental

studies, for instance, through agency-based modelling in combination with environmental data. Furthermore, the platforms support the testing of new approaches in science communication as well as the exchange and transfer of research data.

The ROOTS Young Academy – as a core structure of the Johanna-Mestorf Academy for early career members – enhances research activities of the Cluster, and fosters communication, and international collaborations. It attracts excellent young researchers and provides a stimulating research space to develop independent and innovative profiles across disciplinary boundaries. An educational programme, fostering early independency and international exposure, is provided to doctoral researchers. Educational concepts build on and further develop ideas and concepts successfully tested over a decade by the research-oriented Graduate School “Human Development in Landscapes” (GSC 208).



Work on archaeological finds of the monastic city of Baruun Khüree (17th-20th centuries CE). Yurt in the Orkhon Valley, Central Mongolia (photo: Sara Jagiolla).



Documenting a monumental complex of the Roman Near East in Gadara, Jordan (photo: Brita Jansen).

2 Structural Report

Structural development within ROOTS

ROOTS has developed structurally in the first years of the project according to the envisaged plans. The various subclusters (SC) with their thematic focuses, together with the Young Academy and the Reflective Turn, currently form the basis of the scientific work, supported by the three infrastructure platforms. In accordance with the application and the commitments of the State of Schleswig-Holstein, it was possible to install new professorships, on the one hand, and Young Research Groups and Senior Researchers on the other.

In order to successfully realize ROOTS research aims and to establish the Johanna-Mestorf-Academy as a leading and sustainable center for integrated research on social, environmental and cultural change at Kiel University, a suite of structural aims has been advanced. These are also particularly sharpening the University's research profile with its priority area SECC (Social, Environmental, and Cultural Change) in addition to Marine Research (KMS), Medicine (KLS), and Nano Sciences (Kinsis). As well as building explicit bridges among these priority areas, SECC/JMA bundles currently large interdisciplinary programmes, such as the ROOTS EXC and CRC 1266, and fosters new initiatives such as the ARCHLive or KHK (Käthe Hamburger Kolleg).

ROOTS is part of the Johanna Mestorf Academy, which, as a central institution of Kiel University, bundles interdisciplinary research on past societies. Represented on the board of the JMA are large collaborative projects, collaborative projects applied for during the application phase, the deans of the faculties that are important for the work and non-university cooperation partners, especially the ZBSA.

Structurally, there is currently intensive cooperation with the Cooperative Research Centre "Scales of Transformations". Here, as envisaged by the CRC and ROOTS reviewers, win-win situations are created through infrastructural cooperation, e.g. in the area of field research or graduate training. This also reflects the intensive cooperation with the ZBSA, which is also represented in SFB 1266.

As part of a change in university management, the university is currently restructuring research priorities and making efforts to create a good basis, also in terms of infrastructure, for the next round of the Excellence Initiative. Of course, a ROOTS 2 application is only possible if the proven foundations of the laboratories involved in ROOTS are maintained. Additional measures at the university level make sense, but of course form an add-on to the existing basis. The State of Schleswig-Holstein is also in the

process of restructuring the official research priorities. Our field is completely missing from the first internal papers, which would mean an extreme step backwards.

Establishing new research fields and sustainable development

The aim to establish new research fields around an archaeological nucleus follows up previous achievements since 2007 that integrated new Junior Professorships in Environmental History, Environmental Archaeology and aDNA, all meanwhile transferred into permanent professorships, as well as a new professorship in Archaeozoology/Isotope research, an upgrade of Classical Archaeology from the W2 to the W3 level, as well as a permanent mid-term position in palaeoclimatology.

The aim to establish novel research fields at the interface of the humanities, natural sciences and life sciences has been expanded through six new professorships. These assemble orientations in Geoarchaeology, Social Archaeology, Knowledge Studies, Urban Archaeology, Historical Linguistic Studies, and Social-environmental Modelling (Archaeoinformatics).

Senior Researchers were installed as planned in the areas of Physical Anthropology and Archaeological Fieldwork Development, which form the crucial basis for ROOTS work. Junior Research Group positions exist in the SC Knowledge, Inequality, Urban and Conflict/Conciliation, and the Reflective Turn. ROOTS work has also been consolidated via a scientific base position in the area of the new Isotope Labs (Dietary), in the area of archaeological fieldwork, and for scientific ROOTS publishing.

While two of the new professorships were provided by the Federal State of Schleswig Holstein in 2018, namely with new orientations in **Archaeoinformatics** (Matthias Renz) and in **Urban Archaeology** (Patric-Alexander Kreuz), in the same course, two permanent mid-level faculty positions were also provided for **Physical Anthropology** (Katharina Fuchs), and **Archaeological Field Methodology** (Jutta Kneisel). In addition, a permanent position was provided by the university to a SECC studies coordinator (Oliver Nakoinz), who is an extraordinary professor in Pre- and Protohistoric Archaeology.

Four new professorships (**Social Archaeology, Knowledge Studies, Geoarchaeology, Historical Linguistic Studies**) have been realised as anticipated appointments of existing CAU professorships becoming vacant between 2021 and 2027. The recruitment process to fill these professorships was initiated in 2019. Four new professors, namely M. Furholt, E. Eckmeier, A. Schwab, and I. Serzants) started in 2020 and 2021. Of the originally four new professorships, only three could actually be realised to date (Social Archaeology, Urban Archaeology, Archaeoinformatics), since in the case of the fourth professorship (Linguistics), the realisation took a very long time and the envisaged person accepted a

call to another university. Therefore, a Senior Researcher in Sociolinguistics is currently installed (K. Wichmann).

Mid-level faculty positions were filled with L. Shindo (Dendroarchaeology) and T. Kühl (Scientific Archaeological Fieldwork). Young Research group leader positions were filled with V. Arponen (Theories of Human Behaviour), B. Sven Majchczack (Hazards Subcluster), P. Czembrinski and N. Lamare (Urban Subcluster), C. Thumiger (Knowledge Subcluster), T. Kerig (Inequality Subcluster) and J. Schneeweiss (Conflict Subcluster).

The decision to install a permanent full professorship in **Ethnoarchaeology** (currently a Junior Professorship held by Henny Piezonka) has been met recently. The recruitment process has been initiated in 2022, and it is expected that the position will be filled in 2023.

Since ROOTS was founded, new members have also been accepted as full or associate members. Here, a new evaluation procedure has recently been adopted, which asks much more about the will to work together on the ROOTS message. Reporting obligations of the members are important for the overall evaluation.

The formation of interlinkage groups has turned out to be important, particularly involving the work between the SC and the processing of new topics from the area of the connectivity of past societies.

Structural cooperation is mapped in the various ROOTS committees and events as described and installed in the initial application. These include the general meetings of members, the Cluster council meetings (25 PIs + new professorships), the ROOTS board, the office and the speakers. Crucial for the overall development are the retreats, partly connected with the Advisory Board meetings. The structure has proven itself so far – despite some frictional losses. However, it is only sustainable through the increased and, in the long run, hardly manageable high commitment of the individual actors. A structural balance must be created here.

ROOTS Young Academy

To establish and sustainably consolidate a ROOTS Young Academy is a high priority aim of ROOTS. The Academy provides early career support for researchers within new fields of study created by ROOTS, and further develops concepts of the former Graduate School ‘Human Development in Landscapes’ (see chapter 4).

Structural development outside the university

The need for stronger cooperation with comparable interdisciplinary centres in other parts of the world, as stated in the ROOTS evaluation, has only been partially fulfilled so far. An example is the new membership in the Coalition for Archaeological Synthesis (CfAS). It remains difficult to identify comparable centres of a similar scale. In addition, we have been able to advance our international positioning with various activities, e.g. with the founding of the Social Archaeology and Climate Change (SACC) committee of international stakeholders and scientists as an independent body of experts. Here, however, we are reaching our infrastructural limits.

Perspectives

The indicators of activities are international publications, on the one hand, and third-party funding on the other. While we have very different disciplinary cultures in terms of international publications, third party funding is now quite similar in all disciplines (if we neglect the procurement of large-scale equipment). Chart 1 provides an overview of the third-party funded projects currently being served, broken down by the respective SC. The positive effect of ROOTS, which has developed as a centre of attraction in most SC, becomes clear.

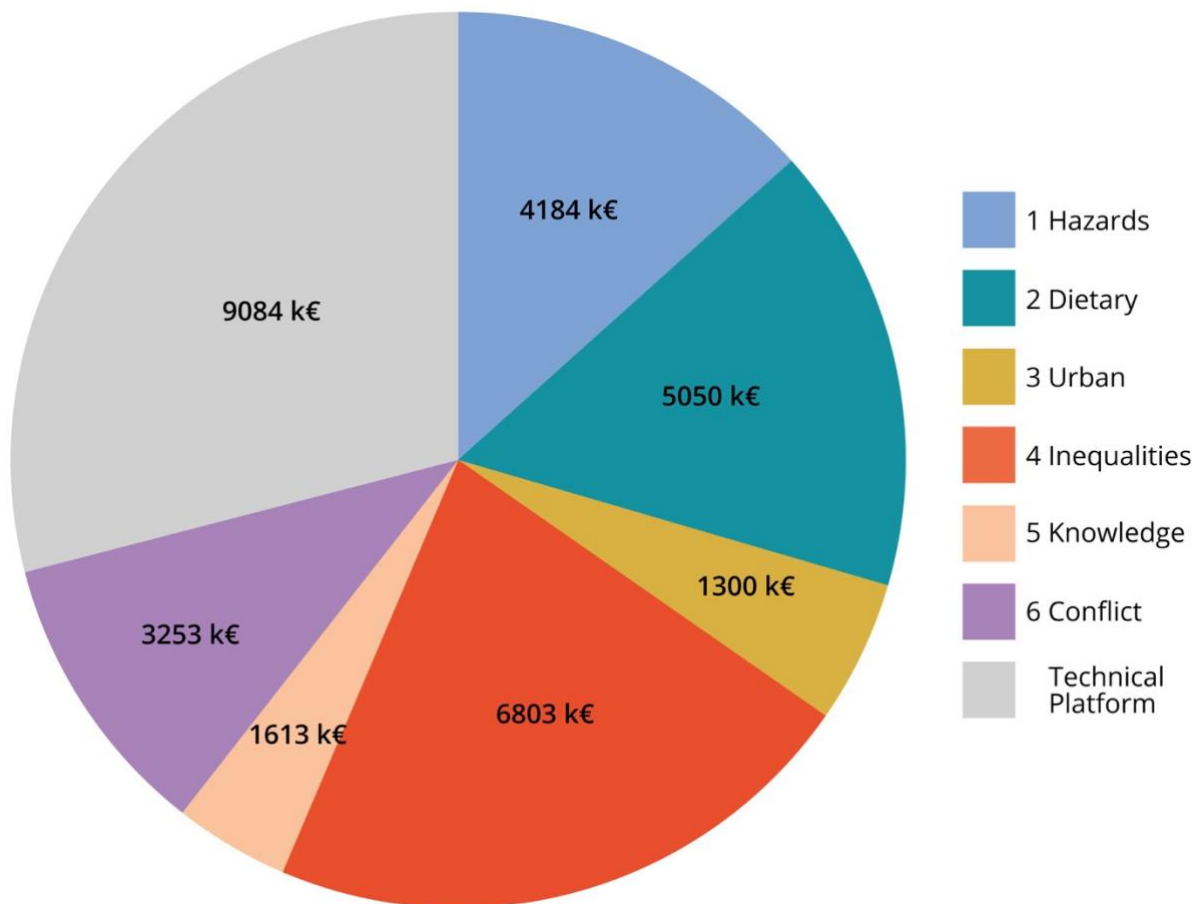


Figure 01: ROOTS creates an environment in which additional third-party funding is acquired outside of ROOTS by ROOTS members. The approved third-party funds from 2019-2025 are taken into account according to subcluster affiliation. Additional equipment funds from all subclusters are listed under the Technical Platform. Despite the incompleteness of the information and pending decisions on further, requested third-party funding, the total sum already amounts to approx. 28034 k€. The positioning of the funds is noted according to preferred subcluster affiliation if there are dual memberships.

The high level of research by the individual ROOTS members is evident in the contributions of the individual ROOTS units to this Midterm Report. In addition to the sometimes clear atomisation of research into numerous individual aspects, which would normally have to be served by, e.g., DFG individual projects but not a Cluster of Excellence, the high role of the Interlinkage Groups and joint activities is expressed. The current naming of the SC only partially corresponds to the developing research foci, which is also a result of the international development of research. Overall, a high level of knowledge about past societies and environments is being generated. What is not yet working properly is the utilisation of past knowledge for the present and future. Accordingly, the excellent scientific core in the field of archaeological-palaeoenvironmental work certainly needs to be re-sharpened.

Infrastructural Advance

A joint building to host the ROOTS Cluster, related programmes, and to foster new initiatives developing in SECC/JMA is an ongoing postulate, aiming to provide a sustainable structural frame, while bundling pertinent infrastructures, fostering interdisciplinary cooperations, supporting international exchange, and encouraging novel research initiatives. This also includes the establishment and continuous development of supportive research platforms (namely the Technical, Communication, and Humanities Platforms). This also implies the smart design and development of a novel laboratory platform integrating and re-thinking existing approaches, as well as testing new analytic approaches for socio-environmental research. These involve an archaeological lab on material culture, stable isotope, biomarker, pedological approaches and laboratory, including routines to process samples of very different archaeological and environmental archives. This platform needs to accomplish high requirements in terms of capacities enabling experimental and analytical high throughput approaches alike.

Aims to host and to foster activities in a joint building shall be realised through a research building (*Forschungsbau*), a format jointly realised by a federal and state initiative, and guided through the Wissenschaftsrat. A clear disadvantage of this 2-phase evaluation is that the forerun is lengthy and costly (requiring an independent research concept), thus requiring additional resources from the scientific community for a project prone to uncertainty (namely planning 5-7 years ahead of time). The Platform is bundling instrumental equipment as needed for multidisciplinary studies with a socio-environmental focus on reconstructing past socio-environmental scenarios.

Overarching Interdisciplinary Research Projects

To stimulate research activities between subclusters, ROOTS supports overarching research projects designed and conducted jointly by PIs of at least two subclusters. Currently 10 projects are in progress (see chapter 5.1 Overarching Interdisciplinary Research Projects).



An electromagnetic induction (EMI) survey near the Roman Iron Age settlement of Tofting close to Schleswig-Holstein's North Sea coast, conducted together with ROOTS partners from the University of Ghent (photo: Jan Steffen).



Documentation of finds during the citizen science excavation "Schenefeld gräbt aus" in Schleswig-Holstein, the first community excavation of its kind in Germany (photo: Jan Steffen).

3 Scientific Report

The scientific development of ROOTS in the first half of the funding period was characterised in particular by (1) the consolidation of the general scientific objective of the Cluster and (2) the implementation of the research that was planned and approved for the individual ROOTS units in the application.

The general discourses on social, environmental and cultural connectivity in past societies were conducted in various joint networking events and retreats, and with various workshops, in which our international partners were also involved. The presence of the JMA chairs also played a role. One of the products is a book (“Connectivity Matters”), which presents the main features of our concept from a theoretical and methodological point of view and is supported by case studies. The internal calls for general resources and a first retreat quickly led to interlinkage groups working between the subclusters and representing the strength of the general concept.

The subclusters, the Reflective Turn and the platforms started their work in a more targeted way and are now characterised by numerous results of the subclusters, which are presented below.

3.1 Subcluster Reports

3.1.1 ROOTS of Socio-Environmental Hazards

Principal Investigators/Members/PhD members/Associate Members

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Renz, Matthias	matthias.renz@email.uni-kiel.de	PI
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Unkel, Ingmar	iunkel@ecology.uni-kiel.de	PI
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Feeser, Ingo	ifeeser@ufg.uni-kiel.de	Full member
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Figure 02 provides an overview of the regions of the subcluster (SC) research activities.

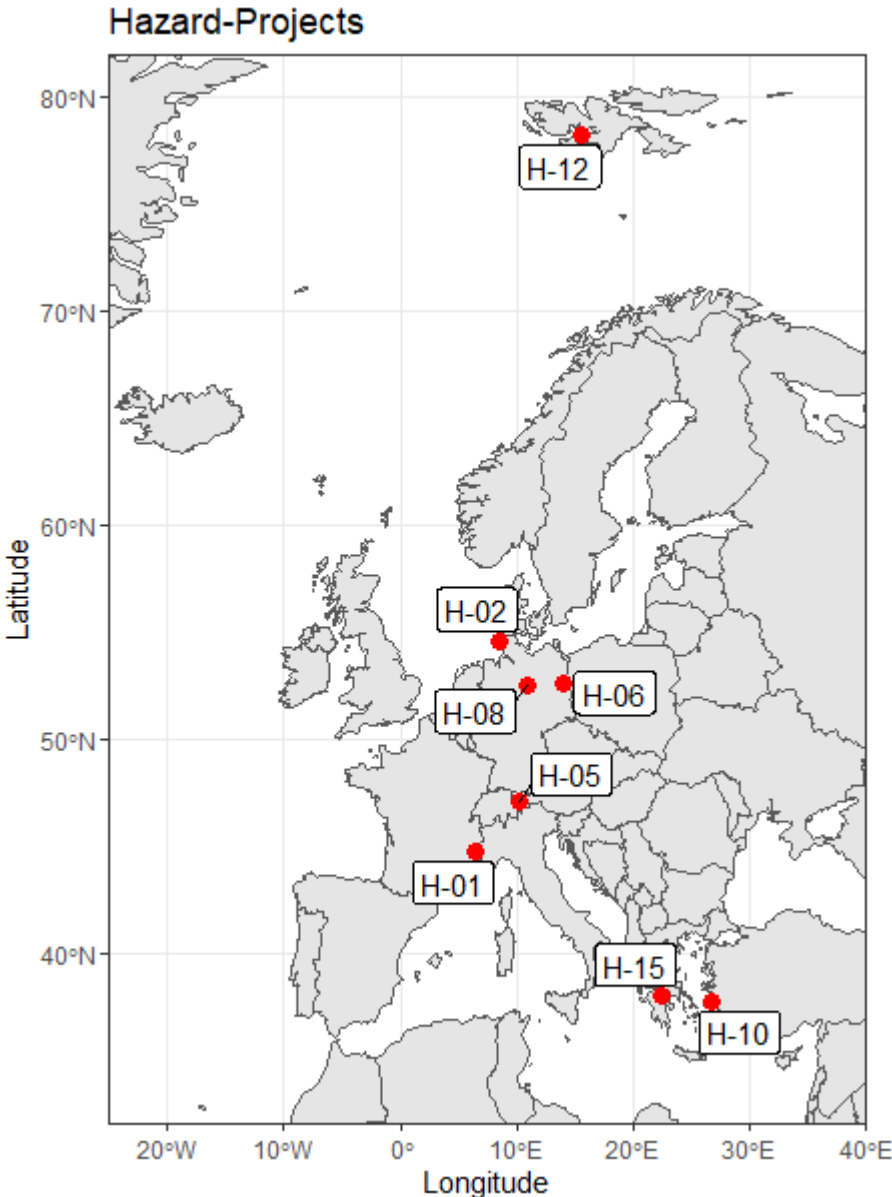


Figure 02: Overview map showing the locations of the projects of SC Hazards, supra-regional approaches not indicated.

Research aims and achievements

Hazards are, in the widest sense, any source of potential damage, harm or adverse effects on societies and/or environments. Depending on the degree of exposure and the level of ecological and/or social resilience, sudden onset events or slow onset changes can be experienced as a hazard and, if the potential damage turns into real impact, end up in a societal or ecological disaster. The SC Hazards research foci are: (1) Climate-driven

hazards, (2) Woodlands, (3) Land-use and soil development, (4) Pollution and Contamination. The spatio-temporal focus of the SC Hazards encompasses the European Bronze Age and the Anthropocene.

During the first part of the funding period, the members of the SC Hazards decided to combine the different foci to one central theme: Coastal Hazards, in connection with human land-use, protection, and adaptation activities, as well as in response to tectonic, sedimentary, and climatic forcings.

There are currently 14 projects in the SC Hazards that are or have been active during the report period 2019-2022. They are summarised in Table 1. The projects report the following summarising information about the respective achievements:

Woodlands / Dendroarchaeology, project Hazards-01, postdoc project of Lisa Shindo. Data acquisition and dendrochronological analysis have been completed. Lisa Shindo is currently working on their interpretation. Two discontinuities seem to emerge: (1) at medium altitude, a change in the species used in construction in the 16th century is observed, perhaps linked to overexploitation (overgrazing?) of the forest and regeneration difficulties, and (2) at high altitude, a revival of wood construction in the 17th century is noted (no older sites from a dendrochronological point of view), perhaps linked to a change in building practices, and/or a historical event that caused all older woods to disappear. The interdisciplinary projects Hazards-14 (“dendro-varves”) and Hazards H-06 (“mining pollution”) are both ongoing, but results are delayed due to the pandemic.

Socio-environmental Hazard, project Hazards-02, postdoc project of Bente Malchzack. The Wadden Sea project, titled: ‘Socio-environmental Interactions on the North Frisian Wadden Sea Coast’, investigates the natural (sea-level rise, flooding, storm surges) and anthropogenic (e.g. ground subsidence) hazards in the early to late medieval marsh landscape of North Frisia, their effects on the settlements and the subsequent human adaptations or acts of abandonment. The aims of the project are (1) to develop and refine a toolbox of research methods that are fit to investigate the largely lost medieval cultural landscape in the Wadden Sea of North Frisia and (2) to develop and bring forth a future cooperative research project. To reach these aims, the project has already formed a strong collaboration between national partners (Mainz University/Geomorphology, ZBSA Schleswig, ALSH Schleswig) and a regular exchange platform with international partners (Groningen University/Terp research group, NIHK Wilhelmshaven, Brussels University/Maritime Cultures Research Institute, Fryske Akademi Leeuwarden). The planned research project is intended to provide a long-term perspective for the study of the Wadden Sea in an interdisciplinary research group.

From 2020-2022, pilot studies with extensive archaeological and geophysical fieldwork have been conducted in the areas of Hallig Hooge and Nordstrand (both districts of Nordfriesland, Germany). By utilising geophysical prospection methods (Magnetic gradiometry, EMI, GPR, Geoelectrics, Seismics) as well as archaeological methods (coring, targeted excavation, metal detecting, find survey) and remote sensing (LiDAR, high precision drone photography in inaccessible areas, satellite data), we succeeded in locating and prospecting remains of early medieval settlements, a high medieval church terp, remnants of dykes and salt peat quarries in the tidal flats. At Hallig Hooge, a medieval terp for salt production was found and partly excavated, shedding new light on the medieval salt industry in the Halligen area, which transformed the landscape substantially and amplified the risk of flooding. A major achievement is the complete prospection of a high to late medieval marsh settlement near Nordstrand, with all settlement elements discernible. Furthermore, it was possible to utilise seismic profiling to trace former, strongly eroded dyke systems over large areas. Thus, the methodology has been successfully broadened to enable large-scale prospections in future research and to reconstruct lost medieval landscapes. The project contributed to the formulation of political recommendations for science and management for the trilateral management of the UNESCO Wadden Sea World Heritage.

Preparations for the aimed collaborative research project are well under way with our national partners. In 2022, the fieldwork will continue to complete several pilot studies as important preliminary work for a grant application.

Pollution and Contamination, project Hazards-03, PhD project of Ginevra Bellini. The project 'Testing the Neolithic Plant Invasion Hypothesis' started in January 2020 with the hiring of the PhD candidate Ginevra Bellini (GB). In the geobotany group of this project headed by the PI Alexandra Erfmeier (AE), we test some of the predictions of the Neolithic Plant Invasion hypothesis (NPIH), according to which plants from Eurasia possess a strong adaptation to agropastoralism thanks to a millennial-long exposure to such practices, while plants from other continents are less adapted. This could contribute to the high success of Eurasian plants as invaders of agroecosystems worldwide. The project aims to link plant invasions as a current phenomenon of the Anthropocene to processes dating back to the Neolithic. Here, we applied experimental approaches to test this.

The PhD candidate created three "exposure-length" groups of invasive species, according to the degree of adaptation suggested by the NPIH: exposure long, native to West Asia; exposure medium, native to Europe; exposure short, native outside of Eurasia. In the summer of 2020, GB implemented a first investigation, consisting of a large-scale multispecies germination experiment. We tested the germination and seedling performance of 30 species in total (10 per group) when subject to disturbances that aimed

to mimic agropastoral practices. The three exposure-length groups did not react differently to the disturbance, as expected, thus not providing support for the NPIH. In 2021-2022, a second multispecies experiment has been set in a field and monitors the response of 45 plant species (15 per group) to different agropastoral disturbances in later plant life phases. The data collected in 2021 in the field seems to suggest that the species' response does not seem to differ according to the exposure length group. For the third work package, we are considering either a meta-analysis or a critical review of some further propositions of the NPIH.

Pollution and Contamination, project Hazards-05, postdoc project of Clemens von Scheffer. Mires are complex and heterogeneous ecosystems which are sensitive to environmental changes. Therefore, especially mires on higher elevations in the Alps are, due to their exposition, geoarchives for past conditions. By analysing peat cores from an ombrotrophic mire in the Verwall Alps in Austria, the project aimed to contribute to a broader understanding of mire development and human impact with a special focus on pollution through ancient mining activity within the Central Alps. To answer questions about peat accumulation or land use and climate signals recorded in the cores, the geochemical composition of the peat was analysed using different XRF-based methods. Macrofossils from different core depths were analysed to allow a temporal classification of mire development and possible external influences. The results from two different mires in the Verwall, the Patteriol mire and the Albona Lake mire, were compared. The onset of peat growth at Patteriol mire can be dated to 6800-7000 cal BP, presumably due to prevailing favourable cool and wet climatic conditions. Evidence of first human impact recorded in the peat is found in the Neolithic around 5300 cal BP. However, the period from the Middle Bronze Age (3500 cal BP) to the end of the Early Iron Age (2300 cal BP) represents a main period of land use impacts. Compared to the Albona mires with adjacent historic mining and different initial geological conditions, the geochemical signals recorded in the Patteriol bog are generally low. Overall, regional trends and well-known lead (Pb) signals, such as influences of the Roman Empire or industrialisation, were particularly found in the peat bog. Overall, the project showed the heterogeneous structure of the bog ecosystem in the region and dependence of the development on natural and anthropogenic impacts.

Environmental Hazards; project Hazards-06, PhD project of Khadijeh Alinezhad. The project aims to investigate the role that volcanic eruptions played in climatic change, human migration, and the history of agriculture with their impact on vegetation changes in two time windows (two working packages): (1) in the migration period (the 1st millennium AD), and (2) in the Bronze Age. The **aims in (1)** are (a) to examine shifts in vegetation composition in the 1st millennium AD, specifically in the first half, (b) to

investigate the movements in human population, and (c) to investigate the factors contributing to these shifts, volcanic eruptions being one of those factors. The **achievements** in (1) thus far: A high-quality annually laminated sequence from Lake Kleiner Tornowsee, Northeastern Germany was selected and a multiproxy approach including pollen, varve, and 14C-AMS dating was conducted on this 1285 cm long sediment core (of which the section 270 cm to 386 cm will be examined in this package) to establish high-resolution records of vegetation history, human activities, and climate variability in the first millennium AD. As a first step in order to demonstrate the trend of changes in the vegetation composition and consequently vicissitudes of human activities in the 1st millennium CE, particularly in the Migration period, 59 samples at 2 cm intervals were taken from the core (KTO) for pollen analysis. In addition to the pollen data of KTO, we used the pollen dataset of four other lakes (Wittwese, Sacrowsee, Potzlowsee, and Rudowersee) in the same area (Brandenburg). The pollen data of these sites were provided by Susanne Jahns from the Brandenburg Archaeological Service (Arch. Landesamt). These pollen datasets enable us to reconstruct vegetation locally and regionally. The pollen results demonstrate a series of settlements and abandonments and subsequently changes in vegetation composition in the first millennium AD. These population discontinuities impacted landscapes by making successions in vegetation composition. The **aims in (2)** are (a) to examine changes in vegetation composition in the Bronze Age, (b) to investigate the changes in human activities, and (c) to investigate the role of Hekla 3 in these changes. The **achievements** in (2) thus far: These examinations will be done on the same core (KTO). The depth at which we expect to observe Tephra particles of Hekla 3 in the Bronze Age, according to the age-depth, ranges from 566 cm to 605 cm (ca. 1010 BCE to 1230 BCE). For reconstructions of vegetation composition and human activities in this period of time, 40 samples with 1 cm intervals for pollen analysis were taken from 566 cm to 605 cm.

Environmental Hazards, project Hazards-07, postdoc project of Magdalena Bunbury. As part of a major initiative to compile archaeological and palaeoenvironmental data across Europe and to produce a database enabling the assessment of human responses to past climatic change, in a 1-year postdoctoral project, Magdalena Bunbury has revisited and assembled archaeological settlement data and sum calibrated archaeological 14C data (as a proxy for human activities) from the Northern German Plain and Scandinavia. Comparison with palaeoclimate data has revealed distinct responses related to the 8.2, 4.2 ky BP events. A manuscript is currently in progress.

Environmental Hazards, project Hazards-10, PhD project of Sara Dannemann and postdoc project of Erica Corradini. The **first aim is to reconstruct** development phases for the coastal Chora Plain on Samos from sediment cores. Influences from marine

transgression, fluvial sedimentation and/or coastal hazards will be identified and dated to then infer phases of environmental conditions. The **second aim** focuses on estimating the potential for land use on Samos by analysing the current soil quality and soil hydrology. Refining and potentially broadening the coverage of the only existing soil map (Aristotle University of Thessaloniki 2015) for Samos will be a valuable output. The proximity to the Turkish coast and the archaeological sites underlines the potential for crop trade since the Late Chalcolithic/Early Bronze Age. Accordingly, the **third aim** is to synthesise the available archaeological and historical data with a focus on (a) crop diversity among the offerings at the Heraion, (b) forms of land use including crop diversity and manuring techniques, and (c) water management including river bed diversion and flood protection.

In October 2020, two sediment cores were drilled in the Chora Plain to a max. depth of 7 m. Preliminary results from radiocarbon dating confirm that the cores cover the desired archaeological periods from circa 6700 cal BP onwards. **XRF scans** of both cores were completed and **colour compilations** (RGB) were composed to help identify **sediment units**. For the initial chronostratigraphy, six plant remains were **radiocarbon dated**. In October 2021, disturbed **topsoil samples** were taken at 23 points within the Chora Plain and on the adjacent slopes. These points cover a range of agricultural use including fields for annual crops within the Chora Plain as well as terraces of different ages/ploughing methods with olive groves along the slopes. Undisturbed topsoil samples were taken at five agriculturally used points for **water permeability** measurements. All topsoil samples have been analysed for water content, SOM, grain size distribution, pH, TIC, TOC, C/N and water permeability in the laboratory.

PhD project of Sara Dannemann and postdoc project of Erica Corradini: A geophysical field campaign will take place in May 2022. The aim is to (1) confirm the suspected route of the Holy Street leading toward the Heraion, (2) find the outer margins of the lagoon in which the two cores were drilled, and (3) identify old river channels of the Imvrassos within the Chora Plain. In September 2022, a second field campaign to (1) investigate the geophysical and sedimentological results further with Direct Push and (2) map selected soil profiles to refine the existing soil map. Analyses of sediment units for SOM, grain size distribution, pH, TIC, TOC, C/N as well as visualising age-depth models for sedimentation rates should be completed by December 2022. Weather and land use/land cover **data** for the Chora Plain is still being collected. A first but comprehensive draft of the land use/land cover data should be completed by June 2022 in a bachelor thesis. Publishing and, if necessary, additional field campaigns, methods or reanalysis is planned for 2023.

Environmental Hazard, project Hazards-11, Project title: 'Sikyon Harbour'. Harbours can be understood as the interfaces of the land and sea portions of networks of routes,

along which persons, goods, knowledge and ideas travel. They enable multifold and multifaceted exchange between individuals and societies on local to global scales, thus forming a key element to be considered in concepts of “connectivity”. While harbours are vital for the on-site and remote interconnected societies, they are exposed to hazards that may affect them lethally or may trigger efforts of the concerned societies to keep them thriving. Hazards affecting harbours occur on different time scales and can be caused by both natural and anthropogenic processes. These include sea-level rise and fall, siltation, storm floods, earthquakes and related tsunamis. Tectonic processes cause coastal uplift and subsidence in both continuous and abrupt ways through earthquakes.

In this context, the still unknown harbour of ancient Sikyon, located on the Peloponnes at the Gulf of Corinth, serves as a study example to investigate how earthquakes may affect the existence of harbours. Evidence of a possible silted harbour basin or a waterway leading to it comes from seismic sounding conducted in the frame of the project. A so-called passive seismic survey was conducted in September 2021 to investigate the seismic structure of the uppermost 20 m of the subsurface. It revealed indentations of basement rocks filled with soft sediments, such as those typical for silted harbour basins. This finding is relevant in the context of ROOTS Hazards in that these geological “anomalies” line up in accordance with the lower course of the small but navigable Asopos River that appears abruptly deviated from its general course. This riverbed bending is typical for rivers displaced by a fault. In addition, evidence of a thin, coarse-grained layer was found embedded in the suspected harbour sediment such as that found associated with tsunamis at other coastal archaeological locations. In addition, this set of seismic velocity anomalies lines up almost parallel to the orientation of local faults known from offshore seismic surveys indicating a possible connection with the general tectonic activity of the Gulf of Corinth.

The project ‘Sikyon Harbour’ is conducted in cooperation with the National Museum of Denmark (Dr. Silke MÜth-Frederiksen) and the Ephorate of Antiquities of Corinth. The passive seismic analysis successfully reveals the seismic velocity structure and can also be applied at other sites for landscape reconstruction. Seismic data processing and interpretation are ongoing work and will be completed in the 2nd half of 2022. In order to date the identified processes, drillings are envisaged in a follow-up project.

Structural aims and achievements

Since March 2021, **Eileen Eckmeier** is the new professor for “Geoarchaeology and Environmental Hazards”, a key professorship of ROOTS, which specifically represents the research focus of SC Hazards. Eileen Eckmeier is the successor of the chair of Hans-Rudolf Bork at the Institute of Ecosystem Research. Her research focus is in the field of soil

geography and geoarchaeology with a special emphasis on human-environment interactions on different spatial and temporal scales, using integrative and interdisciplinary approaches. Main research topics are related to the changes in soil properties induced by land use and climate change, and the analysis of the underlying processes of soil formation and soil degradation since the onset of agriculture until today. Current investigation areas include the European and Asian loess and steppe landscapes, the Alps, and the African savannah. Since 2019, Eileen Eckmeier has been a board member of the Deutsche Quartärvereinigung (German Quaternary Association) DEUQUA.

Aims and plans for 2022 to 2025

The ROOTS SC Hazards aims at a new diachronic and comprehensive level of analysis on questions of socio-environmental hazards and human coping strategies in the past by interlinking methods and archives from environmental, social, and cultural domains. With a wealth of successful postdoc and PhD projects established in the first funding phase from 2019-2021, a major aim for the period 2022-2025 is now to develop a synthetic narrative of human-environment interdependencies in the focus regions. This should not only look at the role of environmental hazards in societal demises, but rather seek successful adaptation strategies employed by resilient societies, for example, in the Wadden Sea region. A major challenge will be to further extend the linked environmental, social, and cultural records beyond the range of historical sources, delineating the role of human activities. We aim at 'calibrating' the record of social, economic, and cultural human activities with regard to suitable societal proxies. Quantitative reconstructions of environmental and societal variables, including refined and continuous timelines of Holocene hazards, will establish new benchmarks, against which hypotheses jointly pursued with the other ROOTS subclusters can be empirically tested.

The research program for the new research group of Professor Eckmeier (geoarchaeology and environmental hazards) will focus on questions concerning the effects and processes of soil degradation. Soil quality is an important determinant for the success of societies based on an agrarian livelihood, and the deterioration of soil and land by climate change or land-use is a significant hazard. The group will investigate the influence of soil conditions on the development, maintenance or even abandonment of settlement structures or settled areas, in cooperation with ROOTS members and external cooperation partners, mainly at sites in Mongolia, Scandinavia and Germany.

One of the key projects in the SC Hazards is the 'Wadden Sea Project' (Hazards-02). For the coming years, fieldwork in the Wadden Sea will be broadened to produce a larger picture of the medieval landscape, its formation, exploitation and destruction. Additionally, prospections on still existent medieval terp settlements in Eiderstedt,

together with international partners (Kiel University/Applied Geophysics, Vienna University, Ghent University) will add a reference to the comparable settlement structures in the Wadden Sea. In addition to the fieldwork, the project will continue and strengthen scientific exchange and collaboration with other European Wadden Sea and Terp researchers as well as with local stakeholders for research, publication and education.

Hazards / Table 1: A) List of finished and ongoing Subcluster projects,

B) Contributions to ROOTS interdisciplinary research projects

Project-ID A	Hazard focus	Project (type, title)	Participants * contact person ** PhD student	Start and anticipated project end	Temporal frame	Regional frame	Deliverables, Publications
Hazards-01	Woodland	From the ancient uses of wood to the restitution of environmental hazards: a dendrochronological approach	Lisa Shindo*, Walter Dörfler, Ingo Feeser	12/2019- 11/2022	Last 2000 years	South-eastern France	Publication in indexed journals; publication of the proceedings of the EAA 2021 dendro session (if session accepted)
Hazards-02	Environmental hazard	Socio-environmental Interactions on the North Frisian Wadden Sea Coast	Bente Majchczack, Wolfgang Rabbel	04/2020- 03/2025	focus on last 1000 years; Neolithic-modern	North Frisian Wadden Sea/Germany	Monograph on workshop; research papers on specific sites; multi-authored paper on current state of the art in the German Wadden Sea archaeology
Hazards-03	Pollution & contamination	Testing the Neolithic Plant Invasion Hypothesis (PhD project)	Alexandra Erfmeier*, Genevra Bellini**	01/2020- 07/2023	Neolithic - Present day	Central Europe -> global	Do European archaeophytes and natives respond better to agro-pastoralism than neophytes? Insights from a multi-species germination experiment
Hazards-04	Pollution & contamination	Hazards of Non-native Species (Neobiota) in the Anthropocene (PhD project)	Konrad Ott*, Gido Lukas**	01/2020- 06/2023 (PhD student cancelled)	Last 5000 years until today (selected examples)	Worldwide (selected examples)	PhD (decline)

Project-ID A	Hazard focus	Project (type, title)	Participants * contact person ** PhD student	Start and anticipated project end	Temporal frame	Regional frame	Deliverables, Publications
Hazards-05	Pollution	Detecting anthropogenic disturbances in environmental archives: contamination, erosion and drainage	Clemens von Scheffer*, Ingmar Unkel	01/2020- 06/2021	Modern times, Middle Ages, Iron Age, Roman Age, Bronze Age,	Alps, northwestern Tyrol, Austria	
Hazards-06	Environmental hazards	Identification of hazards in paleoenvironmental archives with high temporal resolution in the context of societal change (PhD project)	Khadijeh Alinezhad, Walter Dörfler Ingo Feeser, Stefan Dreibrodt	10/2020- 03/2023	Bronze Age and Late Antique Migration period	Northern Germany	PhD
Hazards-07	Climate hazards	Environmental hazards and human mobility in Southern Scandinavia and the Baltic (preliminary title, Postdoc)	Magdalena Bunbury*, Mara Weinelt	10/2020- 09/2021	Last 10,000 years	Southern Scandinavia and the Baltic	Publication in progress
Hazards-08	Climate-human coping	Towards a coherent database to empirically test hypotheses of socio-environmental hazard and inequality	Ralph Großmann, Mara Weinelt, Johannes Müller	10/2020- 09/2021	Neolithic-Bronze Age	Central Europe	Two publications in progress
Hazards-09	Climate-human coping	Focus on Social Resilience to Climate Changes Over the Past 5000 Years	Liang Yang, Mara Weinelt, Ingmar Unkel	2019- 2020/21	Last 5000 years	Northern hemisphere / global	ERL special volume

Project-ID A	Hazard focus	Project (type, title)	Participants * contact person ** PhD student	Start and anticipated project end	Temporal frame	Regional frame	Deliverables, Publications
Hazards-10	Environmental hazards	Archaeohydrological hazards and land-use change on Samos (Greece) (PhD project)	Ingmar Unkel*, Sara Danneemann Wolfgang Rabbel, Erica Corradini	10/2020- 02/2024	Last 5000 years	Greece, Eastern Mediterranean	
Hazards-11	Environmental hazards	Sikyon Harbor	Martin Thorwart Wolfgang Rabbel	08/2021- 05/2022	Ancient Greece	Greece	Seismicity seismic risk
Hazards-12	High Latitudes	Timeless Arctic - commercial hunting in the reconstruction of human impact in Svalbard	Frigga Kruse*,	11/2019- 10/2023	1596-present	Svalbard, High Arctic	Three peer-reviewed papers, PhD thesis
Hazards-13	Climate hazards	Causes and effects of natural hazards on human societies	Martin Graff, Stefan Dreibrodt, Walter Dörfler	08/2019- 12/2020	Late Antique Migration period	Northern Germany	Report
Hazards-14	Climate hazards		Walter Doerfler*, Ingo Feeser, Stefan Dreibrodt, Lisa Shindo	10/2020- 11/2022	Last 8000 years	Northern Germany	If possible, the publication of an article

Project ID	Involved Subclusters	Project Title /Type	Proponents	Start and anticipated end project	Temporal Frame	Regional Frame	Keywords
Overarching Interdisciplinary Research Projects	SC Social Inequality, SC Hazard	Testing hypotheses of socio-environmental hazards in fostering social inequality across Late Neolithic and Bronze Age Europe	Ralph Großmann, Mara Weinelt, Johannes Müller	10/2020-10/2022	3500 BCE - 1500 BCE	Central Europe: Circumharz, Alpine Foreland; Czech/Lower Austria	Demography, Hazard, Climate, Inequality, 14C-Data
Overarching Interdisciplinary Research Projects	SC Social Inequality, SC Hazard	Large-scale spatial patterns of human and climatic developments in western Europe during the Holocene	Mara Weinelt, Julien Schirrmacher, Ralph Großmann, Magdalena Bunbury	11/2021-	6000 BCE - 1000 BCE	Europe	Data compilations Europe: Demography, Hazard, 14C-Data, human and climate development
ROOTS interdisciplinary research projects	ROOTS of Conflict, ROOTS of Hazards, Urban ROOTS, Dietary ROOTS, Botanical Platform, Communication Platform	3DARK DEPTH – Describing, Discussing and Developing Analytical Research Knowledge of the Dark Earth Phenomenon in Theory and Practice	Jens Schneeweiß, Eilenn Eckmeier Pawel Cembrzyński, Ben Krause-Kyora, Wiebke Kirleis, Katrin Schöps	08/2021-07/2023	Middle Ages	Scandinavia	

Project ID	Involved Subclusters	Project Title /Type	Proponents	Start and anticipated end project	Temporal Frame	Regional Frame	Keywords
B	Overarching ROOTS focus						
ROOTS interdisciplinary research projects	ROOTS of Conflict, ROOTS of Hazards, Reflective Turn, Dietary ROOTS, Social Inequality, Botanical Platform	The Forest Finns as a Model for the Early Slavic Migration	Jens Schneeweiß, Magdalena Bunbury, Vesa Arponen, Ben Krause-Kyora, Henny Piezonka, Wiebke Kirleis, Eileen Eckmeier, Sonja Filatova, John Meadows	08/2021-07/2023	Middle Ages	Scandinavia	
other ROOTS inter-cooperation	Jointly with Urban subcluster	Urban Neighbourhoods and Communities	Erica Corradini, Annette Haug, Wolfgang Rabbel	03/2021-12/2021	3rd/2nd century BCE- Late Republican	Italy	Construction phases, GPR, casa del citarista, Pompeji

New members / former members

(see also members table above)

Since March 2021, **Eileen Eckmeier** is the new professor for “Geoarchaeology and Environmental Hazards”, a key professorship of ROOTS, which specifically represents the research focus of SC Hazards. Eileen Eckmeier is the successor of the chair of Hans-Rudolf Bork at the Institute of Ecosystem Research. Her research focus concentrates on the fields of soil geography and geoarchaeology with a special emphasis on human-environment interactions on different spatial and temporal scales, using integrative and interdisciplinary approaches. Main research topics are related to the changes in soil properties induced by land use and climate change, and analyses of the underlying processes of soil formation and soil degradation since the onset of agriculture until today. Current investigation areas include the European and Asian loess and steppe landscapes, the Alps, and the African savannah. Since 2019, Eileen Eckmeier has been a board member of the Deutsche Quartärvereinigung (German Quaternary Association) DEUQUA.

Since 2021, Dr. des. **Mirco Brunner** is an associate member of ROOTS and connected to the SC Hazards. He is a SNSF Early Postdoc.Mobility Fellow at the Institute for Ecosystem Research and an associated researcher at the Oeschger Centre for Climate Change Research (OCCR), University of Bern.

PhD theses: no PhD projects completed yet.

JMA Chairs/Visiting Professors, incl. nominees scheduled for 2022 once approved by board:

Ignacio Mundo JMA Chair November 2020 – February 2021. He is an Adjunct Professor in plant biology at the Faculty of Exact and Natural Sciences of the Universidad Nacional de Cuyo at Mendoza as well as an Adjunct Researcher of CONICET (National Scientific and Technical Research Council of Argentina) at the dendrochronology lab IANIGLA (Argentinean Institute of Snow, Glaciers and Environmental Sciences).

Pavlos Avramidis designated JMA Chair July – September 2022. He is professor for sedimentology at the Geology Department of Patras University in Greece. He is also a member of the PELOPS research network of archaeologists, geoscientists, historians and biologists working on a comprehensive, integrated socio-environmental history of the Peloponnese. Chair of the PELOPS network is **Erika Weiberg**, archaeologist from Uppsala University, who is a member of the ROOTS advisory board.

Activities with international partners

Field campaigns

- *Lisa Shindo* – July 2020. Dendrochronological diagnosis, Lauvitel area, Ecrins national parc, France: with French CNRS laboratory (CCJ) and Ecrins national parc, France.
- *Lisa Shindo* – 2020, 2021. Roman theatre of Orange city (February 2020 and October 2021): with French CNRS laboratory (IRRA).

Conference organisation

- *Lisa Shindo* – 2021. EAA 2021 Kiel Virtual Annual Meeting, session #143 “Dendroarchaeology: Wood Science for the Reconstruction of Past Landscapes and Human-Environment Interactions Based on Archaeological and Historical Studies of Wood Remains”, September 9th: with T. Wazny, Toruń University, Poland
- *Laura Burkhardt, Mirco Brunner, Julian Laabs, Ken Massy* – 2021. Thematic session: “News from the Bronze Age – Scaling Dynamics and Narratives”, Annual Meeting of the European Association of Archaeologists (EAA) 2021 Kiel (virtual), 08–11/09/2021
- *Martin Hinz, Caroline Heitz, Mirco Brunner, Nils Müller-Scheeßel* – 2021. Thematic session: “Bayesian Approaches to Archaeological Questions”, Computer Applications and Quantitative Methods in Archaeology Conference (CAA), 2021 in Limassol, Cyprus (*virtual*), 14-18 June 2021
- *Eileen Eckmeier* – 2022. Conference “Quaternaire 13: Palaeoclimate changes, landscape evolution and human societies - from sedimentary basins to industrial landscapes”, 13.-18.03.2022, Strasbourg (France); member of the scientific committee.

Workshops/ conferences

- *Ralph Grossmann* – 2019. ROOTS Workshop: Quantifying Social Inequalities – New proxies, new methods. Possibilities and limitations to determine social inequalities in archaeological contexts.
- *Khadijeh Alinezhad and Walter Doerfler* – 2021. Societal response to volcanic eruptions hazards in the Late Antique migration and the Bronze Age periods, 27th Annual Meeting of the European Association of Archaeologists, Kiel, 6-11th Sep. 2021(Poster).
https://www.researchgate.net/publication/354437939_Societal_response_to_volcanic_eruptions_hazards_in_the_Late_Antique_migration_period_and_the_Bronze_Age

- *Khadijeh Alinezhad and Walter Doerfler* – 2022. Determining the role of volcanic eruptions in socio-environmental changes in the first millennium AD, (oral-presentation), Quaternaire 13: Palaeoclimate changes, landscape evolution and human societies - from sedimentary basins to industrial landscapes”, 13.-18.03.2022, Strasbourg (France).

https://www.researchgate.net/publication/359349229_Determining_the_role_of_volcanic_eruptions_in_socio-environmental_changes_in_the_first_millennium_AD

- *Eileen Eckmeier* – 2022. International Summer School “Geochronology”, 29.08.-02.09.2022, Morteratsch (Switzerland), organized by University of Zurich and ETH Zurich; (lecturer).

Contributions to ROOTS Platforms and the Reflective Turn Forum

The Wadden Sea projects contributes to the Communication Platform with: 1) the co-production of a 360° movie on the environmental hazards of sea-level rise in the Wadden Sea/Pellworm (completed), 2) the production of a 3D-model of the medieval Rungholt marsh settlement (completed), and 3) the production of an interactive exhibition installation, teaching the methodology of geophysical prospection in tidal flats (expected completion: 04/2022).

Contributions to ROOTS public outreach activities

2022. Weinelt, M. Interview “Klimawandel im Rückspiegel”, Bild der Wissenschaft, Ausgabe Februar 2022.

2021. Mayer, P., Shindo, L. “Forgotten stories of trees and fruits: dialogues between dendrochronology and ethnobotany”, *Let's talk about heritage*, Conference, Library of Greoux-Les-Bains, France, 17 September 2021.

2021. Shindo, Lisa Interview for Kiel University newspaper « Unizeit » by J. Ruske: “Herrin der Ringe”. <https://www.uni-kiel.de/de/unizeit/uz/news/herrin-der-ringe>, July 2021.

2021. “Country heritage and mill days”, Marcoux and Digne-les-Bains, France, 25 and 26 June 2021. Two conferences for the general audience.

2021. Shindo L. “Dendrochronology” poster for the ARDA (Association for research and archaeological documentation of High Provence), 19 June 2021.

2021 Majchczack B.S. EAA film “Hidden Treasures of the Wadden Sea”.

2021 Majchczack B.S. Appearance in documentary films by ZDF Terra X (02/2021); "Before the storm", Elk-Films Copenhagen (in prod.).

2021 Majchczack B.S. Multi-page newspaper feature in Schleswig-Holsteinischer Zeitungsverlag and Badische Zeitung (05/2021); Contribution to and article in mare (10/2021) and an article in unizeit (01/2021).

2021 Majchczack B.S. Radio features on Wadden Sea research on 1) WDR5 (05/2021), 2) Deutschlandfunk (05/2021), and 3) Bayerischer Rundfunk (in prod.).

2020-2021 Majchczack B.S. Public lectures on the Wadden Sea Project: 1) Nacht der Wissenschaften Kiel (11/2020), 2) Sylt Museum (09/2021), and 3) Heimatverein Angeln (09/2021).

2020 Association de amis de l'arbre à l'ouvrage and Shindo L., poster « Dendrochronology », Pays des Ecrins, France.

2020. Film-clip for Orange city "Archaeological follow-up of the work to protect the Orange theatre during Covid-19 containment: episode 4", A. Badie (IRAA, CNRS) editing. <https://hal-amu.archives-ouvertes.fr/hal-02529553/>

3.1.2 Dietary ROOTS: Domestication, Diet, and Diseases

Principal Investigators/Members/PhD members/Associate Members

Name	Email	Role
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Claaßen, Benjamin	bclaaßen@roots.uni-kiel.de	PhD student
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Meadows, John	john.meadows@zbsa.eu	Full member
Tholey, Andreas	a.tholey@iem.uni-kiel.de	Full member (not active)
Torres, Guillermo	g.torres@ikmb.uni-kiel.de	Postdoc
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Winter-Schuh, Christine	c.winter-schuh@ufg.uni-kiel.de	Postdoc

Former member		
dal Corso, Marta	mdalcorso@ufg.uni-kiel.de	Full member
Filatova, Sonja	s.filatova@ufg.uni-kiel.de	Full member

Research activities, achievements, and highlights

- determined through the combined bulk CN and compound-specific nitrogen isotope analyses of amino acids that **early animal domestication processes in the Near East did not involve an increased consumption of proteins** by humans, who instead maintained a heavily plant-based diet
- authenticated the utility of **carbon isotopes** in proteinaceous tissues of bovid livestock as a means to **trace geospatial origins** in semi-arid environments, and rejected nitrogen isotopes in those tissues as a suitable means to define relative aridity levels

- confirmed that **waterfowl and fish proteins can be recovered from ceramics** and identified to genus using a **proteomic approach**, thus providing an analytical 'proof-of-concept' that will demonstrate the importance of aquatic waterfowl for so-called 'Aquatic Neolithic' hunter-gathers of the Siberian taiga Northeast Asia
- established the **feasibility of recovering chloroplast and nuclear genomes in dessicated rye plants**, which were recovered from straw used in historical building constructions, laying down the foundations for future work on more ancient samples
- discovered through close stylistic analyses of Siberian and Mongolian rock art that **first Bronze Age herders of the Altai** travelled through the mountains on the backs of yaks and cattle with packs, rejecting wagons
- explored the **impact of diagenetic alteration of the isotopic composition of tooth enamel** in the burial environment, and how this impacts interpretation of livestock mobility
- revealed that **long-distance movement was not part of early pastoralist mobility strategies** in the Mongolian steppe through multi-stable isotopic analyses of Bronze Age livestock teeth, overturning previous models for the spread of pastoral nomadic groups into Inner Asia and the character of their daily lives
- determined the reliance of **Neolithic hunter-gatherers at Sakhtysh** (Russia) on aquatic resources
- investigated dynamics of **seasonal settlement of historical Sel'kup reindeer-herding communities** located in the Siberian taiga through ethnographic interviews and excavation of historical point.

Additional research aims

- The establishment of **the utility sulphur isotopes in distinguishing freshwater aquatic v. terrestrial food sources** through analyses of modern fish from Russia and three Neolithic cemeteries in Russia
- The establishment of **collagen-apatite fractionation factors in herbivorous taxa** in order to better discern ancient landscape conditions and animal management strategies involving forests, river floodplains, grasslands, and pastures—niches within the floral biome sensitive in their carbon isotopes to water availability and canopy thickness
- The establishment of the feasibility of isolating **textile trade and 'movement' of textiles** in arid- and semi-arid environments through novel oxygen and hydrogen isotope analyses of modern Bedouin textiles, crafted from sheep and goat hair, with known production and movement histories east of the Jordan Valley

- The establishment of the relationship between agro-pastoralist settlement patterns in the Near East characterised by newly established Neolithic homesteads replete for the first time with the full set of domesticated plant and animal technologies, and the **initial spread of pastoralism** into the 'arid margins' of the badia
- The establishment of a first **diachronic, stratified archive of food strategies of the early modern period** in the Mongolian steppe through the excavation of the Baruun Khuree monastery, Mongolia, where massive waste heaps contain large amounts of animal bones.

Structural achievements

- Completion of the **new Archaeological Stable Isotope Laboratory (ASIL)** Olshausenstrasse 80c (December 2021)
- Installation of the **EA-IRMS**, PyroCube Elemental Analyzer coupled to Vislon mass spectrometer for CNOHS isotope analyses in ASIL (December 2021)
- Installation of the **GC-C-IRMS** for compound specific CN isotope analysis (March/April 2022)
- Installation of the **Picarro autosampler** for rapid water OH isotope analysis (underway April 2022)
- Installation of the **ATR-FTIR** for characterisation of organic and inorganic compounds in skeletal bioapatite, collagen, charred seeds, etc.
- Installation of the **tabletop SEM** (COXEM SEM, Model EM-30AXN) for high resolution, high-magnification imaging for the characterization of wood charcoal, charred seeds, skeletal microstructure
- Personnel recruitment: aDNA Technical Assistant
- Personnel recruitment: Archaeological Stable Isotope Scientist (Winter-Schuh)

Structural aims (current and second phase)

- Completion of the new **aDNA Laboratory (UKSH)** (December 2022)
- Acquisition (second phase) of the isoDUALINLET interfaced with a CARB PREP device coupled to a PreciLion mass spectrometer for the analyses of carbonate OC (e.g. enamel and bone apatite, phytoliths, and fossilised carbonates)
- Installation of a cloud-based, searchable database for ASIL

Aims and plans for 2022 to 2025

- Completion of MAD-BAD, FPP, Fractionation Facto, and Rye Cultivation Data Gathering and Analysis in 2023

- Completion of FiberText and Lost CitiesData Collection and Analysis in 2024
- Stable Isotope Workshop in 2023
- Initiation of outgrowth projects leading through to 2025 are currently under discussion

Data management

Ancient DNA Laboratory

- Data is stored centrally in the computing centre and on our own servers at the computing centre in Hamburg for 10 years
- All data collected on samples that appear in publications are stored in a freely accessible nucleotide archive (ENA and NCBI)

Stable Isotope Laboratory

- Metadata data is stored on a cloud-based Elab for 10 years
- Hard data is archived on a ASIL computer, but a cloud-based, searchable database that ties together hard data with metadata is needed

It is not evident how the Humanities Platform DataWarehouse cited in the proposal will be articulated with Dietary ROOTS data management needs.

Conference Sessions and Organised Workshops

- **EAA 2021** (Makarewicz): organized session: From Critique to Synthesis: Transcending the Genomic Divide within Archaeology
- **EAA 2021** (Makarewicz): organized session: Ancient Pastoralist Adaptations in the Eurasian Steppe: The Intersection of Biomolecular and Landscape Archaeology
- **ESEB-STN workshop 2019** (Stukenbrock): co-organizer: “Methods to detect the underpinnings of host-parasite coevolution in genomic data” TUM, Freising
- **Mini-symposia** (Stukenbrock): As speaker of the **Kiel Plant Center**, she was responsible for the organisation of two mini-symposia per semester as well as the yearly KPC symposium day (2019, 2020)
- Kiel Plant summer school August 2021, Kiel (Stukenbrock): organiser
- **Symposium 2019** (Piezonka): co-organizer: “You only see what you know – you only know what you see” (Berlin March 2019)

JMA Chairs/Visiting Professors

- **Anders Fischer** (U Gothenburg), proposed for 2022

Activities with international Partners (not including joint publications)

- **Field Work:** Neolithic – Bronze Age Coastal Adaptations in the Carmel Mountains (funded: ISF; Makarewicz/Flohr with Haifa)
- **Field Work and Sample Acquisition:** Food Production Pathways (Makarewicz/Flohr/Piezonka/Meadows with U Oxford, U Haifa, Tel Aviv U, Hebrew U, Yarmouk U, Mut'ah U, U of Jordan, Florida State)
- **Knowledge Transfer** (Makarewicz/FPP project): Stable Isotope Laboratory Methods (delivered at TAU, November 2021; delivered to Haifa PhD Candidate in ASIL March 2022)
- **Field Campaign** (Piezonka): Lost Cities, Mongolia, year?
- **Workshop** (Piezonka, Meadows, Krause-Kyora): "Late Stone Age burial sites in the Russian Plain: Multidisciplinary research on chronology and population dynamics" (January 2022)

Dietary / Table 1:

**A) List of finished and ongoing Subcluster projects;
B) Contributions to ROOTS interdisciplinary research projects**

Project ID	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
Dietary	Metabolic Adaptation and Disease, Before Animal Domestication	*Ben Krause-Kyora, John Meadows, Henny Piezonka	2023	8000-3000cal BCE	Russia	Disease, pathogen Metabolic pathway	Radiocarbon, isotope, aDNA datasets
Dietary	Genetic variation in ancestral crops	Eva Stukenbrock, Wiebke Kirleis, Ben Krause-Kyora, Guillermo Torres, Almut Nebel, Benjamin Classen	2023	4000BC-1000 AD	Germany, Switzerland	aDNA, biodiversity, cultivation practice	aDNA datasets
Dietary	Mongolia Abandoned Cities	Henny Piezonka	05/2022-05/2024	1000 AD	Mongolia	Isotope Zooarchaeology Urbanism Steppe	Not yet initiated
Dietary	CAC-IFF Collagen-Apatite Carbon isotope Fraction Factors	Cheryl Makarewicz, Karolina Varkuleviciute, Christine Winter-Schuh	02/2022-08/2024	Contemporary	Jordan Germany	Isotope, Feeding study	Animals purchased

Project ID	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
Dietary	Fiber Text	Cheryl Makarewicz, Christine Winter-Schuh, Pascal Flohr	08/2022-12/2024	Contemporary	Jordan	Isotope, Mobility, Material Culture, Intangible Heritage	Community contacts initiated Feb 2022.
Dietary	Total Farming	Pascal Flohr, Cheryl Makarewicz, Christine Winter-Schuh	10/2022-12/2024	6000 BCE	Jordan	Neolithic, Farming, Survey	Not yet started
Dietary/ Hazards	Food Production Pathways	Cheryl Makarewicz, Henry Piezonka, Ralph Schneider, John Meadows, Pascal Flohr	10/2021-12/2023	9000-6000 BCE	Jordan, Israel	Neolithic, Farming, Pastoralism, Landscape Change, Human Diet	Modern plant collection, IL + JO samples 50% collected, initial bone and teeth sampled for CNO

3.1.3 Knowledge ROOTS: Innovation, Cognition, and Technology

Principal Investigators/Members/PhD members/Associate Members

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Research aims and achievements

Crafts apprenticeship and transmission of knowledge in Bronze Age flint working (Eriksen)

An archaeological examination of lithic inventories from a number of Danish Bronze Age settlement sites provides the basis for a discussion of the role of flint craftsmanship in past metal using societies. One part of this project (in collaboration with Moiken Hinrichs M.A.) focuses on the production of so-called asymmetrical, bifacial sickles. More particularly, it will focus on "individual" flint knappers and their technological skills and knowledge and not least on the local and regional socio-economic tradition in which they took part. Ongoing contextual chaîne opératoire analyses of lithic inventories from Early Bronze Age settlement sites (1100-1500 calBC) in the region of Thy, Northwest Denmark indicate, as a rule, that bifacial and crude flake tools were produced by different flint knappers, i.e., flint knappers possessing highly different skills and abilities. Crude flake tools were produced ad hoc – by anybody, anywhere, anytime. The production of bifacial tools, in contrast, was generally characterised by a high degree of precision, control and anticipation of explicit intentions. Evidently, these tools were made by very skilled flint knappers. Contextual analyses of the lithic inventories indicate that these craftsmen were not always around. It is thus asserted that we may be dealing with the leftover lithics from journeymen who spent a part of the year visiting different farmsteads within a specific area offering their services as handymen. This project will serve as a basis for a general discussion of problems related to evidence of skill and learning processes in prehistoric lithic inventories.

Religion and innovation (Klinkott)

Usually, the sources on ancient religion, both in a literary or in a documentary sense, are used to focus on a status quo of religious or cultural conditions in a specific cultural or political frame, or are generally situated in a theological discourse. Thereby, religion is usually characterised by a conservation quality, anchored in cultural tradition and performed in ritual action. In this sense, religion is also attributed with the quality to acquire, document, collect and store knowledge in general. The attractiveness of religion is not only the supposed connection to a – whatever – divine sphere but also the existence of institutions of religion (abbeys, monasteries, temples, etc.) as 'hoards of knowledge' with the religious personal as competent administrators and mediators. Thus, religion is

characterised by a very modern or modernising aspect – the implementation of collected knowledge for actual innovative impact.

It is the purpose of the project to study the innovative dynamics of religion in pre-modern societies in a transcultural and trans-disciplinary way. Therefore, the research focus will be placed on the administration of the ‘archives of knowledge’, the ways of acquiring, exchanging and protecting knowledge, the fields of innovation in sciences, ritual performance, theological conceptions, society and policy. Last but not least, the ways or routes of innovative influences – especially those triggered by a religious context, for example, by religious personal, temples, cult performances, etc. – will be considered. Because of the broad concept with an interdisciplinary and intercultural approach, it is necessary to clarify the borders of the project. Thus, the project definitely will neither study the theology or theological concept of religion, in particular, nor analyse them in a general overarching way. Similarly, it is not the duty of the project to discuss, develop or scrutinise religious terminology in practice or conception. Finally, the project also does not document the importance of religion for society or policy. Instead, the project focuses on processes of knowledge transfer and innovative dynamics. From this point of view, it is necessary to study ‘religion’ as a trigger of innovation in ancient and premodern societies. The adaptation, collection, and handling as well as the release, exchange and transfer of knowledge, ideas and sciences within the scope of religion and cult is still a desideratum in religious studies as well as in the history of science.

The cult of Asklepios as a link between research and urban development (Boelke)

The evolution of medicine in the course of time from the belief in supernatural acts to a scientific approach started in ancient times. An important part of this evolution was the cult of the ancient healing god Asklepios in whose sanctuaries healers and physicians treated and studied the suffering of patients. In addition to working with the patients, they had access to written research which was stored in ancient libraries. These libraries and sanctuaries needed to grow in order to make progress in the field of medicine (and progress made growth necessary), while at the same time the affiliated cities grew with these institutions. Thus, both developments may have accelerated instead of just advancing naturally.

This PhD project aims to prove the hypothesis that the healing god Asklepios can be seen as a link between ancient medical research and the development of cities. To achieve this, the study will mainly make use of literary and epigraphical sources and supplement these with archaeological and numismatic findings from selected locations around the Mediterranean Sea. All findings will be used to generate a database and “archive” of

Asklepios-themed sources, which will also be assembled in a catalogue to be used for further research.

Thesaurus Scientiarum: Ancient corpora of knowledge and their distribution (Käppel, Schneider)

The history of human behaviour has been a history of adjustment to the environment and of coping with natural hazards. In this respect, all forms of knowledge play an important role, in particular, explicit scientific knowledge. The aim of this project is to establish cross-cultural corpora of knowledge of selected domains (environment, meteorology (climate), astronomy/natural resources, biology, and technology) and make them available for future research. The aim of the (sub-) project is the identification and parametrisation of appropriate sets of knowledge from a selection of domains.

Case study from astronomy:

Science meets Vision: The clash between Greek astronomical theory and Egyptian cosmological iconography in the so-called Eudoxos Papyrus (Pap. Paris 1)

The so-called Eudoxos Papyrus in the Louvre in Paris is one of the most impressive papyrus rolls written in Greek that survived from antiquity in the dry sand of Egypt. Written in the 2nd century BCE, it came from Saqqara (Memphis) to Paris in the middle of the 19th century and was assigned the "Number 1" in the papyrus collection of the Louvre. On the back, an artistic Hellenistic acrostic poem ascribes the contents of the roll to the "Eudoxou techne". The text itself is a scientific astronomical treatise on the basic elements and movements of the sun, the moon, and the stars. It is equipped with 32 partly coloured drawings, which seem to illustrate the text. However, scholars regarded the interplay between the text and the drawings as merely decorative and, to a large extent, scientifically incomprehensible. Therefore, scholars dismissed the papyrus as a work of the famous 4th century BCE astronomer Eudoxos and regarded it as an exercise written by an incompetent 'pupil' decorating the text with fancy pictures. In contrast, the project tries to explain the disconnected coexistence of the drawings and the text not as mere incompetence, but rather as a mediation between 'new', allegedly modern, scientific Greek knowledge (represented as text) and 'old', allegedly overridden, Egyptian knowledge (represented as iconography). This 'clash' of knowledge systems seems to be the reason, why modern scholars, who tried to understand the drawings as immediate visualizations of the text, were bound to fail. The 'illustrated treatise' of the so-called Eudoxos papyrus is, nevertheless, an impressive attempt – however successful – to integrate competing cultural sets of knowledge ('modern' vs. traditional, Greek vs. Egyptian), presented in competing modes of representation (text vs. icon).

Ancient guts (Thumiger)

This project focuses on a key, but comparatively underrated aspect of ancient medicine and anatomy: the gastric area of the body and the process of food ingestion and assimilation. Other functions and vital processes have attracted more attention in historiographies of medicine, such as the role of the brain in cognition, cardiocentric models in competition with encephalocentrism, blood circulation, the humours and respiration. Despite its well-known importance and involvement in a variety of aspects of animated life, the gastric sphere, instead, has not been a central topic. My aim is to redress this balance, exploring the topic from the most concrete and material – the construction of different bodily anatomies and physiological models; the pragmatic, social and economic aspects of human food intake – to the most abstract – psychological and cultural, even metaphorical ‘guts’. This topic is innovative in a number of ways. First, it focuses on an aspect of the human body and its physiology that are seldom addressed, despite its obvious centrality. Secondly, it combines the philology of ancient texts, history of medicine, and material and cultural history in a broader sense, while including considerations of current neuroscientific suggestions to bring ancient theories in dialogue with modern views about the body. Thirdly, it explicitly joins medical models and non-technical perceptions and metaphors of the body and finally, it aims to bring together the history of ancient doctrines about the body and the concrete, material history of ancient life in one of its most basic aspects, the consumption of food and drink and its processes. Thus, this study intends to further a dialogue between different areas of history, while strongly affirming the relevance of ancient texts to contemporary questions.

Science and Myth in Greco-Roman Antiquity (Lattmann)

The project deals with two paradigmatic forms of knowledge in ancient Greek and Roman culture, namely myth and the mathematical sciences, in part also with regard to their dynamic connectivity. Several papers have been, and shall be, presented at national and international conferences that, on the one hand, address the pragmatic function of myth in 5th century BCE Greek verse literature, in particular as it relates to the social episteme and praxis encoded in and reflected by it and, on the other hand, shed light upon the beginnings of scientific mathematics in Greco-Roman antiquity as a central technology within the European tradition. These papers and additional articles shall be worked out for submission for publication.

Prehistoric Amber Connectivities (Serbe)

The project focusses on the distribution of amber artefacts in the European Bronze Age (2200 – 800 BCE) and the possibilities to research idea transfer through embedded knowledge in artefacts. Currently, a database is available with 33028 countable amber

artefacts mined from 44 catalogues and eleven secondary publications for clarification on certain objects. The question on dating uncertainties was solved using the newly developed method of non-uniform aoristic calculations (NUAC) giving a better incorporation of C14-Dates in aoristic probability calculations.

The next steps of the project will focus on similarity analysis of different regions and a respective multidimensional network creation taking the connections through time into account. The successive network analysis will give insights on connections between certain regions and will ultimately answer the question on knowledge transfer between societies during the European Bronze Age.

Results regarding the network creation and analysis are expected around 10/22 so that the project can be finished around 05/23.

Other projects

Garden Scent Project (Thumiger, Zentgraf) in cooperation with the Reflective Turn Forum, SC Hazards and SC Urban. A special issue "Gardens, Human Senses and Eudaimonia", is in progress and is expected to be published in October 2022.

International Symposium „Homo homini lupus est? Menschenbilder und das Fremde: Interaktion und Wahrnehmung“ (Zentgraf and Boelcke in cooperation with PhD candidates from SC Urban, SC Hazards, and from the Muthesius Kunsthochschule Kiel).

Interlinking Group: Abfall/Waste (Zentgraf in cooperation with SC Conflict). A contribution on *Abfall im Garten* from a philosophical and an archaeological perspective is in progress as a ROOTS booklet.

Activities for the future

“Routes and Knowledge Transfer in the Southern Caucasus (mid-4th – 1st mill. BCE)” (Ricci/Kneisel)

Within this project, a doctoral candidate will analyse chains and clusters of burial mounds (kurgans) in selected plateaus and river valleys in the Southern Caucasus (Armenia, Azerbaijan, and Georgia) in order to reconstruct: a) the dispersal mechanisms of the kurgan phenomenon; b) technology transfer of metal processing and use (including bronze, gold, silver); and c) wealth distribution within the kurgan groups between the mid-4th and the 1st mill. BCE.

“Interfaces of Technology in Early Metal using Societies II” (Eriksen)

Within this project, a doctoral candidate will investigate the development in agricultural knowledge systems during the Nordic Bronze Age. Thus, the focus of the PhD project lies on the connection between agricultural technologies and harvest implements at the interface of technologies in early metal-using societies in Northern and Central Europe between 2000 and 500 BC. The project should address these issues through a focus on technology, e.g., the role of the production and use of lithic versus bronze sickles through chaîne and schéma opératoire studies, as well as the development in the organisation of agricultural practices (different crops, field systems, etc.), and the relation to socio-political & economical structures of the Bronze Age.

Routes of Amber and Knowledge Transfer connected with them (Kneisel)

currently no text available

Comparative Guts: A digital exhibition and image catalogue (Thumiger/Messner)

The aim is to explore the Graeco-Roman, the Chinese, the Aztec, the Egyptian, other Asian and Sub-Saharan African traditions – medical and ‘popular’ – as well as examples of Neolithic rock-carvings. I am of course open to more suggestions and cooperations. Secondly, I would like to involve biological and medical sciences not only by including examples from state-of-the art medical imaging of the human body, but also by opening a dialogue with researchers about concepts such as the sympathy between the organs of the digestible system and the brain, the relationship between nutrition and mental health, and the very concept of ‘organ’ and ‘system’ within the human body.

Follow up to Thesaurus Scientiarum:

Transfer of Knowledge by Translation: Cultural reciprocities and their digital representation (Käppel/Lattmann)

currently no text available

Knowledge / Table 1:

A) List of finished and ongoing Subcluster projects;

B) Contributions to ROOTS interdisciplinary research projects

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants :	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Knowledge		Sacred Buildings - Knowledge in Building and Financing Cathedrals in the Late Middle Ages		05.2021-11.2022				
SC Knowledge	Transfer of technological knowledge	Crafts apprenticeship and transmission of knowledge in Bronze Age flint working	Berit V. Eriksen	2019-2026	2nd-3rd millennium BC	Central & Northern Europe		Publications
SC Knowledge	Transfer of technological knowledge	Craftful minds - Tracing knowledge through time	Moiken Hinrichs supervised by B. V. Eriksen	08.2019-02.2023	2nd-3rd millennium BC	Central & Northern Europe (Northern Denmark)	Lithic Technology, Bifacial Technology	PhD thesis

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Knowledge	Transfer of technological knowledge	Knowledge transfer across generations in prehistoric societies (theory, methodology, case studies)	Marcus Wild supervised by B. V. Eriksen	2021-2022	3rd-10th millennium BCE	Central & Northern Europe		Publication
SC Knowledge	Transfer of technological knowledge	Lost in Translation: Transformed and forgotten knowledge	Berit V. Eriksen, Jutta Kneisel	2021-2023	Pre-/proto- and early history	Europe and neighboring regions		EAA session 2021; Publication of proceedings scheduled for 2023
SC Knowledge		Prehistoric Amber Connectivities – Networks and Interaction in the European Bronze Age	Benjamin Serbe	09.2019-03.2023	2200-800 BCE	Europe	Amber, Network analysis, Similarity Indices	Major publication, Datasets on Bronze Age Amber

New Professor

Prof. Dr. Andreas Schwab, Classics, Ancient Greek, Knowledge Studies (since 1.9.2021).

Activities with international partners

Andreas Schwab: Herodotus Helpline (<https://herodotushelpline.org/>) and Journal "Syllogos": A Collaborative Online Journal dedicated to the Study of Herodotus and his World. Together with Paul Demont (Sorbonne), John Dillery (Virginia), Francesca Gazzano (Genova), Jan Haywood (Leicester), Elizabeth Irwin (Columbia), Polly Low (Durham), Pietro Vannicelli (La Sapienza).

JMA Chairs/Visiting Professors

Prof. Dr. Charlotte B. Damm, Artic University of Norway, Tromsø.

By invitation from Prof. Dr. Berit V. Eriksen, SC Knowledge, Prof. Dr. Charlotte Damm spent 4 months in Kiel in the wintersemester 2021 (Sept.-Dec. 2021)

Activities with international partners

Workshops/conferences, *including workshop and conference sessions organised abroad*

- EAA session #222: »Lost in Translation: Transformed and forgotten knowledge« (EAA 27th Annual Meeting, Kiel 2021). Convenors: **B.V. Eriksen**, C.B. Damm, J. Kneisel. Proceedings will be published by ROOTS – Cluster of Excellence with Sidestone Press Academics.

3.1.4 Urban ROOTS: Urban Agency and Perception

Principal Investigators/Members/PhD members/Associate Members

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Felber, Timo	felber@germsem.uni-kiel.de	Full member
Gomez-Montero, Javier	gomez.montero@romanistik.uni-kiel.de	Full member
Grund, Max	mgrund@roots.uni-kiel.de	PhD student
Kobusch, Phillip	kobusch@klassarch.uni-kiel.de	Full member
Kreuz, Patrick-Alexander	kreuz@klassarch.uni-kiel.de	Full member
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Zimmermann, Christiane	c.zimmermann@email.uni-kiel.de	Full member

Former members		
Bork, Hans-Rudolf	hrbork@ecology.uni-kiel.de	PI (retired)
Fouquet, Gerhard	fouquet@email.uni-kiel.de	PI (retired)
Lamare, Nicolas	nicolas.lamare@u-picardie.fr	Postdoc (moved to Université de Picardie Jules-Verne (Amiens))
Feuser, Stefan	sfeuser@uni-bonn.de	Co-PI (moved to University of Bonn)
Krüger, Anna-Lena	al.krueger@klassarch.uni-kiel.de	moved to Hamburg University

Research aims and achievements

The subcluster (SC) Urban ROOTS focuses on the agency and perception of urban spaces from a historical perspective. The main focus is on cities of pre-modern times (antiquity and the Middle Ages). Cities are understood here as historically variable hubs in dynamic networks, which clearly distinguish themselves from the surrounding environment in various aspects (environmental, cultural, social, political, ritual and economic). In cities, extensive and very complex processes of interaction and exchange take place between

multivocal, multicultural, and multilocal actors and groups with their agencies so that cities can be described as nodes of connectivity. Urbanity is thus primarily created by the agency and perception of past urban actors. Therefore, the reconstruction and research of these dynamic processes promise a broad understanding of the driving forces behind urbanisation processes.

Accordingly, the SC focuses on the history of urbanism and its many aspects (environmental, demographic, economic and social) and research on the structures of urbanity. The idea is to show the interdependence between urban environmental settings, material and immaterial resources, forms of urban design (architecture), mental concepts of urbanity, and forms of urban agency (e.g. formalised through institutions or non-formalised) and perception. Urban ROOTS approaches this socio-environmental network from the perspective of human (inter-)action and perception.

The SC members explored the overall question of urban agency and perception in the first three years of a project through focus topics: 1) Urban Water, 2) Economy, Ecology and Urban Development, 3) Imaginaire of Cities, 4) Neighbourhoods, and 5) Sacred Spaces. The research was conducted through i) individual projects, ii) internal focus groups aiming to increase dialogue between urban disciplines, iii) external projects within ROOTS, and iv) the organisation of workshops, conferences and other events aiming to reach the global academic community as well as the non-academic audience.

Initial activities of the SC concentrated on the focus topic of **Urban Water**. It intended to bundle the activities of the first years and constitute an important factor in activities during the following years. The significant achievement was an international conference titled *Urban Water* (23-26 October 2018; organised by N. Chiarenza, A. Haug and U. Müller). The conference addressed water's symbolic, aesthetic, and cultic aspects in urban contexts and its role in politics, society, and the economy. Chronologically, the spectrum of conference contributions ranged from antiquity to the early modern period. The conference results were published in 2020 (*Power of Urban Water*, ed. by N. Chiarenza, A. Haug, U. Müller) and contain nine papers by ROOTS members. In addition, research activities in this field were specifically initiated and promoted. For example, a study on the relationship between *Water supply, settlement organisation and social connectivity* is currently in print (A. Haug, U. Müller, in J. Müller *et al.* (eds.) 2022). The role of water installations in urban design and perception was also an essential aspect of the research project of SC postdoc Fellow Nicolas Lamare. The same was also explored in greater depth in an interdisciplinary project (ROOTS internal grant) by N. Lamare and G. Torres. The first results of this research are currently in print (*Journal of Roman Archaeology*, 35/1, 2022). Additionally, an internal focus group (A. Haug, U. Müller, M. Grund, A.-L. Krüger) worked on a paper concerning practices of bathing cultures in antiquity and the Middle Ages.

The focus topic of **Economy, Ecology and Urban Development** is addressed by the research projects of P. Cembrzyński, U. Müller, and G. Schwedler (with PhD M. Grund). These individual projects are under development (archive queries, paper preparation). A project by P. Kreuz (*Lixus*) had to be abandoned due to covid-restrictions, on the one hand, and diplomatic problems on the other. The Moroccan borders were closed until mid-June 2021 and from autumn 2021 to early spring 2022. Individual districts were shut off, and inland travel was restricted. In addition, there was a unilateral suspension of contact and cooperation of Moroccan authorities with German institutions (incl. the embassy) for a major part of 2021. Within this focus topic, members of the SC involved in research concerning the medieval period (G. Schwedler, M. Grund, C. Müller-Liedtke, P. Cembrzyński) organised a conference called *State of Art in Urban History* (28-29 October 2021). The next international four-day conference *Stadterweiterungen und urbane Dynamik im Mittelalter* is planned for June 2022 (U. Müller, G. Schwedler). It will explore the topic of internal urban development and its economic and ecological constraints.

A focus topic, **Imaginaire of Cities**, was developed by the projects of T. Felber and M. Dahm and by J. Gomez Montero (with PhD F. Weber). A conference *Mentale Konzepte der Stadt in Bild- und Textmedien der Vormoderne* (10-12 June 2021, organised by M. Dahm and T. Felber) has already taken place and is currently being prepared for publication.

The fourth focus topic developed by the SC is **Neighbourhoods**. The projects of A. Haug (Casa del Citarista), P. Kobusch, and G. Zeilinger deal with this more intensively. A colloquium, *The Dynamics of Neighbourhoods and Urban Quarters* (11-12 November 2021, organised by A. Haug and C. Beck), was also held in 2021 and is being prepared for publication.

A fifth focus is on **Sacred Space**. Projects by J. Gomez Montero (with PhD F. Weber), C. Zimmermann and G. Schwedler are primarily dedicated to this field. The first international conference, *Built Ritual Space*, was held in 2021 (22-23 October, organised by P. Kobusch, J. Hartung), which is also currently being prepared for publication.

Another set of activities designed to strengthen connectivity between SC individual perspectives on the urban phenomenon included a series of internal meetings. They were conducted in the form of reading circles and joint talks. These resulted in creating the focus group dedicated to investigating contradictions in the city (paper in preparation). Recently, a new meeting series organised by subcluster early career researchers (*URBAN Talks*) has started. It gathers urban researchers from ROOTS, the Lost Cities project (H. Piezonka, J. Ethier, C. Ressel) and the DenkRaum Program (A. Haug). It is dedicated to exploring connections between the past and the present.

Cooperation within ROOTS resulted in receiving finances (ROOTS internal grants) for additional activities. A project by N. Lamare with G. Torres (Dietary ROOTS) aims to explore population health and living conditions through studies of biological residues in aqueducts. A project by P. Cembrzyński (together with J. Schneeweiß, E. Eckmeier, B. Krause-Kyora, W. Kirleis, and K. Schöps) will contribute to an understanding of the formation of so-called urban dark earth.

A significant achievement was the conference *Urban Design zwischen Vergangenheit, Gegenwart und Zukunft* (21-23 March 2022, organised by A. Haug and A. Hielscher). The intention was to bring together research and experiences on the city and urban design phenomena from all the universities and leading academic institutions of Northern Germany. The conference also gathered practitioners of urban design from the city administration. It was aimed to generate broad networking and exchange beyond the SC itself. A publication of some selected contributions for public readership is planned in the ROOTS Booklet Series (A. Haug, P. Kobusch (eds.), foreseen: 2022).

Urban ROOTS organised the lecture series *Bridging the Gap: Urbanity between Past and Present* to reach a wider audience. The concept was to juxtapose historical urban phenomena and problems with contemporary ones to highlight the relevance of historical investigations for our present-day social discourse. This lecture series started in the first year of funding.

All these activities thus emphasise different aspects of action and perception in the urban context. In this way, they provide a picture in its entirety that helps to understand the construction of urbanity. The mixed results of these individual approaches increasingly emphasise the complexity of the phenomena and their strong interconnectedness.

Structural aims and achievements

With the establishment of a new W2 professorship for Classical Archaeology/Urban Archaeology (Patric-Alexander Kreuz) and the assigned assistant (Anna-Lena Krüger, currently vacant), structurally sustainable research on urbanity has been anchored at the CAU on a long-term basis.

On a medium-term level, two postdoc positions were assigned to the SC (N. Chiarenza/Classical Archaeology, then P. Cembrzyński/Medieval Archaeology and N. Lamare/Late Antique Archaeology, since 04/22 P. Kobusch/Classical Archaeology) – and two PhD positions (M. Grund and K. Müller-Liedtke) have been added. Another PhD position is currently advertised for the period 2022-2025.

The SC and the teachers involved also initiated the establishment of a study certificate for “Urban Studies” at Kiel University. This certificate has been open to students since the last winter semester, 2021/22. The content of the certificate is characterised by the participating disciplines, which range from archaeology and geography to history, literature and European ethnology. It thus offers access to a transdisciplinary approach to the city as a research object from various perspectives. Students of all degree programmes at Kiel University can obtain an optional additional qualification with this certificate as part of their compulsory electives, which is then certified with an additional diploma.

Aims and plans for 2022 to 2025

The following funding phase is planned to develop the cross-cutting topics further and thus advance the transdisciplinary exchange. The cross-cutting groups will be understood as separate research units that illuminate and deepen different aspects under the common overarching research question of urban agency and perception.

Thematically, three themes have currently emerged with different personnel, some of which take up existing focal points and develop them under a modified perspective:

a) **Urban Borders** – a group dedicated to exploring how the social formation of groups and processes of space formation interact with each other in the creation of social and spatial borders. The group will organise a series of events (lectures, walks).

b) **Sacred Space** – a group is primarily concerned with the demarcation of sacred space within the city from profane spaces and spaces with other connotations.

c) **Urban Concept** – a focus group aims i) to define the city as an effect of a complex interaction between human agents and ii) to find a commonality between different time and geographical frames. It will serve to build a theoretical model of urbanisation process.

d) **Sociotopographies** – a focus group investigates the relationship between social and physical spaces from an interdisciplinary perspective.

Urban / Table 1:

A) List of finished and ongoing Subcluster projects;

B) Contributions to ROOTS interdisciplinary research projects

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Partici-pants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
A SC Urban	Mutual interaction between urban agency, urban form, resources and natural environment as well as environmental perception in a specific type of town	Ecology of a Mining Town: Evolution of Environment, Society and Economy from the Middle Ages to the Early Modern Period	Pawel Cembrzyński	2019-2025	Middle Ages / Early Modern Period	Czechia, Germany , Poland	Archeology, mining, towns	Foreseen: journal paper, monograph
SC Urban	Observation of individual modes of perception and social patterns of action in various locations associated with Pilgrimage; interaction with built and designed space	Pilgerstätten und die Wurzel von Urbanität	Javier Gomez Montero (with Florian Weber PhD)	2019-	Middle Ages	Central, Western Europe	Sacred Space, mobility, urban planning	Foreseen: articles (+ PhD-monograph)
SC Urban	Exemplary insight into a residential block in use for over 250 years and its changing principles of architectural design and forms of furnishing as a starting point for understanding patterns of perception and action in the field of urban housing.	Casa del citarista	Annette Haug	2019-2022	Antiquity	Pompeii	Archaeology	Publication

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Urban A	"Urban design" is understood as a concept that describes the overlapping of the design of the material world and the agency and perception of the inhabitants of cities.	Conference: Urban Design zwischen Vergangenheit, Gegenwart und Zukunft	Annette Haug	March 2022	Antiquity – Present	World-wide – mainly Europe	Urban design; urban planning, action and interaction, perception	Interdisciplinary Conference + Booklet: foreseen
SC Urban	Project analyses where emotionally charged actions take place, where specific forms of communication can be traced, so that it also correlates with communicative, mental and perceptual processes.	Cities as affective and emotional spaces. Erotics and love in Rome and Pompeii	Annette Haug	-2022	Antiquity	Pompeii	Archaeology, sex, graffiti	Monograph: foreseen
SC Urban	s. above	The Casa del Citarista (I 4,5.25.28) as an interdisciplinary case study between building archaeology and geophysics	Annette Haug, Wolfgang Rabbel	2021-	Antiquity	Pompeii	Building development; methodological case study	Monograph: foreseen (= project citarista) and article
SC Urban	The social dimension of the city - neighbourhoods and communities - are developed out of the interdependence of urban action/perception, urban materialities and urban imaginary concepts.	Colloquium: City neighbourhoods and city communities	Annette Haug, Christian Beck	2021	Antiquity	Mediterranean	Neighbourhoods; agency and perception; urban planning	International Colloquium (11/2021); publication: foreseen

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Urban	Interdisciplinary comparison of the relationship between urban layout and the specific cultural and social agency of the actors.	Pompeii and Lübeck: a comparative approach	Annette Haug, Ulrich Müller	2022	Antiquity; Middle Ages	Pompeii, Lübeck	Urban design, agency and perception	Joint article: foreseen
SC Urban	As cult buildings are central spaces inside ancient cities, the colloquium asks, to which degree the action and communication inside the buildings was connected with the urban surroundings.	Built Ritual Space	Philipp Kobusch	2021-2023	Antiquity	Mediterranean	Human action in urban spaces, sacred space	Colloquium hybrid (2021); Publication: foreseen 2023
SC Urban	Agency and perception in urban housing in roman provincial contexts.	Concepts of Urban Living in Times of Political and Cultural Transition	Philipp Kobusch	04/2022-2025	Antiquity 2 nd c. BCE – 2 nd c. AD	Iberian Peninsula	Urban living space, human action and perception, "Romanization"	Monograph: foreseen
SC Urban	juxtaposition of urban problems and phenomena of the past and present that result from the confrontation of urban planning and the agency of the inhabitants.	Lecture Series 'Bridging the Gap'	Patric-Alexander Kreuz	WS 2019/20	Antiquity - Presence	World, Europe	Urban development, urban design, planning, agency and perception	Public Lecture series WS 2019/20

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Urban A	Uses of public spaces and buildings, of recognisable actions and routines in the urban space, of collective memory associated with certain places (forum) and their transformation over the centuries.	Designing Cities, Shaping Lives: Urbanity and Environment in Ancient North Africa and its Mediterranean context. The case of Sufetula (Sbeitla, Tunisia)	Nicolas Lamare	2019-2021	Antiquity, Late antiquity	North Africa	Urban development, water, agency and perception	Monograph and articles: foreseen
SC Urban	Agency: The founding and surveying of the city; the planned (?) urban space of the oppidum Borguntricke. Perception: The perception of the changed (?) urban arrangements in the course of the partial desertification. The narrative of partial urban desertification in the pre-modern period up to the present and its use as a cultural resource.	High and late medieval urban development in rural areas. The Borge-trich deserted area, Kr. Höxter	Ulrich Müller	2019-2020	Middle Ages	North Rhine-Westphalia	Archaeology, desertification, rurality	

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Urban A	Redesign of an urban space between the model of the emporium and the city of late medieval design. Schleswig with the conscious turning towards and architectural visualisation of the ecclesiastical and aristocratic actors as a decisive step for the further development of the "Latin European" city model in the mare balticum.	Project preparation (WHK) for application: Schleswig. The transformation of urban space in the 11th/12th century.	Ulrich Müller	08/2021 -	Middle Ages (11th/12th century)	Schleswig	Northern German, transformation of Urban Spaces / Urban Development	
SC Urban	Urban expansion as a central playing field of urban agency.	Stadterweiterungen und urbane Dynamik im Mittelalter	Ulrich Müller, Gerald Schwedler	2022	Middle Ages	Europe	Urban Development;	Conference (June 2022) A publication is planned
SC Urban	The literary presentation of urban space and its architecture, and the city as a social configuration provides information about the mental conception of the city or urban space.	Urban Topographies in Medieval German Troy-Literature	Margit Dahm, Timo Felber	07/2019-10/2022	Middle Ages	German Literature, German-speaking area	German Literature, mental concepts, images of urbanity	Colloquium and Publication: foreseen 2022

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Urban A	In the literary discourse of the Middle Ages, the city is charged to a considerable extent with religious orders of meaning that decisively determine its agency. At the same time, religious patterns and allusions also shape the perception of the city.	Babylon und Jerusalem als Paradigmen literarischer Stadtgestaltung in narrativen Texten des 12.-15. Jhs	Margit Dahm	04/2022-12/2022	Middle Ages	German Literature; German-speaking area	German Literature, mental concepts, images of urbanity	Lecture: at the conference, Deutsche Versnovellistik des 13. – 15. Jhs.' (07.-09.09.2022 in Potsdam) + paper in the connected volume; substudy in post-doctoral thesis
SC Urban	The project deals with the question of the agency of early Christians in urban space and the perception of Christian agency among non-Christian city dwellers.	Early Christianity in Corinth and the Peloponnese	Christiane Zimmermann, Andreas Müller, Hilmar Klinkott	2018-2025	Antiquity	Corinth and Peloponnese	Greece, archaeology, theology, city	4 articles, 1 book (Publication: "Early Christianity in Corinth and the Peloponnese"), Digital Workshop
SC Urban	The main focus lies on Urban Agency: external and internal urban actors and their interaction, their communicative ways and conflicts, representational efforts and material resources.	"Stadthöfe" – Monastic and Noble Courtyards in Medieval Towns as Interfaces of Town-country Relations	Gabriel Zeilinger	2019-2023	Middle Ages	Lower Austria and Northern Germany	Town, history, cloister, exchange, economy	Articles

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Urban A	Medieval towers were mainly built to be perceived: they could be heard (bells) and seen from far. The construction required the full cooperation of all urban groups and worked to a certain degree as a social unifier.	Medieval Towers	Gerald Schwedler	2020-2023	Middle Ages	Alsace	City, history, tower, economy	Online edition of retrieved data in the archives of Strasbourg (France)
SC Urban	Providing a methodology for measuring human interaction in the field of "trust management". Furthermore it proposes objects that are perceived in stance for the whole urban community: the city book.	Medieval towns and financial management	Gerald Schwedler (together with Max Grund PhD)	2020 -	Middle Ages	Holy Roman Empire	Economy, city planning	Article (+ PhD-monograph): Foreseen

Project ID	Involved Subclusters Overarching ROOTS focus	Project (title /type)	Proponents	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
B	SC Urban SC Dietary	Water quality and health conditions in ancient times: an assessment of Roman Empire aqueducts via metagenomic analyses of fossilised biofilms from Sufetula (Sbeitla, Tunisia)	Nicolas Lamare, Guillermo Torres	2021	Roman Empire – late antiquity	North Africa, Tunisia	Water, metagenomic analysis	
		Publication Group “Mirror of the World. Contribution: Governance and History of Salvation in Founding Myths and Architecture of German Cities in the Middle Ages”	Timo Felber et al.	Start: 08/2020	Middle Ages	German cities	Founding myths, German literature,	
	Reflective Turn, Urban ROOTS, Knowledge	Gardens, Human Senses and Eudaimonia	Dana Zentgraf, Konrad Ott, Chiara Thumiger, Timo Felber	12/2020-10/2022	Antiquity and Middle Ages	Europe	Smell, sensescapes, culture	Publication
	ROOTS of Hazard; ROOT of Conflict; Urban ROOTS; Dietary ROOTS, Communication Platform	3DARK DEPTH – Describing, Discussing and Developing Analytical Research Knowledge of the Dark Earth Phenomenon in Theory and Practice	Eileen Eckmeier, Jens Schneeweiß, Pawel Cembrzyński, Ben Krause-Kyora, Wiebke Kirleis, Kathrin Schöps	08/2021-07/2023	Middle Ages, prehistory, antiquity	Europe, America, Africa	Dark Earth, geoarchaeology, settlement	Workshop, publication

JMA Chairs/Visiting Professors, incl. nominees scheduled for 2022 once approved by board:

Vittorio Magnago Lampugnani
Miko Flohr
Axel Christophersen
J. Rife
Monica L. Smith

Activities with international partners

Workshops/conferences, including workshop and conference sessions organised abroad

- Colloquium *Stadterweiterungen*; 8-11 June 2022, organised by U. Müller and G. Schwedler.
- Conference *Urban Design zwischen Vergangenheit, Gegenwart und Zukunft*; 21-23 March 2022, organised by A. Haug and A. Hielscher.
- Conference *The Dynamics of Neighbourhoods and Urban Quarters*; 10-13 November 2021, organised by A. Haug and C. Beck.
- Conference *State of the Art in Urban History*; 28-29 October 2021, organised by M. Grund and G. Schwedler.
- International Colloquium *Built Ritual Space*; 21-23 October 2021, organised by P. Kobusch and J.-H. Hartung.
- Early career symposium *Homo homini lupus est? Menschenbilder und das Fremde: Interaktion und Wahrnehmung*; 17-18 September 2021, organised by PhDs of the SC Urban ROOTS and Knowledge + Reflective Turn, S. Boelcke, G. Lukas, C. Müller-Liedtke, L. Pannek, and D. Zentgraf.
- Conference *Mentale Konzepte der Stadt in Bild- und Textmedien der Vormoderne*; 10-12 June 2021, organised by M. Dahm and T. Felber.

Contributions to ROOTS public outreach activities

- Annette Haug: Participation in ROOTS Lecture Series: <https://www.klassarch.uni-kiel.de/de/ROOTS/vergangene-semester>.
- Annette Haug / Ulrich Müller: Organisation *Urban Water Colloquium* (with U. Müller and N. Chiarenza, published).
- Annette Haug: Organisation *Neighbourhood Colloquium* (publication under way, with A. Hielscher): <https://www.klassarch.uni-kiel.de/de/ROOTS/mentale-konzepte-der-stadt-in-bild-und-textmedien-der-vormoderne>.

- Annette Haug: Organisation Congress: *Urban Design in Vergangenheit, Gegenwart und Zukunft*, March 21-23 in collaboration with DenkRaum: <https://www.klassarch.uni-kiel.de/de/urban-design>.
- Ulrich Müller: Community Archaeology Project „Schenefeld gräbt aus“; 2021.
- Pawel Cembrzyński: Interlinkage Group “Ideology and Identity” - Coordination of work of an interlinkage group, presenting the results, writing a multi-author paper.
- Interlinkage Group “Waste” - First activity – booklet concerning waste and circular economy, text about re-use of lead with Marie Jäcker.
- N. Lamare, G. Torres, M. Grund, “Waste Water”, in J. Schneeweiß (dir.), *Waste/Abfall*, Leiden, Sidestone Press (ROOTS Booklet Series).
- Gerald Schwedler: paper delivered in Lübeck on the financing of towers and the nave of the Marienkirche; publication in 2022/23: ‘Wie hat man die Marienkirche finanziert? Lübeck im Kontext der gotischen Gründerzeit in Europa’.
- Gerald Schwedler: Presentation of digital tools and Strasbourg Data as source material international Summerschool “Digital Humanities” Lübeck/Kiel 08/21.
- Gerald Schwedler: Paper delivered at Université de Strasbourg “Financing the cathedral of Strasbourg” 10/21; Article in the Bulletin de la Cathédrale de Strasbourg on the material gathered and analysed since 10/21 through the Urban ROOTS project, Deadline 06/22.
- Patric-Alexander Kreuz: Winter term 2019/20: Coordination and organisation Public Lecture Series of the Subcluster Urban ROOTS “Bridging the Gap: Urbanity between Past and Present”.
- Phillip Kobusch: Organisation of the international colloquium *Built Ritual Space* – publication foreseen for 2023.

3.1.5 ROOTS of Inequalities: Social, Economic, and Environmental Developments

Principal Investigators/Members/PhD members/Associate Members

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Former members		
Bröcker, Johannes		PI (deceased)
Fouquet, Gerhard	fouquet@email.uni-kiel.de	PI (retired)

Research aims and achievements

Main achievements are

- 1) a unified econometrical approach to measuring social inequality using a set of agreed concepts and indices
- 2) several huge data collections and organisation of larger data volumes

- 3) first case studies completed or are about to be completed
- 4) lectures, conferences, and publications that provided the necessary visibility to expand existing scientific networks.

The application identified three aims: **A1)** The quantification of social inequalities, **A2)** the description of the dynamics of social inequality and **A3)** the description of the societal consequences of inequalities. Four foci are assigned to these topics: T1) the quantification of material culture on a European scale, T2) the relation between social inequality and the use of and access to natural resources, T3) social inequality and connectivity (the latter addressing cohesion and globalisation), T4) Carpathian Social Inequality (regional case studies). During the joint work, the need to establish a T5) focus on method development arose. A close connection exists to the Reflective Turn Forum.

The interrelations between the different projects as well as between methodologies, method development and case studies are shown in Fig. 3.

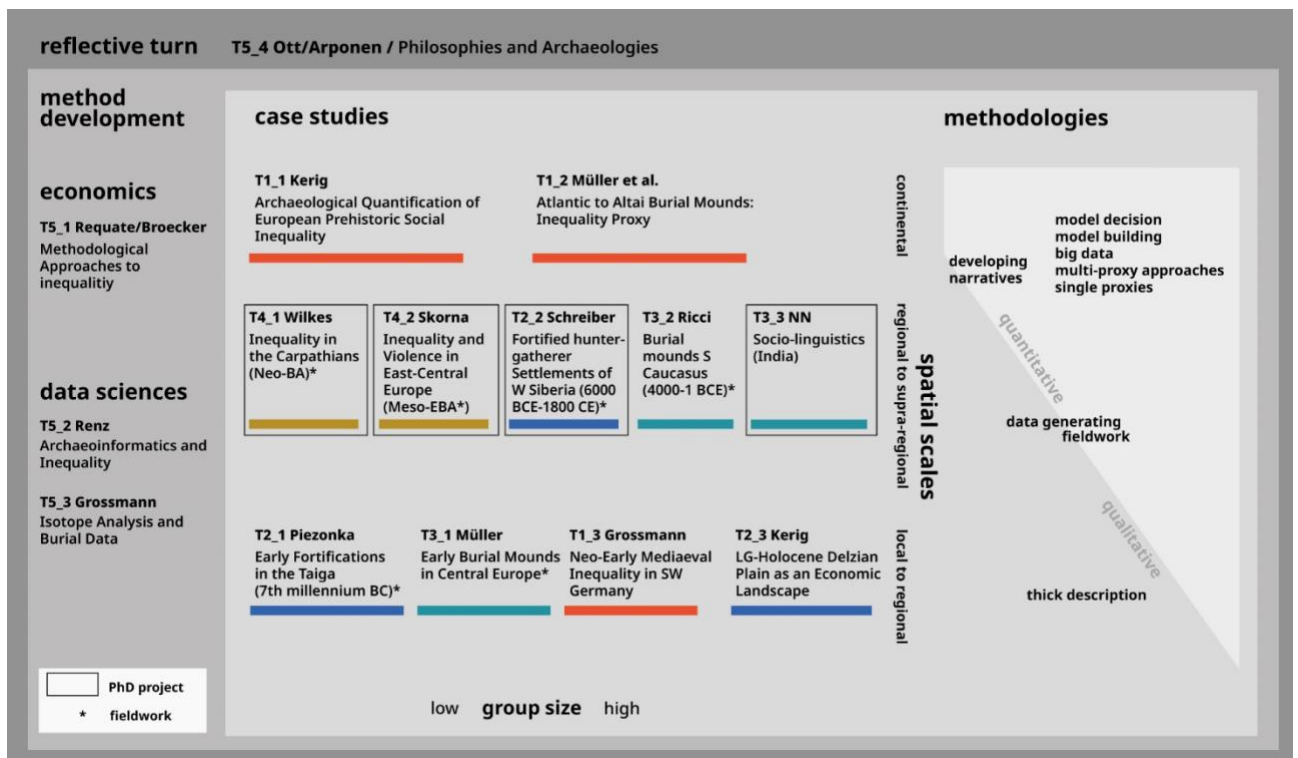


Figure 03: ROOTS of inequalities. Structure of approaches, methodologies and projects. Not shown are the recently integrated projects of Martin Furholt (Social Archaeology professorship), Sören Wichmann (Postdoc socio-linguistics) as well as of the internal grant and ROOTS interdisciplinary projects (see Tables 1 and 2)

A1) Most of the projects (T1_1, T1_2, T1_3, T2_2, T4-1, T4_2) are working towards a quantification of social inequalities from material culture. They all benefit greatly from the methodological work done by the economic project T5_1 which is designed to support the ongoing empirical work.

Both T1 projects (T1_1 and T1_2) are building on large Pan-European data-collections. Kerig's project (T1_1) gathered grave goods of several thousand graves from Central Europe in three time slices (Early Neolithic/Linear pottery, Early Bronze Age, Late Iron Age/Latenè). The coding allows multiplication of the number of artefacts by value measures like minimal labour investments or metal weights. In connection with two interdisciplinary ROOTS projects ("Big exchange" and "Interlinking") as well as within the below mentioned Tandem Project with Renz, a huge amount of data related to interregional Eurasian exchange networks (bimodal network: source -> findspot) could be gathered and organised. This data collection of millions of artefacts from thousands of sites is still expanding. Currently, the recording of settlement data begins (within an internal project as well as in connection with the GINI project lead by the former Mestorf chair Kohler).

Müller *et al.* (T1_2) built a database of Eurasian burial mounds with data spanning from Western Europe to the Altai and from the Early Neolithic to the Iron Age (in collaboration with Ricci T3_2). Müller *et al.* are using base area and volume as a direct proxy for social inequality. The analytical work is done in close collaboration between archaeology (RA Laabs) and economics (RA Marzian).

With the publication of a monograph by Grossmann (the final outcome of T1_3), a first regional diachronic study from the subcluster (SC) is now available.

The PhD candidates were able to successfully complete their respective data collections during fieldwork, despite sometimes considerable limitations and multiple realignments due to the pandemic situation. All candidates started the phase of analytical work – the PhD dissertations T4_1, T4_2 and T2_2 are to be expected to be finished in good time.

A2) The dynamics of social inequality are directly addressed within most of the ongoing projects, the PhD dissertations T4_1, T4_2 and T2_2 as well as within the regional studies (T1_1, T_2, T1_3, T2_1, T3_1, T2_3).

In the middle of the project duration, the approaches are predominantly descriptive (may it be qualitatively or quantitatively) and related to the respective specific example. Although this fieldwork also suffered from the pandemic situation (and recently from the war in Ukraine), Piezonka (T2_1 as well as an internal grant), Ricci (external grant see below), Müller (T3_1) and Kerig (T2_3) could carry out archaeological fieldwork (collection

surveys, excavations, site surveys, ethno-archaeology). Linguistic fieldwork has been done by Khan (T3_3) and Peterson, who both are working towards a data-driven general typology of language contact.

A3) The societal consequences of social inequality will come into focus during the second project phase.

Structural aims and achievements

The structural aims for the development of the subcluster's field are mainly achieved by the establishment of permanent and medium-term positions in relation to the SC.

The new professorship for Social Archaeology started in 2021: With Martin Furholt, the regional specialisation in SE Europe was also strengthened.

A new professorship for ethno-archaeology will be connected to the SC. The establishment of this professorship is of vital importance for the SC. The postdocs with medium-term positions aim to establish research groups.

Tim Kerig established a group working diachronically using archaeo-statistics and informatical methods within a socio-archaeological *Handlungstheorie*-framework.

In connection with Martin Furholt, Paul Duffy is working on Bronze Age SE European social inequalities.

Soeren Wichmann started working on socio-linguistic topics thus further sharpening the "socio"-profile of the SC.

The economists, led by Requate and the late Johannes Bröcker, held a lecture series on the (quantitative) measurement of wealth inequality in ancient societies which will be repeated for the upcoming PhD cohort (also a contribution to the Young Academy).

An annual "Johannes Bröcker Memorial Lecture" will start in 2022 and is dedicated to present outstanding economic research to a wider audience at Kiel campus.

The continuation of the Kerig position during the project phase is an important strategic goal.

Aims and plans for 2022 to 2025

During the last semesters, the SC developed a certain dynamic especially between archaeologists, linguists and economists. The task of the group is now to agree on a unified approach which has the potential to lead to a commonly held narrative. Such a

“Kiel approach”/“Kiel narrative” will serve as the basis for a continuation of the ROOTS application.

A certain division of labour is emerging at the moment: One would not be wrong to assume that social inequality is currently one of the most discussed topics within archaeology. Furthermore, the archaeologists are bringing in the depth of time, the continental level and the general problem of social evolution (by no means necessarily in a Darwinian sense).

At the European level, strong regional differences in the strength of social inequalities are initially perceptible, as expected. The regional description and differentiation of these trends remains an important task. The different ways of extracting surpluses become clear through the use of the concept of the social inequality frontier. Here it is obvious to take network inequalities into account, which may be caused by 1) the spatial distribution of natural resources and which arise 2) through comparative advantages as well as 3) network effects caused by the mediation between regions. Both, in the context of looking at the large exchange networks of prestigious goods and in the context of an ERC grant newly acquired by Müller, the connection between materiality and social inequality emerges as important (one key concept here is secondary visualisation as a means for social constitution). The archaeologists gathered in the SC all work primarily on non-state societies of Europe and Western Asia, in most cases with group sizes of house societies, of villages, of so-called tell societies and early mega-sites. For the societies studied, certain levelling mechanisms seem to be characteristic but not fully understood in archaeology. In particular, concepts from recent evolutionary thinking and sociological *Handlungstheorie* may help to move from an over-simplifying focus on assumed motivations to explanations and interpretations of actual actions that have taken place. These new developments in social sciences open up numerous opportunities for cooperation with both economics and linguistics within the SC.

The involved sociolinguists examine very specific social situations and processes. Languages spoken in direct proximity will normally exhibit evidence of contact. The comparative method allows a reconstruction of past stages of languages. Such evidence makes languages a powerful source of evidence for past human interaction. Contacts between different social groups are usually characterised by inequalities of different kinds, and these will often leave traces in the languages involved. For instance, people without secure access to essential resources are more likely to accommodate linguistically to other groups than those who do have such secure access, whereas situations of widespread social equality among different groups can lead to situations of stable, long-term multilingualism among languages of approximately equal social status. The literature on language contact and its structural outcomes is extensive, often providing

critical insights into the internal structures of past societies. However, such studies tend to focus on single case studies making far-reaching claims about language contact in general. The subcluster's linguists are pooling efforts, drawing upon own observations from Eurasia and beyond as well as upon the rich unsystematic literature on this topic.

From the economists' point of view, not only the unusually long time series are interesting from a methodological point of view but also analysing and modelling the interactions between social and societal processes with economic methodology is of fundamental economic interest – it might lead or contribute to a better understanding of long-term developments through what has been called “processes of processes”.

The discussions towards a unified approach already started in 2020, leading especially to a joint publication (Kerig *et al.* in press) and presenting, for the first time, the economic idea of the social inequality frontier to archaeology. The SC will now develop the idea of the frontier further, showing the opportunities of applying the approach to different societal spheres.

In the second half of 2022, a two-day retreat will be organised to advance the “Kiel approach” in projects of the SC. Topics will be the identification of the relevant agents (individuals, social groups, sites, regions), agreeing on a synthetic methodology and benchmarking the subcluster's further progress.

From the beginning of 2023 and parallel to analytical work, we will join together in new working and writing groups to achieve a synthesis: “The Kiel approach/The Kiel narrative”.

Inequalities / Table 1:

A) List of finished and ongoing Subcluster projects and

B) Contributions to ROOTS interdisciplinary research projects

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Inequalities	T 4	ARDS	Paul Duffy, Pascal Flohr, Dragana Filipovic	03/2022-03/2023	5500 BCE-1500 BCE	e.g. Carpathian Basin	Plough agriculture, social inequality, innovation, isotopic analysis	Publications, isotopic datasets, radiocarbon data
	T 4	Internal Grant: Siedlungsorganisation und Soziale Differenzierung im Neolithikum im Karpatenbecken	Martin Furcholt	03/22-2/2023	5 th millennium BCE	Carpathian Basin	Settlement organisation, social differentiation, Neolithic	Journal Paper, Pilot Study for larger application
	T 5	Isotope Analysis and Burial Data	Ralph Grossmann					Initial. 3 rd party funding
	T-1	Neo-Early Medieval Inequality in SW Germany	Ralph Grossmann	2019-2020				Monograph published
	T 3	Burial Mounds of the Caucasus	Andrea Ricci		4000-1 BCE	Caucasus		
	T 1	Arch. Quantification of European Prehistoric Social Inequality	Tim Kerig		8000-1 BCE			Publications
	T 2	LG-Holocene Delzian Plain as an Economic Landscape	Tim Kerig		8000-1 BCE			Publications

Project ID	Subcluster focus in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
A	T 1, 2, 3, 4, 5	ABC of Inequalities	Tim Kerig (red.), all members of subcluster					Wikipedia of important terms of the research field
	T 1	Conference, Roundtable, Publication: "Inequalities in Supra-Regional Eurasian Exchange Networks"	Tim Kerig, Johanna Hilpert,	2.12.21-4.12.21	8000 – 2000 BP	Central Europe, Near East, Mediterranean	Raw material exchange; large networks, sourcing, distribution patterns	Flyer, poster, intl. presentations Publication (end 2022)
SC Inequalities	T 1	Establishment of a Network of Networks	Tim Kerig, Johanna Hilpert,	04/22-12/22	8000 – 2000 BP	Central Europe, Near East, Mediterranean	Raw material exchange, international research Network, 3 rd party funding	Establishment of intl. research network Initial. 3 rd party funding
SC Inequalities	T 3	[In]equality, Multilingualism and Identity in Jharkhand: A Sociolinguistic study of Chhota Nagpur Plateau/ Monograph	Ariba Khan	01.03.2021-131.08.2024. (this is without the 6 months extension)	5 th -10 th BCE until present.	Central Eastern India	Inequality, linguistic identity, multilingualism, tribal language, ethnic groups, language politics.	PhD thesis
	T 3	Early Burial Mounds in Central Europe	Johannes Müller					Publication

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
A	T 1	Atlantic to Altai Burial Mounds: Inequality Proxy	Johannes Müller, Henny Piezonka, Julian Laabs, Andrea Ricci	2019-2024	Neolithic - Iron Age	Eurasia	Inequality in burials, Gini	Publications, Contribution to WEHC Paris 2022, DB
	T 5	Leveling mechanisms	Johannes Müller, Henny Piezonka, Tim Kerig (RA René Ohlrau)	2020-2021				Review article
SC Inequality	T 2	Towards Territoriality and Inequality? Examining Prehistoric Hunter-gatherer Fortifications in the Siberian Taiga	Henny Piezonka, Chairkina, Dubovtseva, Lyubov Kosinskaya	2020-2022	6 th mill. BCE - 16 th cent. AD	West Siberia	Hunter-gatherers, Western Siberia, fortified and open settlement, statistical wealth measurement, wealth inequality, territoriality	Publication
		Early Fortifications in the Taiga	Henny Piezonka	7 th millennium				Publications
	T 5	Methodological Approaches to Inequality	Till Requate, Johannes Bröker	2019-2025			Econometry, inequality measurement	Support of other subcluster projects
	T 5	Archaeoinformatics and Inequality	Matthias Renz	2019- 2025			Methodological work	Support of other subcluster projects, DB

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
A	T 2	Wealth, Control and Conflict: Evaluating Fortified Hunter-Gatherer Settlements of Western Siberia (6000 BCE-1600 AD)	Tanja Schreiber	01.12.2019-31.08.2023	6 th mill. BCE - 16 th cent. CE	Western Siberia	Social Archaeology, Quantitative Archaeology, socio-environmental inequality, conflict, hunter-gatherer fortifications, social resistance	PhD thesis
SC Social Inequality and SC Conflict and Conciliation	T 4	Understanding Social Inequality and Violence	Henry Skorna	09/2019-07/2023	5500-1600 BCE	Carpathian Basin and Western part of Middle Europe	Prehistory; Social Inequality, Neolithic, Eneolithic, Early Bronze Age	PhD Thesis Database of Burial sites
SC Social Inequality and SC Conflict and Conciliation	T 4	Metallurgy and Violence: A Dagger from Slovakia	Henry Skorna, Khurram Saleem	09/2021-06/2022	4000/3800 BCE	Moravia and Southwestern Slovakia	Dagger Prehistory, Eneolithic, violence, material analysis	Publication

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Inequality	T 4	Social Inequality in the Carpathian Area from the Neolithic to the Bronze Age	Fynn Wilkes	10/2019-10/2023	6000-1000 BCE	Carpathian Basin, Slovakia, Hungary, Serbia, Romania, Croatia	Burial Analysis, Inequality measures, Quantitative Study	PhD Thesis Database of burial sites
SC Social Inequality	T 4	Social Inequality & Diet in the Bronze Age Society of Jelsovce	Fynn Wilkes, Henry Skorna	01/2021-12/2022	2100-1650 BCE	Southwestern Slovakia	Bronze Age, Social Inequality, Diet, Isotopes	Dataset (burials, isotopes), Publication
SC Social Inequality	T 4	Estimating Metal Weights at Bronze Age Cemeteries	Fynn Wilkes, Henry Skorna	06/2021-12/2022	2200-1650	Southwestern Slovakia	Bronze Age, Bronze, Metal, material analysis	Datasets of metal weights, Publications
SC Inequality	T 4	Inequality of a Late Neolithic Settlement Based on a Geomagnetic Survey	Fynn Wilkes	10/2019-10/2023	5500-4000 BCE	Balkans, Opovo	Settlement analysis, Inequality measures, Survey	Publication

Project ID	Involved Subclusters Overarching ROOTS focus	Project (title /type)	Proponents:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
ROOTS interdisc. Project	Conflict and Conciliation, Social Inequality	Connectivity and fortifications	Tanja Schreiber, Oliver Nakoinz, Anna Loy, Christoph Rinne, Jutta Kneisel, Maria Wunderlich, Nicole Taylor	2020-2023	mainly Iron Age	global	Connectivity, fortifications	Publication
	Social Inequality, Dietary	Digging into a boreal playground: Collaborative Archaeology, childhood and Reciprocity of knowledge transmission within a Sel'kup community in West Siberia	Tanja Schreiber, Morgan Windle	2021-2023	modern	West Siberia	Collaborative archaeology, knowledge transmission, Sel'kup, social learning, cultural heritage	Publication

Project ID	Involved Subclusters Overarching ROOTS focus	Project (title /type)	Proponents:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
ROOTS interdisc. Project "Big Exchange"	SC Inequalities, SC Knowledge, SC Conflict	Big Exchange: Searching for Knowledge, Social Inequality and Politics behind exceptional Large-Scale Networks in European Prehistory	Tim Kerig, Jutta Kneisel, Oliver Nakoinz	1.11.20-15.1.22	8000-2000 BP	Central Europe, Near East, Mediterran ean	Network science, large scale raw material networks, SNA methods, distribution patterns	Publication, database
ROOTS interdisc. Project "Interlinking Exchange"	SC Inequalities, SC Knowledge, SC Conflict, Archaeoinformatics	Interlinking exchange: The Search for Communalities in Prehistoric Networks (Europe, W-Asia, N-Africa - 8000 to 1 BCE)	Tim Kerig, Johanna Hilpert, Lorenz Kienle, Jutta Kneisel, Oliver Nakoinz, Matthias Renz, Andrea Ricci	15.01.22- 15.01.23	8000-2000 BP	Central Europe, Near East, Mediterran ean	Network science, raw material networks, communalities, distribution patterns, pattern mining, data science	Publications, database
Interlinkage group: Identity and Ideology	Connection between Identity and Ideology from aspects of different field of disciplines.	"Performative power of Ideology"	Pawel Cembrzynski					Multi-authored paper

Project ID	Involved Subclusters Overarching ROOTS focus	Project (title /type)	Proponents:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
B	Interlinkage group: ROOTS of Routes		Andrea Ricci, Jutta Kneisel, Johannes Müller					ROOTS booklet
	Interlinkage group: Resources and Exchange		Tim Kerig, Ilka Parchmann, Ulrich Müller					Not defined
	All Subclusters represented		Tim Kerig, Andrea Ricci					Coffetable book on ROOTS

JMA Chairs/Visiting Professors, incl. nominees scheduled for 2022 once approved by board:

Tim Kohler (autumn 2021)

Gary Feinman (Nov-Feb 2022-2023)

Marcella Frangipane (spring 2023)

Activities with international partners

- PhD workshop with Tim Kohler, autumn 2021
- EAA 2021: Several sessions organised and chaired by members of the SC: e.g. Session #228: Agricultural Change and Social Inequality: Approaching complexity, organised by Tim Kerig and Fynn Wilkes (in collaboration with Jutta Lechterbeck, Univ. Stavanger)
- Several field campaigns 2019-2022 in Siberia by Henny Piezonka
- Field campaigns 2021 and 2022 by Martin Furholt
- Geophysical measurements on the Uzun Rama Kurgans, central Azerbaijan November 2021 by Andrea Ricci, in cooperation with Dr. Bakhtiyar Jalilov, National Academy of Science, Azerbaijan
- In 2019 and 2021, two campaigns in Soran/Iraqi Kurdistan by Tim Kerig
- Training archaeological staff in Soran Kurdistan 2020–2021 by Tim Kerig
- ROOTS Inequality Workshop October 2019: Publication of the proceedings by Vesa Arponen and René Ohlrau
- ROOTS conference “Inequalities in Supra-Regional Eurasian Exchange Networks”: joint publication of all conference participants, organised by Tim Kerig und Johanna Hilpert
- Network of Networks: An international network of researchers working on raw material exchange networks building on former projects (DFG, Leverhulme) of Tim Kerig with Johanna Hilpert
- GINI Project directed by Amy Bogaard and Tim Kohler (Tim Kerig collaborator)
- Application writing (DFG/AHRC) by Tim Kerig with Andy Bevan (UCL) – first application rated “excellent” but not successful, resubmission end of 2022/start of 2023

Workshops/conferences, including workshop and conference sessions organised abroad

2019

- Kiel: International Conference “Socio-environmental Change During the Last 12000 Years” III (400+ participants) – organised by, among others, Johannes Müller
- ROOTS Inequality Workshop in October 2019, in collaboration with the Reflective Turn Forum, organized by Vesa Arponen and René Ohlrau

2020

- Kiel: Deutscher Archäologie Kongress (800 participants) – organised by, among others, Johannes Müller
- Public Participation in Archaeological Research: Opportunities and Limitations, 7-8 2021 – Workshop in the framework of the communication platform activities, organised by Andrea Ricci

2021

- Kiel: Annual workshop of the European Association of Archaeologists (2500 participants) – organised by, among others, Johannes Müller
- International ROOTS Conference and Roundtable: “Inequalities in Supra-Regional Eurasian Exchange Networks”, 2.-4.12.2021, hybrid organised by Johanna Hilpert and Tim Kerig

Data management

All data on raw material exchange networks produced by Tim Kerig and Johanna Hilpert is already incorporated in the “Landman” platform, in cooperation with the Center for Interdisciplinary Data Science team. Data produced within the T1_1 project will be incorporated later (due to capacities).

Soeren Wichmann has continued to expand the ASJP database of basic vocabulary of the world’s languages (<https://asjp.clld.org/>) which, since the last release in 2020, has grown by 6% to a coverage of 74% of the world’s languages through 10,017 word lists.

Contributions to ROOTS Platforms and the Reflective Turn Forum

- Johannes Müller: Communication platform: megalithic routes - membership, board etc. / SACC Social Archeology of Climate Change Summit / EAA

Contributions to ROOTS public outreach activities

- Johannes Müller: Megalithic routes - scientific board, etc.
- Johannes Müller: Pandemics booklet
- Johannes Müller: Arte-Film on megasites
- Johannes Müller: Various interviews in television and radio
- Johannes Müller: Various contributions in popular scientific magazines by journalists (Bild der Wissenschaft, Spectrum, New Scientist)
- Johannes Müller: Podiumsdiskussionen (z.B. Die Zivilisationsfrage in der Berliner Kongresshalle „Schwangerer Auster“)
- Johannes Müller: SACC: Social Archeology of Climate Change Summit

3.1.6 ROOTS of Conflict: Competition and Conciliation

Principal Investigators/Members/PhD members/Associate Members

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Research aims and achievements

The following **central objectives**, which were formulated in the application, are pursued by the subcluster (SC):

- a) new conflict theories including a focus on conciliation aspects
- b) clarification whether conflicts generally follow 'typical' patterns
- c) understanding of the diachronic development of conflicts and conflict resolution

In order to achieve objective a), a regular Reading Circle was organised as a working tool (Loy, Nakoinz, Schneeweiß), in which relevant texts are read and discussed together. External specialists were invited to join the discussion. The results of the discussions are

documented. Since the beginning of 2022, a Writing Circle has been formed to work on a paper based on what has been developed (all). The purpose of this paper is to formulate the conflict theory of the SC and to present it to the scientific community for further discussion.

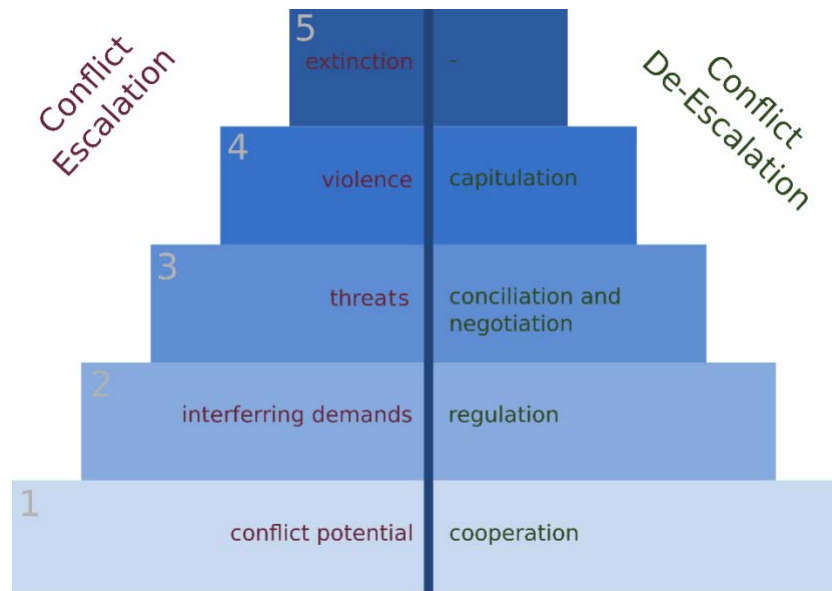


Figure 04: The pyramid of conflict escalation and de-escalation, ©after Nakoinz *et al.* 2020, 2

Objective b) can only be achieved if several case studies are evaluated comparatively. The escalation pyramid (Nakoinz, Kneisel; cf. figure) serves as a model for the course of conflicts. A fortifications database, in which fortifications are registered Europe-wide and diachronically according to a uniform scheme, serves as a basis for the case study. So far, several thousand fortifications are already included. Currently, criteria are being developed and conflict triggers are being identified, which allow to define a certain escalation level for a conflict at a concrete fortification. This research is currently in the pilot stage (Nakoinz, Loy). The work with the database also contributes to objective c), but other case studies and research projects carried out within the SC also contribute here. Examples are the investigation of pit rows as boundary markers (Kneisel) or regional studies on fortifications landscapes (Schneeweiß). We would also like to refer to the attempt to quantify violence and conciliation by means of a Central European Conflict and Conciliation Index (CE ConCon Index), which will be launched this year and will make it possible to display quantitative diachronic curves of violence and conciliation conjunctures in Central Europe (Müller).

To achieve the overall goal of empirical and theoretical comprehension of past conflict causes, trajectories, and conciliations, the SC has defined **four research foci**. The aforementioned research is predominantly concerned with the research focus *Boundaries*

and Fortifications. Two further research foci (*Resource Availability* and *Production and Modes of Exchange*) are, among others, considered from the perspective of material science. A cross-disciplinary platform for material research of archaeological artefacts was established (Kienle, Saleem, Schürmann). The platform enabled material analysis of numerous archaeological items from Neolithic to medieval times to unearth interesting insights about the regional connectivity, technology development and specific use of the artefacts. The research is also aimed at developing the methodology for the solid-state material analysis for functional, structural and nanoanalytical characterisation of archaeological artefacts using state of the art material analysis techniques. A combination of scanning electron microscopy (SEM) and transmission electron microscopy (TEM) was utilised on metallic artefacts for surface, subsurface and bulk material analysis. Focused ion beam (FIB) was used to extract thin slices of the samples from the artefacts to keep the process quasi non-evasive. Additionally, Raman and FTIR analysis were utilised to attain chemical profiles of amber.

Brief summary of the studies:

- Testing the hypothesis of the extension of Baltic networks in the Middle Dnieper: A detailed study on the micro-chemical analysis of 11-12th century CE archaeological objects from former Eastern Prussia and Ostriv (present day Ukraine) cemeteries was conducted by nano-analytical techniques. It is the first time that transmission electron microscopy (TEM) was carried out on medieval East Baltic and Ostriv cemetery artefacts. The analysis was aimed at distinguishing between the elemental compositions of the copper-based artefacts and drawing useful conclusions about the Baltic population's mobility patterns. The results showed a consistent usage of brass (Cu-Zn) in Ostriv grave ornaments, whereas pure Cu, brass (Cu-Zn) and bronze (Cu-Sn) were found in the East Baltic artefacts. Despite similarities in the morphology of the artefacts, the raw materials in the two regions are not identical. Where the Ostriv cemetery artefacts form a homogenous group in terms of material composition, i.e. brass, the artefacts from East Baltic regions range from pure Cu to brass and bronze. The results are being studied closely to gain further insights about the metallurgy and archaeological perspective of the artefacts.
- Late Neolithic Copper Axe from Scania belonging to 2000 BCE:

Material analysis consisting of transmission electron microscope (TEM) and scanning electron microscope (SEM) was conducted on a late Neolithic copper axe excavated at Eskilstorp, Southwest Scania in 2015. The analysis was aimed at identifying whether or not there is a decorative silver layer present on the surface of the Neolithic copper axe.

SEM was conducted for surface analysis and focused Ion Beam (FIB) was used to extract thin slices of the sample from different regions on the surface and core of the axe for analysis under TEM. SEM elemental maps of the surface revealed a relatively thick layer of iron compounds on one side of the axe and a free copper layer covered with microscopic silver beads and spirals. The structural analysis with TEM showed a Cu₂O matrix with uneven distribution of silver crystals on the surface, whereas the bulk of the axe consisted of pure Cu with impurities such as Ag, Sn and As typical of Fahlore Cu ore. The Cu₂O and Ag rim are the corrosion products formed as a result of secondary alteration. The decorative silver layer is probably lifted and washed away as a result of underlying corrosion leaving silver crystallites on the surface of the axe. The results are being further studied.

- FTIR and Raman analysis on amber artefacts to identify Baltic amber:

Comparative studies of Baltic amber were conducted to differentiate between the amber of different origins and their fossilisation process from a chemical view point. The spectral profiles depend mostly on geographical locations of the samples, their botanical sources as well as maturation grade and geological conditions. The Baltic amber was successfully identified owing to the presence of Baltic shoulder in the FTIR spectrum. The Raman analysis, in contrast, helped to identify the maturation of the artefacts which was related to the age of the amber and temperatures of the surrounding environment. Amber analysis by applying different temperatures under ambient pressures is planned in order to investigate the effects of heat on the amber due to the environment conditions.

- Knapping tool identification by trace element analysis on crevices in a flint pilot study was conducted. A two-step methodology consisting of digital microscope and scanning electron microscopy (SEM) has been developed to identify the copper traces in the crevices and cracks of the flint sickles and daggers. This pilot study was aimed at identifying the knapping tool by the trace element analysis on experimental flint replicas.

The fourth research focus *Rituals, Religion, Ideology, and Communication* has not yet been researched prominently; this will take place in the second half of the ROOTS term (see below).

Structural aims and achievements

One structural aim was to fill a professorship for Historical Linguistic Studies within the framework of the SC. The professorship was filled by Ilja Seržant, who, however, accepted an external appointment after a short time, so that this aim can no longer be achieved. Historical Linguistic Studies has, however, received reinforcement in the person of Sören

Wichmann. Wichmann's research over the next few years will pertain to the language dynamics of different areas of Eurasia, including how to distinguish languages and dialects in Central Europe, a methodologically oriented study of Russian dialectometry, and the areal typology of South India.

The formation of so-called focus groups has proven to be an effective structural measure, representing an informal association of interested SC members dedicated to a clearly defined objective (e.g. writing an article). However, only a few focus groups have been established so far. Examples are the already mentioned Reading and Writing Circles and the focus group Fortifications Dictionary, which is dedicated to terminological questions. Somewhat differently structured is the focus group Material Sciences that was already described above. It is an important instrument to utilise and bundle the existing high-end infrastructure of the Technical Faculty not only within the SC, but also to be available for other subclusters with similar questions.

Aims and plans for 2022 to 2025

In the second half of the ROOTS term, the promising projects that have been started will be continued and brought to a medium-term conclusion. A central role will be played by the fortifications database, whose data stock will be multiplied by upcoming cooperation projects with similar projects in Poland and the Baltic States. The Fortifications Dictionary will be implemented into the database. In addition to its function as a thesaurus, the aim is to devote more attention to the translation of terms into other languages.

The basic theoretical considerations from our SC will be laid down in a paper that is expected to be published simultaneously in several languages. The aim is to reach representatives of different scientific traditions and to sensitise them for this topic. Furthermore, specific questions and objectives of the SC will be tackled, which have not been in the foreground so far. The Central European ConCon Index (CE ConCon Index) mentioned above supports the following SC objectives "to make past conflicts diachronically comparable in terms of their severity and consequences" – severity will become comparable and thus interpretable through quantification; and the GIS-supported spatial evaluation of the index will enable the representation of the spatial and social scales of conflict in past societies for Central Europe.

The research focus *Rituals, Religion, Ideology, and Communication* will be addressed by a PhD study. The process of filling the PhD position with the title *From Conflict to Cooperation in Pre- and Protohistoric societies* is pending. The candidate is expected to prepare a dissertation dealing with rituals, communication and diplomacy. Diplomacy is understood as a specific form of communication that is highly connected with rituals and rules. The

dissertation topic has many possible facets; examples include the evaluation of political and commercial interactions for conflict resolution, of language and language knowledge in intercultural communication, or of objects as “ambassadors” or bearers of real or invented memories in cross-cultural contexts.

Conflict / Table 1:

**A) List of finished and ongoing Subcluster projects;
B) Contributions to ROOTS interdisciplinary research projects**

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Conflict and Conciliation	Production and modes of exchange	Baltic immigrants in the Middle Dnieper region: artefacts analysis	Khurram Saleem, Christian Horn, Ulrich Schürmann, Lorenz Kienle	08/2019-11/2022	11th and first half of 12th Century CE	East Baltic regions and the Ostriv cemetery	Material analysis, archaeometry, Baltic immigrants, TEM	Publication, material composition dataset of the artefacts, report on the material analysis
SC Conflict and Conciliation		Material analysis on a Neolithic copper axe	Khurram Saleem, Ulrich Schürmann	08/2019-11/2022	2000 BCE - Late Neolithic	Eskilstorp, Southwest Scania	Neolithic copper axe, material analysis, TEM	Publication, material composition dataset of the axe
SC Conflict and Conciliation	Production and modes of exchange	FTIR and Raman analysis on Baltic Amber	Khurram Saleem, Benjamin Serbe, Karl Johann Offermann	08/2019-11/2022		Kalliningrad (Russia) Skallingen Vejers, (Denmark)	Baltic amber, FTIR, Raman	Publication, material composition dataset of Baltic amber
SC Conflict and Conciliation	Production and modes of exchange	Metallurgy and violence: A dagger from Slovakia	Khurram Saleem, Henry Skorna, Marketa Havlikova, Martin Bača	09/2021-06/2022	4000/3800 BCE	Moravia and Southwestern Slovakia	Dagger, prehistory, material analysis, Eneolithic, violence, material analysis	Publication

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Conflict and Conciliation	All Subclusters	Focus group material science and analysis (FGMSA I-VI)	Khurram Saleem, Ulrich Schürmann, Lorenz Kienle	09/2020-01/2023	-	-	-	Focus group
SC Conflict and Conciliation	-	PhD / Solid State Material Analysis Methodology for characterisation of archaeological artefacts	PhD-student: Khurram Saleem Supervisors: Lorenz Kienle, Claus von Carnap-Bornheim	10/2019-02/2023	Neolithic, Late Neolithic, Medieval Age	Denmark, Baltic Region, Ukraine	Conflict, conciliation, archaeometry, Medieval Age	Dissertation, publication, dataset (Artefacts of the Neolithic, Medieval Age)
SC Social Inequality and SC Conflict and Conciliation		Understanding Social Inequality and Violence	Henry Skorna	09/2019-07/2023	5500-1600 BCE	e.g. Carpathian Basin and Western Part of Middle Europe	Prehistory, social inequality, Neolithic, Eneolithic, Early Bronze Age	PhD Thesis, database of burial sites

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Conflict and Conciliation	Boundaries and fortifications	Fortification Database	Oliver Nakoinz, Anna Loy, Jens Schneeweiß, Jutta Kneisel	2019-2025	Neolithic – Middle Ages, with focus on Bronze Age – Iron Age	Europe, focus on Central and Northern Europe	Fortification, database	Database
SC Conflict and Conciliation	Boundaries and fortifications	Kjelderbakke	Anna Loy, Oliver Nakoinz, Solveig Ketelsen	2021	Middle Neolithic (Iron Age expected)	Denmark	Fortification	Publication
SC Conflict and Conciliation	Production and modes of exchange	Painted Pottery	Anna Loy, Oliver Nakoinz, Ulrich Schürmann, Khurram Saleem	2022	-500 - 0 BCE	Schleswig-Holstein	Painted pottery, import, Iron Age, TEM analysis	Publication
SC Conflict and Conciliation	Production and modes of exchange, rituals, religion, ideology, and communication	Simb Workshop “Transportation and Communication in the First Millennium BCE”	Anna Loy, Oliver Nakoinz	2022	-1000 - 0 BCE	Central and Northern Europe	Transport, communication	Workshop report

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
SC Conflict and Conciliation		PhD / Deciphering Defensive Landscapes: Conflict and Conciliation in the first Millennium BCE	PhD-student: Anna K. Loy Supervisors: Oliver Nakoinz, Eileen Eckmeier	10/2019-06/2023	First millennium BCE	Southwestern Baltic region	Conflict, conciliation, fortifications	Dissertation, publication, dataset (fortifications of the Late Bronze Age/Early Iron Age)
SC Conflict and Conciliation	Boundaries and fortifications	Conflict management in cultural and territorial border areas of the Slavic world in the Middle Ages	Jens Schneeweiß	2019-2025	500-1300 AD	East Central Europe, Northeastern Europe	Fortifications, trade route, Volkhov River, Varangians, Eastern Baltic, landesausbau, circular villages, Elbe River	Publications, WebGIS dataset (atlas)
SC Conflict and Conciliation	Boundaries and fortifications	Fortification Dictionary	Oliver Nakoinz, Anna Loy, Jens Schneeweiß, Norbert Nübler	2020-2023	Neolithic – Middle Ages	Global (focus on Europe)	Fortification terminology	Dataset, thesaurus for database, publication
SC Conflict and Conciliation	Boundaries and fortifications	Fire pit alignments	Laura Rose, Jutta Kneisel	2021	1400-0 BCE	Northern Europe	Fire pit database, magnetic survey	EAA presentation, publication

Project ID	Involved Subclusters	Project (title /type)	Proponents	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
B ROOTS interdisc. project "The Forest Finns as a Model for the Early Slavic Migration"	SC Conflict, SC Hazards, SC Dietary, SC Social Inequality, Reflective Turn, Botanical Platform	The Forest Finns as a Model for the Early Slavic Migration	Jens Schneeweiß, Eileen Eckmeier, Wiebke Kirleis, Vesa Arponen, Henny Piezonka, John Meadows, Ben Krause-Kyora	08/2021-07/2023	500-800 AD, 1500-1800 AD	Scandinavia (Norway, Sweden), Southern Baltic Area (Mecklenburg - Vorpommern)	Migration, mobility, subsistence, LALIA, swidden cultivation, predictive modeling, archaeological visibility	Publications, case study (for archaeology of marginal groups)
ROOTS interdisc. project "3DARK DEPTH"	SC Conflict, SC Hazards, SC Dietary, SC Urban, Botanical Platform, Communication Platform	3DARK DEPTH – Describing, Discussing and Developing Analytical Research Knowledge of the Dark Earth Phenomenon in Theory and Practice	Jens Schneeweiß, Eileen Eckmeier, Pawel Cembrzyński, Wiebke Kirleis, Ben Krause-Kyora, Katrin Schöps	08/2021-07/2023	Last 2000 years	global	Archaeological taphonomy, subsistence strategies, micromorphology	Publications, conference, case study and dataset (for real yield potential of Dark Earth)
ROOTS interdisc. project "Between invasion and domestication"	SC Dietary, SC Hazards, Communication Platform, SC Conflict	Between invasion and domestication: rethinking the socio-environmental ROOTS of crops, weeds and invasive species	Wiebke Kirleis, Alexandra Erfmeier, Konrad Ott, Ilka Parchmann, Jens Schneeweiß, Ben Krause-Kyora, Eva Stukenbrock, Guillermo Torres	01/2022-07/2023	Last 7000 years	global	Plant cultivation, rye, crops and weeds, methodology	Publications, conference

Project ID	Involved Subclusters Overarching ROOTS focus	Project (title /type)	Proponents	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
B ROOTS interdisc. Project "Boas Talks"	SC Social Inequality, SC Conflict, Humanities Platform, Reflective Turn	Boas Talks	Henny Piezonka, Maria Wunderlich, Nils Müller-Scheeßel, Jens Schneeweiß, Vesa Arponen	08/2020-07/2022	none	global	Franz Boas, Cultural Anthropology, cross cultural and transdisciplinary research approach, Ethnographisch-Archaeologische Zeitschrift	Conference, publications (establishing new journal)
ROOTS Interlinkage Group "Waste/Abfall"	All Subclusters	Stories of Waste and Value / Roots of Circular Economy	Jens Schneeweiß	2021-2022	none	global	Waste management, stereotypes, recycling, faeces, resources	Publication (booklet)
ROOTS Interlinkage Group "Routes and Networks"	All Subclusters	Booklet: Routes and Networks. Contributions of Jens Schneeweiß: 1) Wie kommt Buddha zu den Nordmännern nach Schweden?, 2) Connection breakdown – Three Vikings abroad (mit H. Piezonka)	Henny Piezonka, Andrea Ricci, Lutz Käppel	2021-2022	Contribution: Viking Age	global	Assimilation, trade, cultural transfer	Publications (contribution to booklet)

Project ID	Involved Subclusters	Project (title /type)	Proponents	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
B	Overarching ROOTS focus							
ROOTS interdisc. Project "Big Exchange: Searching for Knowledge, Social Inequality and Politics behind Exceptional Large-Scale Networks in European Prehistory"	ROOTS of Inequalities, Knowledge ROOTS, ROOTS of Conflict and Conciliation	Big Exchange: Searching for Knowledge, Social Inequality and Politics behind Exceptional Large-Scale Networks in European Prehistory	Tim Kerig, Jutta Kneisel, Oliver Nakoinz, Johanna Hilpert	2021	500-800 AD, 1500-1800 AD	Eurasia	Networks, migration, mobility, exchange	Publications, database, conference

Former members:

Prof. Ilja Seržant, Daria Alfimova (since 04/2022 Potsdam University)

New associated members (since 2022): Dr. Timo Ibsen, Hans Whitefield (ZBSA)

JMA Chairs/Visiting Professors, incl. nominees scheduled for 2022 once approved by board:

Tim Kohler

Gary Feinman

Activities with international partners (e.g. field campaign, conference organisation, joint publication...)

- Fieldwork: Kjelderbakke-Project in cooperation with ArkVest Denmark (contact: Esben Schlosser Mauritsen) (excavation of a fortified knoll in western Denmark), joint publication in progress (Loy)
- Fieldwork: Sultana (Romania), Stolnicieni (Moldava), Nagaland (India), Sumba (Indonesia), Leki Male (Poland), Kakusz (Hungary), Maidanetske (Ukraine), Stolnicieni (Moldavia), Falbygden (Sweden) (Müller)
- Survey in Norway and Sweden (Schneeweiß)

International joint publications: edited volume "Fortifications in their natural and cultural landscape: from organizing space to the creation of power" (in print); edited volume "Towards an international archaeology of fortifications: methodologies and interpretations" (in preparation); joint paper with Natalia Grigorieva (Russia) and Philippe Rentzel (Switzerland) in Записки ИИМК РАН.

International joint project proposals:

- 2020: 1) Archaeological-topographical Atlas of Hillforts and Hithes at the River Volkhov (DFG-RFBR, with Ivan Eremeev, Russia. Rejected); 2) Interdisciplinary Hillfort Studies at the Daugava River: Merging and Decoding Archaeological, Environmental and Linguistic Data (DFG-NCN Beethoven, with Piotr Kittel, Poland. Start 04/2022).
- 2021: Mala Pereshchepina revisited: archaeological, archaeometric, archival and environmental investigations of an early medieval complex on the Eastern European steppe (with Orsolya Heinrich-Tamaska at Thyssen Foundation; with Hermitage, Russia, and Institute of Archaeology Kiev, Ukraine. Rejected).

- 2022: Baltische Migranten an der Ostgrenze der Kiever Rus'. Der spätwikingzeitliche archäologische Komplex von Ostriv am Ros, Ukraine (DFG, with Vsevolod Ivakin, Ukraine. Pending).

Workshops/conferences, including workshop and conference sessions organised abroad

Claus von Carnap-Bornheim

- 16 April 2019: Workshop »The Ostriv site«, Kiew, Schleswig
- 8 June 2019: Conference Attila's Europe, Budapest; Lecture together with Andreas Rau: Scandinavia and Eurasian Nomads – A Search for Traces and Interpretations
- 27 June 2019: Conference Archaeology in the 21st Century, Moscow; Lecture: Dealing with a Monster! Viking age Hedeby and its research strategies of the early 21st century
- 22 September 2020: Deutscher Archäologie-Kongress, Kiel, online; Lecture together with Ulf Ickerodt, Johannes Müller: Weltkulturerbe und Exzellenzcluster: Von Haithabu bis Nagaland – neue Horizonte der Archäologie
- 24 September 2020: Deutscher Archäologie-Kongress, Kiel, online; Lecture together with Berit V. Eriksen; Das Zentrum für Baltische und Skandinavische Archäologie: ein Leuchtturm in der nordeuropäischen Forschungslandschaft
- 7 October 2020: 31. Österreichischer Museumstag, Krems an der Donau; Lecture: Museum und Wissenschaft – Das Beispiel Schleswig
- 5 November 2020: ICOMOS, Tagung Archäologische Welterbestätten – Archaeological World Heritage Sites; Lecture: Nach dem Spiel ist vor dem Spiel! Haithabu und Danewerk als UNESCO Welterbe
- 4 February 2021: Festveranstaltung der Archäologischen Fakultät der Universität Warschau, Warschau; Lecture: Herrn Prof. Dr. Aleksander Bursche zum 65sten Geburtstag! Laudatio
- 2 November 2021: Leibniz-Institut für Geschichte und Kultur des östlichen Europa, Leipzig, Oskar-Halecki-Vorlesung; Lecture: Kriegsbedingt zerstört – wissenschaftlich rekonstruiert. Die Prussia-Sammlung aus dem Königsberger Schloss
- 9 December 2021: 50 Years Institute of Archaeology, Jagiellonian University, Kraków; Lecture: The bog find of Thorsberg – News from items and ensembles

Oliver Nakoinz

- Kiel 2021: EAA 2021, Session 267, History of Measuring and Calculations in Archaeology, in collaboration with S. Plutniak, Toulouse, T. Kerig, Kiel and Aleksandr Diachenko, Kiev.
- Bern 2019: EAA 2019, Session 203, The Age beyond 'paradigms' - Eclectic shapes of Processualism 2.0?, in collaboration with C. Girotto, München, A. Diachenko, Kiev, and R. Rivers, London.
- Krakow 2019: CAA 2019, Session 28, Computational classification in archaeology, in collaboration with M. Hinz, Bern
- Kiel 2019: International Open Workshop 2019 GSHDL, Session 6, Complexity in archaeology – Diachronic transformations of complex networks and theoretical aspects of complex systems, in collaboration with J. Schlicht, Kiel, M. Hinz, Bern, D. Knitter, Kiel, L. Yang, Kiel, T. Kohler, Washington.
- Kiel 2019: International Open Workshop 2019 GSHDL, Session 7, Mediterranean Connections – how the Sea links people and transforms identities, in collaboration with A. Rutter, Kiel, E. Loitzou, Kiel, F. Fulminante, Bristol, L. Schmidt, Kiel, D. Möhlmann, Kiel, L. Käppel, Kiel, H. Klinkott, Kiel.
- Kiel 2019: International Open Workshop 2019 GSHDL, Session 8, Territoriality in Europe in the Bronze and Iron Age, in collaboration with S. Valenzuela Lamas, Barcelona, D. Knitter, Kiel, S. Schaefer-Di Maida, Kiel, W. Dörfler, Kiel, I. Feeser, Kiel, D. Filipovic, Kiel, W. Kirleis, Kiel, J. Kneisel, Kiel, H. Raese, Kiel.

Lorenz Kienle

- Poster (ID 519): Berlin EMC19, Section: Metals, alloys and intermetallic, "Analytical TEM methods for Neolithic materials", K. Saleem, U. Schürmann, J. Kneisel, J. Müller, C. von Carnap Bornheim, L. Kienle
- Kiel 2020: All subclusters workshop: Introduction to material science and analysis techniques – presentation/Lab tour (TEM, SEM, XRD, Raman, FIB), K. Saleem, U. Schürmann, L. Kienle
- Poster (ID 45): Vienna EMA 21, Comparative Material Analysis on Viking age brass ornaments by TEM, K. Saleem, U. Schürmann, R. Shiroukhov, J. Müller, C. von Carnap Bornheim, L. Kienle
- Presentation: EAA 2021, Session 22 (Material culture studies and societies), Differences and similarities of material culture in East Baltic and Ukrainian cemetery artefacts from Medieval period using electron microscopy, K. Saleem, U. Schürmann, R. Shiroukhov, V. Baranov, V. Ivakin, C. von Carnap Bornheim, L. Kienle (Online, oral)

Anna Loy

- EAA 2021 Session #315: Conflict escalation and de-escalation in urbanity, Organizers: Anna K. Loy, Paweł Cembrzyński, Victoria Alliate and Camilla Zeviani
- Poster: Defensive Landscapes - Traces of Conflict and Conciliation in Early Iron Age Denmark at EEPB 2020 in Bibracte, 2020
- Presentation: Models of conflicts, movements and the evidence of fortifications, Oliver Nakoinz and Anna K. Loy at Continuités et discontinuités à la fin du IIe siècle avant J.-C. dans l'espace celtique et à sa périphérie Table-ronde Bibracte, Centre archéologique européen. 25-27 octobre 2021, 2021
- Presentation and discussant: Deciphering Defensive Landscapes – Coping with Materialities of Conflict at 'Materialities of Challenge/Challenges of Materialities', 6.-7. November 2020, Mainz – virtual Workshop
- Presentation: The location of connected fortifications, Oliver Nakoinz and Anna K. Loy at COMFORT "The setting of fortifications in the natural and cultural landscape" International workshop – 5th-6th of March 2020 in Schleswig, Germany
- EAA 2022 Roundtable #399: Linking databases for comparing research: Do we need a European Hillfort Information System? Organizers: Anna K. Loy, Loup Bernard, Timo Ibsen and Hans Whitefield
- Presentation: Anna K. Loy, Raising walls, constructing communities. DAAD Virtual symposium on the broad theme of Constructing Communities. Networking for early career archaeologists. 10th–11th May (oral, online)
- Presentation: Victoria Alliate, Anna K. Loy, Oliver Nakoinz, Conflict processes and urban processes interconnected (paper in the EAA Session #315) (online, oral)
- Discussant: Anna K. Loy, Finding interdisciplinary (discussant in the EAA session #245) (online, oral)
- Presentation: Daniel Knitter, Gerrit Gunther, Anna K. Loy, Oliver Nakoinz, New Realism – New Positivism? CE-TAG. 7th Annual Meeting in Brno "Theoretical Approaches to computational archaeology" (19th-20th October) (oral)

Johannes Müller

- 2021 Kiel: Annual workshop of the European Association of Archaeologists (2500 participants)
- 2020 Kiel: Deutscher Archäologie Kongress (800 participants)
- 2019 Kiel: International Conference "Socio-Environmental Change During the Last 12000 Years" III (400+ participants)

Jens Schneeweiß

- Co-Organisation of the Session “Archaeology of the Western Slavs” at the MOVA- and WSV-Conférence in Jena in October 2021, postponed to September 2022
- Co-Organisation of the ROOTS-Workshop “Boas-Talks – Scientific colloquium commemorating the 140th anniversary of Franz Boas’ Doctorate” (November 2021 in Kiel)
- Co-Organisation of the International Conference “Slavs and their neighbors in the 1st Millennium A.D.” (October 2021 in Novi Sad, Serbia)
- Main Organisation of Session #273 at the European Association of Archaeologists (EAA) “Towards an international archaeology of fortifications: Methodologies and interpretations” (September 2021 online in Kiel)
- Co-Organisation of Session #232 at the European Association of Archaeologists (EAA) “Swords to ploughshares – Conciliation as an alternative to conflicts. A diachronic perspective between late Neolithic and Viking Age” (September 2021 online in Kiel)
- Co-Organisation of Session #448 at the European Association of Archaeologists (EAA) “Just a demonstration of Power? The setting of strongholds within their landscape” (August 2020 online)

Jutta Kneisel

- Kiel 2021: EAA 2021, Session 232: H. Skorna, J. Kneisel, M. Jaeger, J. Schneeweiß, Swords to Ploughshares – Conciliation as an Alternative to Conflicts. A Diachronic Perspective between Late Neolithic and Viking Age
- Kiel 2019: International Open Workshop 2019 GSHDL, Session 8, Territoriality in Europe in the Bronze and Iron Age, in collaboration with S. Valenzuela Lamas, Barcelona, D. Knitter, Kiel, S. Schaefer-Di Maida, Kiel, W. Dörfler, Kiel, I. Feeser, Kiel, D. Filipovic, Kiel, W. Kirleis, Kiel, J. Kneisel, Kiel, H. Raese, Kiel

Data management

- Wichmann has continued to expand the ASJP database of basic vocabulary of the world’s languages which, since the last release in 2020 (<https://asjp.cild.org/>), has grown by 6% to a coverage of 74% of the world’s languages through 10,017 word lists.
- Datenbank Gräber, Datenbank Häuser (Müller)
- Fortification Database (Nakoinz)

Contributions to ROOTS Platforms and the Reflective Turn Torum

- Johannes Müller: Communication platform: megalithic routes – membership, board, etc. / SACC: Social Archeology of Climate Change Summit / EAA

Contributions to ROOTS public outreach activities

- Johannes Müller: Megalithic routes – scientific board, etc.
- Johannes Müller: Pandemics booklet
- Johannes Müller: Arte-Film on megasites
- Johannes Müller: Different interviews in television and on radio
- Johannes Müller: Different contributions in popular scientific magazines by journalists (Bild der Wissenschaft, Spectrum, New Scientist)
- Johannes Müller: Podiumsdiskussionen (z.B. „Die Zivilisationsfrage“ im Berliner Kongresszentrum „Schwangerer Auster“)
- Johannes Müller: SACC: Social Archeology of Climate Change Summit
- Sören Wichmann: Interview published in Unizeit 02.04.2022 (<https://www.uni-kiel.de/de/unizeit/uz/news/wortstatistik#>): “Von der Wortstatistik in die Urgeschichte”. The interview relates to the paper “Conditions on word length” by Søren Wichmann and Eric W. Holman, under review by PLoS One.
- J. Schneeweiß (ed.), Stories of Waste & Value. ROOTS of Circular Economy. ROOTS booklet. In preparation.
- J. Schneeweiß, Wie kommt Buddha zu den Nordmännern nach Schweden? In: H. Piezonka, A. Ricci, L. Käppel (eds.), ROOTS of Routes: Mobility and Networks between the Past and the Future. ROOTS booklet. In preparation.
- J. Schneeweiß, H. Piezonka, Gekappte Verbindungen - Drei Wikinger auf Abwegen. In: H. Piezonka, A. Ricci, L. Käppel (eds.), ROOTS of Routes: Mobility and Networks between the Past and the Future. ROOTS booklet. In preparation.
- M. Grund, B. Majchczack, J. Schneeweiß, Ein Herz für Ballaststoffe. In: J. Schneeweiß (ed.), Stories of Waste & Value. ROOTS of Circular Economy. ROOTS booklet. In preparation.
- J. Schneeweiß, D. Zentgraf, Gartenabfälle – Gartenböden. Stories of Waste & Value. ROOTS of Circular Economy. ROOTS booklet. In preparation.
- Participation in the Rent-a-Scientist campaign (Nacht der Wissenschaft) in 2020 and 2021: lessons in schools in Rendsburg, Büdelsdorf and Kiel.
- W. Dörfler/J. Kneisel, Tagebuch einer Bernsteinhändlerin (Bonn 2021).
- W. Dörfler/J. Kneisel, Diary of an Amber Trader (Bonn 2021).

- Open house at the excavation Dobbin, Mecklenburg-Western Pomerania with presentations and activities for the visitors, 14.3.2020; 17.10.2020; 16.10.2021
- Participation in the Archaeolab
- Newspaper/Journal/Media Interviews:
 1. Emma: Die Bronze und die Frauen, Ausgabe Januar 2022
<https://www.emma.de/artikel/die-bronze-und-die-frauen-339157>
 2. Planet Wissen (Fernsehinterview): Bronzezeit – Die vergessene Epoche 01.12.2020.
<https://www1.wdr.de/mediathek/video-bronzezeit--die-vergessene-epoche-100.html>
 3. Bild der Wissenschaft: Interview: „Klimawandel im Rückspiegel“ Ausgabe Februar 2022
 4. Rent-a-scientist September 2021 (4 Schulen: Rendsburg, Dänischhagen, Altenholz, Jevenstedt)
 5. Videoclip Bronzezeit: Landmarks of the North: Megalithic tombs and Bronze Age grave mounds September 2021
<https://www.cluster-roots.uni-kiel.de/en/news/news-archive/roots-films>
 6. Interviewportrait: in Zusammenarbeit mit Dr. Ruth Kamm, Gleichstellungsbeauftragte der CAU, soll eine Webseite mit Interviews, Text und weiteren Informationen zusammengetragen werden. Ziel ist es, jungen Wissenschaftlerinnen Vorbilder zu zeigen, deren Karriereweg zu beleuchten und so Möglichkeiten aufzuzeigen. Dezember 2021

3.2 Reflective Turn Forum

Principal Investigators/Members/PhD members/Associate Members

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Ohlrau, René	rohlrau@roots.uni-kiel.de	Full member
Zentgraf, Dana	dzentgraf@roots.uni-kiel.de	PhD student
and all full members		

Research aims and achievements

As stated in the Full Proposal for the Cluster of Excellence ROOTS (2018), the Reflective Turn Forum aims at fostering critical and reflective scientific debate and exchange within ROOTS and the scientific community beyond it, concerning the formation of hypotheses and interpretations of research data and results from the points of view of philosophical and other theories of human action. Within that, the Reflective Turn Forum seeks to provide a critical and reflective **epistemological review of knowledge production practices** and their intellectual background. Particular attention is being paid to the **identification and verification of general patterns and trends of past-present connectivity** between the social, environmental, and cultural domains and their explanatory potential today. In cooperation with the Communications Platform 2, the Reflective Turn Forum was also tasked with **knowledge transfers between the scientific community and society**.

These research aims are or were pursued and achieved as follows, summarised also in Fig. 05.

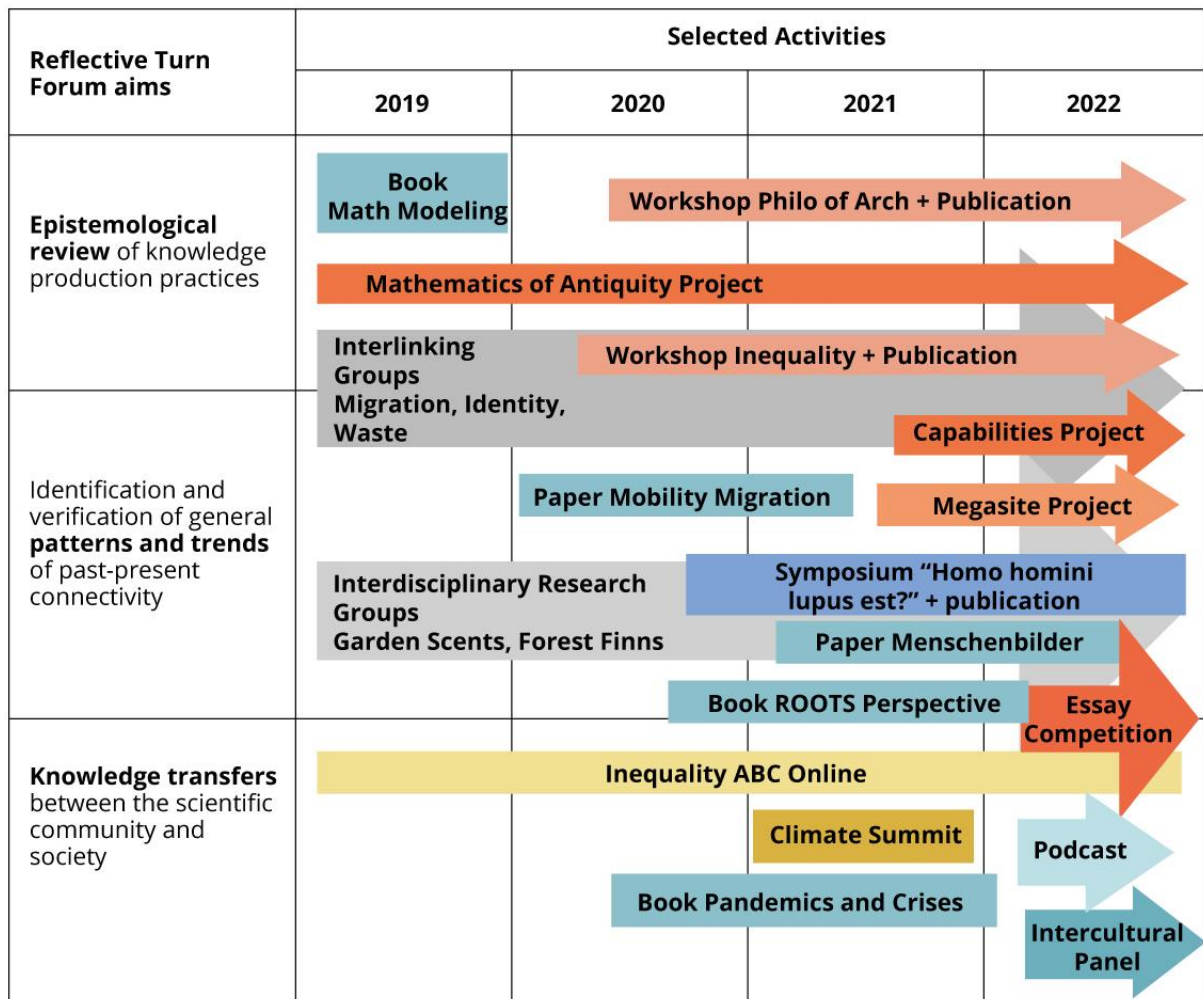


Fig. 05. Overview of the Reflective Turn Forum aims and selected activities from 2019 going forward. Blocks indicate finished projects, arrows on-going work.

- **The Inequality Workshop and Book Project** (Arponen, Ott, Ohlrau) invited selected international scholars of archaeological social complexity and political organisation to Kiel. The aim was to strengthen the interest in Kiel on capability-based and other bottom-up approaches by relating them to other approaches in the field such as anarchism, cooperation, and heterarchy. An edited collection of contributions is in preparation in cooperation with Martin Furholt of the Inequality Cluster.
- **The Philosophy of Archaeology Workshop and Book Project** (Arponen, Ott, Ohlrau) invited selected archaeological theorists to Kiel. The aim was to develop an original approach in the philosophy of archaeology in discussion with existing archaeological theory such as post-humanism, ethnoarchaeology, and post-structural theory. An edited collection of the contributions is in preparation.
- **Symposium „Homo homini lupus est? Menschenbilder und das Fremde: Interaktion und Wahrnehmung“** (Zentgraf in cooperation with PhD candidates

from the subclusters (SC) Knowledge, Urban, Hazards, and the Muthesius Kunsthochschule Kiel). The symposium was addressed to early career researchers who are concerned with theoretical reflexion on or historical examples of "Menschenbilder". The goal was to collect different constructions of this very wide term to emphasise the manifold understandings. The participants were international and interdisciplinary, including perspectives from philosophy, archaeology, cultural history, German studies, and scientific illustration. The symposium was held online in 2021. A publication is in progress, expected to be published in September 2022.

- **Interlinking Group: Abfall/Waste** (Zentgraf in cooperation with SC Conflict) A contribution on *Abfall im Garten* from a philosophical and an archaeological perspective is in progress as a ROOTS booklet.
- **Interlinking Group: Ideology & Identity** (Lattmann) is working on a collaborative paper on the interrelation of ideology and identity incorporating a case study with a focus on Greco-Roman antiquity (jointly with Chiara Thumiger).
- **Interlinking Group: Migration** (Arponen) investigates the phenomenon of child mobility. Joint publication is in preparation.
- **Mathematics in Antiquity** (Lattmann): The project aims to shed further light on the beginnings of scientific mathematics in the European tradition in Greco-Roman antiquity. Lattmann is going to present papers at two conferences which shall subsequently be worked out for submission for publication.
- **The Inequality ABC** project of the Inequality Cluster in ROOTS incorporates contributions from Reflective Turn Forum members (Arponen, Müller).
- **The Relaunch of the EAZ Journal in Kiel** was accompanied by a workshop to which Arponen contributed by inviting international cooperation partners (Angelbeck, Cunningham). The Reflective Turn Forum will cooperate with the EAZ in the future.
- **The Reflective Turn Essay Competition** has been launched (April 2022) to invite international scholarly contributions on the question of whether recurring patterns of socio-environmental connectivity can be observed in a past-present perspective.
- **The Megasite Horizons** project is launched, aiming to investigate the deep roots of settlement aggregation. It reflects on the definitions of urban in the light of slum formation in the Anthropocene. Three focus areas spanning from the Iberian Peninsula to Southwest Asia and ranging from 8000-2200 BCE are currently under research. This project integrates philosophy and archaeology by developing the application of quality-of-life and human well-being concepts to archaeological material. It integrates the themes of social inequality (Cluster 5) and urbanisation (Cluster 4) by means of the Reflective Turn. The publication strategy aims for

technical papers as proof of a concept for well-being indices and a book in the ROOTS monograph series to display the approach in a wider narrative. Results will be presented at relevant international workshops and conferences.

- **Book project: Connectivity Matters!** Social, Environmental and Cultural Connectivity in Past Societies. Leiden in print (editor Müller, contribution from Arponen).
- **Book Project: From Farmers to Heroes?** (editors M. Dębiec, J. Gorski, J. Müller, T. Saile, P. Włodarczak) Archaeological Studies in Honour of Sławomir Kadrow, Bonn in print.
- **Book project: Philosophy of Archaeology: A ROOTS-Perspective (Ott).** The monography intends to present a groundwork for a philosophy of archaic history and archaeology. It entails three main parts and an ethical afterword. The first part is about the epistemology of history and it deals with different conceptual investments. The second part is about historical materialism. This part claims that economic life as such originated in the Neolithic. The third part deals with the presumed origins of the Anthropocene in the Neolithic. It points at several achievements that could be quantitatively enlarged in modern times. The ethical afterword deals with conditions and prospects for a good and sustainable Anthropocene from the perspective of past-present-connectivities. The manuscript is 200 pages long. The book shall be finished by the end of summer 2022.

Structural aims and achievements

- Structurally, the Reflective Turn Forum was supported from the start of ROOTS phase one by the position of the **Junior Research Group Leader** (Arponen since May 2020). To build upon the foundations created over nearly a decade of work in Kiel and to solidify the status of reflective, interdisciplinary and philosophical work as part of archaeological research in Kiel in the future, the intention is to make the position permanent in the ROOTS second phase.
- In the course of the pandemic, Reflective Turn Forum funds were deployed to hire a **postdoctoral researcher** (Ohlrau) to pursue the Megasite Horizons project and to further broaden the interface with archaeological and related work within ROOTS.
- Laura Schmidt was employed as a **postdoctoral researcher** in the Garden Scent ROOTS Interdisciplinary Research Project.
- For personal reasons, former **PhD student** Gido Lukas quit his project, while **PhD student** Dana Zentrgraf continues.

Aims and plans for 2022 to 2025

In the future, alongside existing initiatives, the Reflective Turn Forum plans to pursue and augment the stated Research Aims (3.1) by the following new directions.

- **The Capabilities and Well-being Postdoctoral Research Project** will be launched (from Summer 2022) to further pursue the pioneering work conducted in Kiel on questions of social organisation, power, and inequality from the perspective of the Capability Approach (Arponen 2016).
- **ROOTS Intercultural Panel:** In times of increasing intercultural awareness and reflection, the Reflective Turn Forum wishes to help ROOTS to construct an intercultural panel to discuss and develop ideas for interculturally competent scientific conduct. The panel will consist of invited international scholars representing underrepresented ecological and cultural zones of the world.
- **Exposition of current work of artist Jenny Schäfer** (Zentgraf) in cooperation with the department of philosophy of Kiel University and the Zoological Museum Kiel. Jenny Schäfer is an artist with a focus on the reflection of the Anthropocene. Her perspective is influenced by philosophers such as Donna Haraway. Jenny Schäfer's work includes photography, paintings and texts. With her essay on collections and works, she adds an interesting facet to the discourse of archaeology's role in anthropogenic discourse. The event was planned for April 2021 but postponed due to Covid-19; a new date has not yet been set.
- **The Reflective Turn Podcast:** In cooperation with the Communication Platform, the Reflective Turn Forum is planning to launch a monthly interview podcast covering reflective, interdisciplinary research in the humanities. Podcasting is a medium of knowledge transfer that has gained massively in popularity in recent years and represents a golden opportunity to transfer knowledge from science to society.

Reflective Turn Forum / Table 1:

A) List of finished and ongoing Reflective Turn Forum projects; B) Contributions to ROOTS interdisciplinary research projects

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliver-ables
Reflective Turn, Urban	Inequality / Urban / Reflective Turn	Megasite Horizons	René Ohirau	11/2021- 11/2024	8000-2200 BCE	Europe and Southwest Asia	Origins of agglomeration; anthropocene; well-being; slums	Paper (in print), book

Project ID	Involved Subclusters Overarching ROOTS focus	Project Title /Type	Proponents	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliver-ables
Conflict, Dietary, Inequality, Reflective Turn	Inequality / Urban / Reflective Turn	The Forest Finns as a Model for the Early Slavic Migration	Jens Schneeweiß, Magdalena Schmid, Vesa Arponen, Ben Krause-Kyora, Henny Piezonka, Wiebke Kirleis, Eileen Eckmeier, Sofia (Sonja) Filatova, John Meadows	08/2021-07/2023	536-660 CE (Slavs), 1580- CE (Finns)	Europe	Migration, ethnography, archaeology, climate	Workshop, academic paper
Knowledge, Hazards, Urban, Reflective Turn	Knowledge, Hazards, Urban, Reflective Turn	Garden Scents	Dana Zentgraf, Konrad Ott, Chiara Thurmiger, Timo Felber, Laura Schmidt, René Ohirau, Wiebke Kirleis	08/2020-01/2023	Ancient, mediaeval, modern	Europe	Gardening, senses, environment	Workshop, academic edited collection

JMA Chairs/Visiting Professors

JMA Chair in 2021

Professor Tim Kohler, Washington State University.

JMA Chair from November 2022,

Professor Gary Feinman, University of Illinois, Chicago.

Activities with international partners

Guest Lecture, Dr. Adam Green, Cambridge University, on “Indus economics: insights into egalitarian urbanism in South Asia’s first cities”, May 2022 (Ohlrau).

Analogical Reasoning, a co-authored paper project with the anthropological archaeologist Jerimy Cunningham, University of Lethbridge, Canada (Arponen).

Workshops/conferences, including workshop and conference sessions organised abroad

Several Reflective Turn Forum members were active organising conferences, sessions and/or delivering talks in the following:

- **EAA Kiel 2021**, annual conference of the European Association of Archaeologists organised in Kiel, online (2500 participants).
- Deutscher Archäologie Kongress 2020, Kiel (800 participants).
- International Workshop “Socio-environmental Change During the Last 12000 Years” III, Kiel 2019 (400+ participants).
- EAA Barcelona.

3.3 Platforms

3.3.1 Technical Platform

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Schwark, Lorenz	lorenz.schwark@ifg.uni-kiel.de	Full member

Structural aims and achievements

The Technical Platform provides expertise and support enabling research projects to rely on well-proven approaches as well as to test new research ideas within three main foci: The first focus concerns **field expertise** in archaeological excavations, surface geophysics and scientific diving. The second focus is on the **analysis of finds** in the context of archaeobotanical, palaeoenvironmental and zooarchaeological studies. This is supplemented by Nanoscale surface analysis, preparation for laboratory dating, identification of biomarkers, stable isotope and trace element analysis, molecular genetic analysis and materials science. **Information technology is the third focus**, providing support for information technologies, including multidimensional information systems and visualisation with Geographic Information System (GIS) and 3D visualisation. Jointly with the Humanities Platform, the Centre for Interdisciplinary Data Science (CIDS) was established that enhances the innovative possibilities of field surveys and excavations. Furthermore, new data management and integration strategies are developed for the expanding quantity and quality of data of different nature. This focus is shared with the Humanities Platform 3. Several field trainings and lectures were offered on the handling of technical devices (e.g. the geomagnetic devices), aiming at teaching new methods to

the graduates in order to be prepared for later application. This is one step towards early independence at an early career stage.

Near-surface geophysics is a key methodology for archaeological prospecting and palaeo-landscape reconstruction. For this purpose, ROOTS could rely on state-of-the-art equipment from the beginning, including magnetics, ground penetrating radar, electric resistivity tomography and seismic sounding. However, as geophysics expresses subsurface structure only in terms of physical soil parameters, major efforts of the Technical Platform were directed in acquiring and developing instrumentation that enables a ground truthing of geophysical measurements. This can be achieved through combining downhole sampling, performing downhole geophysical measurements and linking this information to surface measurements through numerical modelling. The new downhole instrumentation for near-surface geophysical downhole measurements includes *inter alia* magnetic devices, a natural gamma-ray spectrometer and a downhole seismometer. A key instrument for wetland investigations is a direct-push unit that enables sensing while drilling, thus avoiding problems with core loss and core compaction. The direct-push unit is equipped with an electric conductivity sensor and a soil colour sensor.

The **coring of peat and lake sediments** is a fundamental task for the palaeo-ecological investigations and the reconstruction of climate and human influence in the past. For this purpose, we aimed at developing coring equipment for deep lakes on the basis of existing high precision coring devices.

Scientific diving is an interdisciplinary competence enabling researchers to conduct scientific activities at submarine locations. ROOTS benefits from the Scientific Diving Center at Kiel University which offers scientific diving training and provides diving equipment. The ROOTS Technical Platform complements the Scientific Diving Center by offering specific training on techniques of underwater archaeology on demand. Herewith, researchers are enabled to include submerged sites with extraordinary conservation of organic materials in their projects.

One important pillar of the analysis of finds, is **the Botanical Platform**. It has been established to provide and support analyses of pollen, seed and fruit remains, wood and charcoal and the investigation of modern analogues for multiple projects tackling landscape development, vegetation dynamics, the reliance on vegetative resources by humans and societies, and to add botanical proxies to palaeo-climatological research. The aim of the Botanical Platform is (1) to offer facilities and support for students' own research activities concerning botanical matters, (2) to offer teaching of palaeo- and archaeobotanical approaches to students, and (3) to perform research in the ROOTS

framework. The platform bundles existing and new resources as well as expertise hosted at the Institute of Pre- and Protohistoric Archaeology and at the Ecology Centre, thus covering a wide range of botanical expertise in an archaeological and in an ecological/biological research and teaching context, bridging different disciplines, institutes and faculties at CAU via research and teaching activities. The determination of wood, charcoal and other plant remains for more precise evaluations of C14 analyses in a wide variety of projects is one important task of the Botanical Platform to improve results.

Achievements

Dipl. Biol. Yasmin Dannath (project coordination/half time) supports the coordination of the platform and carries out small-scale archaeobotanical analyses linked to ROOTS PhD/Postdoc projects. In 2021, a new table top scanning electron microscope (SEM) was purchased. Y. Dannath has taken responsibility for its maintenance. As the support, introduction and supervision is very time-consuming, some archaeobotanical requests have to be postponed or even rejected. In light of additional new tasks, the Botanical Platform would benefit from an upgrade of the part-time position to a full-time position in order to maintain the excellent standard that was established thus far.

**Technical Platform / Table 1:
ROOTS Technical Platform 2019-2021, list of supported projects.**

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and end of project	Temporal frame	Regional frame	Deliverables
SC Dietary	Plant ecology, archaeobotany (pollen, NPPs like parasites, macroremains)	PhD: Archaeobotanical investigations on urban settlements in northern Germany from the 12 th to the 17 th century; The case studies of Luebeck, Kiel and Uelzen.	Anna Wierzgon, Wiebke Kirleis	2016-2022	Medieval, Early modern times	Northern Germany	Contribution to dissertation 2022: Yasmin Dannath: <i>Pflanzen in der Stadt: Eine vergleichende archäobotanische Studie zur Vegetation und Pflanzennutzung in Kiel, Lübeck und Uelzen in Mittelalter und früher Neuzeit.</i>
SC Dietary	aDNA analysis, archaeobotany, plant ecology	Genetic variation in ancestral crops, "Wellerholz wanted!"	Sonja (Sofia) Filatova, Benjamin Claaßen, Guillermo G. Torres Estupian, , Ben Krause-Kyora, Eva Holtgrewe-Stukenbrock, Wiebke Kirleis	2020/2021	Early modern times	Germany	Filatova S, Claaßen B, Torres Estupian GG, Krause-Kyora BF, Holtgrewe-Stukenbrock E, Kirleis W. 2021. Toward an Investigation of Diversity and cultivation of Rye (<i>Secale cereale</i> ssp. <i>Cereale</i> L.) in Germany: Methodological Insights and First Results from Early Modern Plant Material. <i>Agronomy</i> . 11 (12):2451.
SC Dietary	aDNA analysis, archaeobotany, plant ecology	Genetic variation in ancestral crops, "Wellerholz wanted!"	Sonja (Sofia) Filatova, Wiebke Kirleis	2020/2021	Medieval, Early modern times	Germany, Niedersachsen, Göttingen	Filatova S, Kirleis W. 2021. Artenvielfalt in der spätmittelalterlichen Landwirtschaft. Bericht aus dem „Archiv Wellerholz“. <i>Archäologie in Niedersachsen</i> . 24:147-150.

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and end of project	Temporal frame	Regional frame	Deliverables
SC Conflict	Soil analysis, isotopes, archaeobotany	3DARK EARTH	Jens Schneeweiß, Frank Schütz, Wiebke Kirleis	2021/2022	Medieval, Early modern times	Germany f. e. Bardowick, Niedersachsen	Yasmin Dannath: Report: Voruntersuchung-Pflanzenreste – Bardowick (Niedersachsen) Fundstelle 148, BRD 21, M-2101021
SC Social inequality	Archaeology, macroremains	Hundisburg-Obetal: Competition and Conciliation	Maria Wunderlich, Johannes Müller	2019/2020	Neolithic	Germany, Sachsen-Anhalt	Yasmin Dannath: Report: Pflanzenreste – Hundisburg Obetal 13112
SC Social inequality	Anthropological archaeology, archaeobotany (macroremains, charcoal)	Social Inequality and Violence in Hunter-Gatherer Communities of Western Siberia	Henny Piezonka, Tanja Schreiber	2019/2020		Russia/Sibiria Kayukovo 1 and 2 Amnja 1 and 2	Yasmin Dannath: Report: Russland – Sibirien – Amnja 1 und Amnja 2 Großrest- und Holzkohlenanalyse
SC Hazards	Dendrochronology, wood identification	Archaeology in Oldenburg S-H, Milchdamm	Lisa Shindo, Walter Dörfler	2020-2022	Neolithic	Germany, S-H, Oldenburg	ongoing
SC Conflict	Soil DNA analysis, isotopes, archaeobotany (macroremains, charcoal, pollen)	Forest Finn Project	Jens Schneeweiß, Ben Krause-Kyora, Wiebke Kirleis, Eileen Eckmeier, Elena Ponomarenko	2021, continued	Medieval, Early modern times	Sweden, Norway	ongoing

New equipment: The CAU provided the Technical Platform with funding of 450,000 Euros for equipment purchases, as 26% of the budget was cut at the beginning of the term. Ten proposals from different subclusters were submitted and sent to the members of the TP for reviewing and comment. Seven purchases could be implemented (Tab. 2). This includes one table top electron microscope with an EDX device. The upgrade of the geomagnetic equipment and the set-up of the 3D-scanner are not yet completed but should be finalised in the second quarter of 2022. Additionally, a new metal-free tow bar for the existing geomagnetic device was constructed in 2020 to improve the measurements when used with a motorised vehicle.

Table 2: ROOTS Technical Platform, list of new devices in 2021-2022

Device	Subcluster-Platform	Field of application
Table top scanning electron microscope + EDX	Subcluster 2 – Diets; Kirleis; Botanical Platform	Food crust, tephra, botanical macroremains, ceramics, bones, metal, phytoliths, elemental composition
Upgrade geomagnetic equipment	Subcluster 5 – Inequality; Furholt; Technical Platform	Geophysical survey, archaeological prospection
Spectro XEPOS HE (XRF)	Subcluster 5 – Inequality; Furholt; Technical Platform	Elemental composition, provenience testing; ceramics, soil, bones
Automatic Keyence 3D-scanner	Subcluster 5 – Inequality; Furholt/Kneisel; Technical Platform	3D-reconstruction, geometric morphometrics, ceramics, bones, metal
ATR-FTIR spectroscopy	Subcluster 2 – Diets; Makarewicz; ASIL	Chemical composition of various materials, incl. bone, enamel, plants, sediments, etc.
High precision evaporator	Subcluster 2 – Diets; Makarewicz; ASIL	Analysis of oxygen and hydrogen isotopes of water samples
Direct push unit for HR downhole electric conductivity and soil colour measurements	Platform 1 – Technical Platform; Rabbel/Unkel	<i>In-situ</i> stratigraphy in wetland settings for palaeolandscape development and palaeohydrology
Geophysical borehole sensors and drilling equipment	Platform 1 – Technical Platform; Rabbel	Downhole magnetic, natural gamma ray and seismic sensors for geophysical ground truthing and stratigraphy
Coring Equipment, Lake coring supplements	Platform 1 – Technical Platform; Dörfler/Rabbel	Sampling of peat sequences, electric outboarder and boat equipment for palaeoecological analyses

Device Usage

The statistics for the usage of selected devices of the Technical Platform (Fig. 6) show – after the implementation of ROOTS in 2019 – a clear impact of the COVID situation in 2020 with a reduced degree of utilisation. For 2021 and as partly visible in the preliminary numbers for 2022, there is an increased use at present. One of the first results directly based on the use of the geomagnetic equipment is published by ROOTS member Jens Schneeweiß (2021).

In 2022, a new online calendar for the equipment of the Technical Platform together with the CRC 1266 and the UFG was prepared to have an up-to-date and transparent overview of the usage and availability of loanable devices as well as the computational hardware of the ROOTS-implemented Center for Interdisciplinary Data Science (CIDS).

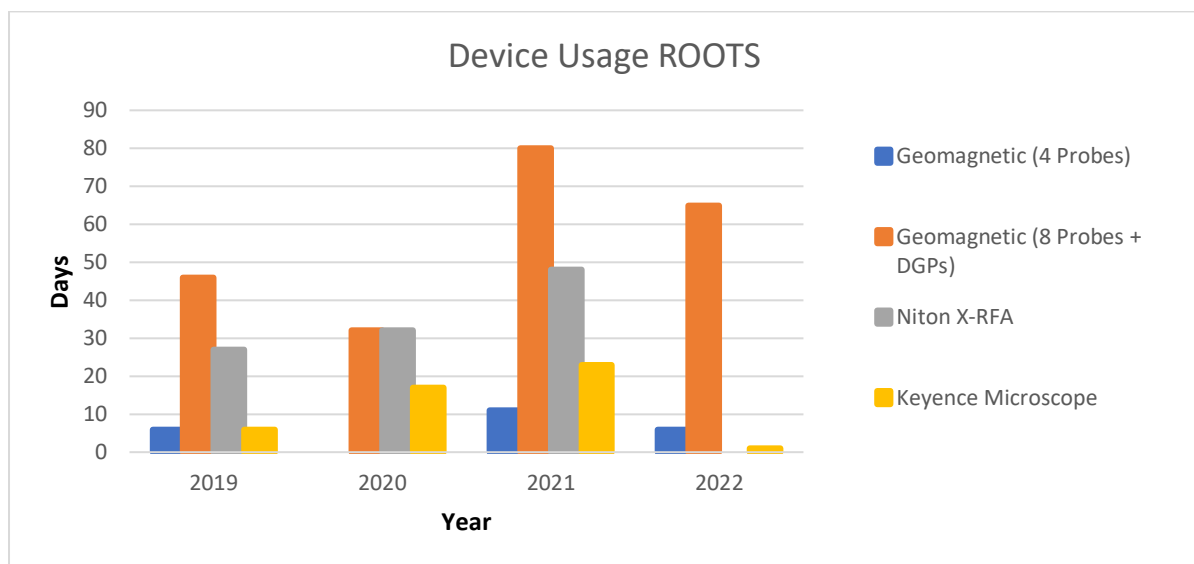


Figure 06: Usage of selected devices from 2019 to 2022. The numbers for the present year are preliminary and reflect the usage in the first quarter and the current entries in the new online calendar

Aims and plans for 2022 to 2025

The technical expertise bundled in the TP of ROOTS allows for a more intensive cooperation between the different laboratories. The current aim of the Technical Platform is to install and establish the newly acquired equipment (Tab. 2), establishing routines and access points so that other staff and potential users can be trained in the new devices. In order to demonstrate to the members of the “Young Academy” and beyond how to use the new technical equipment (e.g. geomagnetic devices, 3D-Scanner), various introductory courses are on the agenda. Basic manuals will be written in the form of hand-outs to facilitate and simplify the handling of the equipment. The first available hand-out

is for the 3D scanner. The new professor, Eileen Eckmeier (Institute for Ecosystem Research - Soil Geography, Geoarchaeology), who is also a member of the Technical Platform, considerably expands the range of laboratory equipment and experience and contributes to diverse application possibilities/areas within the TP and thus ROOTS.

Data management

The data management of the Cluster of Excellence ROOTS is organised within the frame of the CIDS that is equipped through the Technical Platform and maintained between the TP and the Humanities Platform (P 3), coordinated by Prof. Matthias Renz, Archaeoinformatics/DataScience. In addition, since May 2021, the implementation of a central data agglomeration hub has been prepared by Hartwig Bünning (ROOTS – Information Systems and Project Management) in cooperation with the CRC 1266. Preliminary projects on the integration of existing data have already begun as pilot studies and will be expanded in the future.

Contributions to ROOTS public outreach activities

As public outreach activities, the Botanical Platform presented archaeobotanical methods at the “Arche Warder” (Schleswig-Holstein) for a special “stone age-event” and at the “Nacht der Wissenschaften” in Preetz. Furthermore, the school laboratory “Archaeo:Lab” was opened in 2021 in the “Kieler Forschungswerkstatt” under the direction of Katrin Schöps. Here, Y. Dannath supports the archaeobotanical stations (macroremains, pollen). The Botanical Platform was also involved in the “Stone Age Mile” in Albersdorf (AÖZA, Archaeological Ecological Centre Albersdorf). In addition, the Botanical Platform accompanies and organises trainings at the AÖZA and jointly with the Communication Platform (Karin Schöps) at the “Kieler Forschungswerkstatt”. Experiments on Neolithic crop cultivation are carried out there with school groups. Wiebke Kirleis gave talks at the “Kinderuniversität Kiel” in 2019 and the “Night of the Profs” in 2021. Moreover, magnetic prospections will be published in one of the next issues of the AID. Furthermore, public lectures on the construction of a burial mound of the Early Bronze Age were held at various schools in Schleswig-Holstein in the frame of the Kiel University campaign “rent a scientist”.

3.3.2 Communication Platform

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Müller, Johannes	johannes.mueller@ufg.uni-kiel.de	Full member
Schöps, Katrin	schoeps@ipn.uni-kiel.de	Full member
Ricci, Andrea	aricci@roots.uni-kiel.de	Full member
Weinelt, Mara	mweinelt@roots.uni-kiel.de	Full member
Associated and exchange with further colleagues (e.g.)		
Kerig, Tim	tkerig@roots.uni-kiel.de	Teaching
Kirleis, Wiebke	wiebke.kirleis@ufg.uni-kiel.de	Archaeo:lab
Majchczack, Bente	bmajchczack@roots.uni-kiel.de	Expedition tollkit
Müller-Scheeßel, Nils	nils.mueller-scheessel@ufg.uni-kiel.de	Boas Talks
Schneeweiß, Jens	jschneeweiss@roots.uni-kiel.de	Archaeo:lab
and all full members		

Outreach aims and achievements

Kiel Science Factory: The archaeo:lab

Based on ROOTS research approaches, the archaeo:lab was developed to set up the first archaeology lab for school students, aiming at offering students insights into archaeological work beyond films like “Indiana Jones”. A teacher training workshop has been developed as well in order to accompany the student lab visit.

The lab opened in September 2021. Through excavations and experiments, school classes from grades five to seven discover how people lived in the Neolithic period. The program is comprised of different modules, all of which aim to convey the archaeological content to the students as well as to provide them with an understanding of scientific work. The students obtain an authentic insight into the field of archaeological research, which is often characterised by myths and adventures. For this purpose, an excavation field was set up in Kiel Science Factory and various archaeological finds were replicated in order to make everything as authentic as possible. During the visit to the archaeo:lab, the students work in small groups focussing on basic human needs: dwelling, food, social interaction and the environment in the Neolithic period. They analyse pollen samples under the microscope to get an idea of what the landscape looked like and to draw conclusions on the living conditions. As the first houses were built in the Neolithic period, a ground plan of such a house was printed to scale on a large tarpaulin. By means of discolorations,

posts, walls or even fireplaces can be recognised. By taking on the role of excavators, the students document the ground plan of the house and their findings. They draw the floor plan and discuss which part of the house had which function. How did people live back then? How was life different compared to today? Afterwards, the students take samples from a fireplace located in the excavation area of the Kiel science lab. They find charred food remains and pottery sherds. The food remains are separated from the sediment by slurring and sieving and are determined in the laboratory. Hence, conclusions can be drawn about the diet of people in the Neolithic period. Ceramic sherds are obtained by carefully sieving the sediment. From the pottery sherds, the students learn that it is possible to identify what kind of vessels were used by the people of Schleswig-Holstein during the Neolithic period. Using the patterns and shapes of the pottery, it is sometimes even possible to find out which regions carried out exchange with each other. At the end of the visit to the archaeo:lab, the class discusses its impressions of life in the Neolithic period.

Two extensions are planned for this program: one station will be developed on the subject of clothing, leading up to the Bronze Age, and the second station will implement the theme of “moving large stones”. The latter will focus on how megalithic tombs were built. It is also planned to develop a programme for older students with a focus on a different period (e.g. the Middle Ages or the present time) in cooperation with the history:lab of the Kiel Science Factory.

In cooperation with a teacher quality development project (LeaP_CAU), archaeological loan boxes for schools were developed with an accompanying handbook for teachers. The Communication Platform (ComPlat) continued work on this handbook and it should be ready for print by the end of 2022. Teacher training workshops will be prepared to accompany this activity.

To involve further young investigators from the Young Academy, a teaching program with three modules (museum and exhibition, school labs and videos) has been prepared. Unfortunately, this offer was finally cancelled after four trials due to the low number of participants.

Public Outreach

The Communication Platform took part in the Rent-a-Scientist campaign, for which some scientists created and presented a lesson in front of a school class at this year’s Kiel University Digital Night of the Sciences, as well as participating in lectures.

The ComPlat also participated in public events such as Kieler Uni Live and the celebration of Schleswig-Holstein. No further public events were carried out due to the pandemic in 2020 and 2021. The Kieler Uni Live will also not take place in 2022.

Furthermore, due to the pandemic, the annual conference of the European Association of Archaeologists was again held online in Kiel. The Communication Platform was instrumental in making films about archaeological monuments and sites from Schleswig-Holstein, which served as a substitute for field trips. For example, films were made about the UNESCO World Heritage Sites Haithabu and Danewerk, the archaeological excavations in the North Frisian Wadden Sea, megalithic graves and burial mounds from the Bronze Age as well as the work in the archaeo:lab of the Kiel Research Workshop. The film work with an external film agency will be continued and developed into an image film about ROOTS.

Based on existing tools, such as interactive touch tables or ceramic puzzles, toolkits for exhibitions at public events have been further developed. In corporation with other SC and the Reflective Turn, further outreach projects (e.g. a game-based learning and speed-dating approach) have also been submitted to the ROOTS interdisciplinary project program.

Via the ComPlat, ROOTS became a member of the network 'Megalithic Routes' (<https://megalithicroutes.eu/de/startseite/>). An associated PhD project on supporting excursions with a digital App (David Hoelscher, KiSOC) has been submitted and is currently under review.

Citizen Science program

Citizen Science programs show rising interest in the science communication area but are difficult to set up in archaeology due to administrative restrictions. To learn from other countries where community archaeology is more common, a workshop "Public participation in archaeological research: Opportunities and Limitations" was organised by the Communication Platform and took place on 7-8 June 2021. After a first digital meeting of the participants in November 2020, the workshop could again only take place digitally, so that the opportunities and limitations of Citizen Science in archaeology were discussed online. A total of 26 scientists took part in the workshop, with ten presentations from England, Denmark, the Netherlands, Austria and Germany. One of the issues discussed was how to increase public participation in research and not just in data collection. What impact would this have on research questions, research methods and practical cooperation in field research? Especially in countries like England and Denmark, projects increasingly involve citizens from the beginning. The basic approach of "wellbeing" or "well-being" is now the key concept in discussions about prosperity and sustainable

development of people and societies and it is implemented as a concept in Citizen Science projects. Archaeology can also serve as a tool to create a sense of trust between lay people and experts.

In 2022, the Communication Platform will implement the new knowledge about Citizen Science projects with a project of its own. In cooperation with Dr Carenza Lewis of the University of Lincoln (**a visiting scientist of ROOTS), up to 40 Test Pit Excavations (TPE) will be excavated over two weekends in May and June 2022. In small teams, community members will excavate these under archaeological guidance. As all the pits are of the same size and follow the same methodology, they offer the same opportunities to different people in different places, and both social and archaeological data can be directly compared. The participatory approach and specific features of the TPE integrate lay and expert knowledge and support from the implementation of the excavation to the research of the results.

Site considerations for the project quickly resulted in the village of Schenefeld, District Steinburg, where initial site inspections and meetings with a local collector and mayor had already taken place. After intensive archival research on sites and excavations, it became apparent that Schenefeld represents one of the settlements with the longest continuity in Schleswig-Holstein. During the research, gaps in the settlement history became apparent, which we are trying to close with our project, among other things. The project is accompanied by staff from the Leibniz Institute for Science and Mathematics Education (IPN) so that the social aspects can be investigated as well as the historical development of the site through evaluations.

In cooperation with further Citizen Science projects at the Kieler Forschungswerkstatt, a paper for the ROOTS booklet on 'Waste' has been submitted.

Structural aims and achievements

In 2020, several internal workshops took place on the platform's goals and aims. The aim of the meetings was the development of a strategic concept for the Communication Platform. For this purpose, the goals of ROOTS and the recommendations of the Advisory Board were compared with the goals of the Communication Platform and connections and commonalities were noted and agreed upon resulting in tasks and projects suitable for the strategic concept.

To implement ROOTS and archaeology outreach measures into educational programs on a long-term basis, the archaeo:lab has been implemented in the conceptual program of the Kieler Forschungswerkstatt, addressing school students as well as (future) teachers.

The network of school student research centres (SFZ-SH) has been involved as well in order to explore how community archaeology might become a program at different schools in the future. This, however, has to take the administrative hurdles into consideration.

At Schloss Gottorf, the ComPlat program has made further progress in implementing projects for Citizen Science and public outreach. Through the workshop "Citizen Science in Archaeology", cooperation between other European institutes have been made. The close collaboration with Prof. Carenza Lewis of Lincoln University in England finally resulted in inviting her to Schleswig and Kiel as a JMA chair in 2022, which had been postponed several times due to the pandemic.

Additionally, the Citizen Science Project has led to further intensive cooperation with the State Archaeological Office.

Aims and plans for 2022 to 2025

To raise awareness among students with regard to future outreach and education activities, the approach "Aus der Forschung in die Bildung" as an interdisciplinary teaching module for teacher trainee and subject matter students shall be adapted and also tested for the fields of archaeology and historical sciences.

ROOTS and ROOTS associated conferences, such as "Boas Talks" or the "Urban Design" conference, shall be analysed with regard to outreach into public opportunities, such as social media journeys or design thinking activities for students.

The archaeo:lab and the Citizen Science programs will be continued.

However, due to changes in staff (retirement of Claus von Carnap and Walter Dörfler), the ComPlat has to negotiate future activities in 2022 and 2023.

**Communication Platform / Table 1:
A) List of finished and ongoing Platform projects**

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
KiFo		archaeo:lab	Katrin Schöps, Walter Dörfler	2019-ongoing	Neolithic, Bronze age and later periods	Schleswig-Holstein		Programs for school students, accompanying materials and training for teachers
Schenefeld gräbt aus	ComPlat	Public Outreach	Claus von Carnap-Bornheim, Ilka Rau, Katrin Schöps	2021-2022	8 c. - 19 th c.	Schenefeld, SH		Conceptual framework for Community Citizen Science archaeology in Germany
EAA Films		Public Outreach / conference	Angelika Hoffmann, Katrin Schöps, Walter Dörfler, Ilka Rau	06/2022-09/2022	-	Schleswig-Holstein		4 movies for conference
Image film	All subclusters	Public outreach	Andrea Ricci, Sebastian Schultrich, (Ilka Rau, Katrin Schöps)					Image film
Geomagnetic Wadden Sea exhibit			Walter Dörfler, Bente Majchrzak					Exhibition tool
Activities at events	Communication Platform	Public Outreach	Katrin Schöps, Walter Dörfler, Ilka Rau				Kieler Woche, Landesgeburtstag	

Project ID	Subcluster focus (as in proposal)	Project (title /type)	Participants:	Start and anticipated project end	Temporal frame	Regional frame	Keywords	Deliverables
A								
Rent-a-Scientist, CAU European Research Night			Ilka Rau, Jens Schneeweiß, Bente Majchczack, Katrin Schöps	09/2019 09/2021 und 09/2022				
Social Media	All subclusters		Andrea Ricci					
Podcast Exzellenz-cluster	All subclusters		Andrea Ricci					
PhD Teaching: Communication Platform program and Reflection of YA teaching program	PhD students		Claus von Carnap-Bornheim, Ilka Parchmann, Katrin Schöps, Ilka Rau, Ilka Parchmann	Arranged four times but finally cancelled due to low number of participants				Intermediate reflection of Young Academy teaching structure

JMA Chairs/Visiting Professors

Prof. Carezza Lewis, Lincoln University (June-August and October/November 2022)

Activities with international partners

Prof. Carezza Lewis, Lincoln University is participating the Citizen Science Project
"Schenefeld gräbt aus"

Workshops/conferences

Workshop "Public participation in archaeological research: Opportunities and Limitations"
organised by the Communication Platform 7-8 June 2021, after a first digital meeting of
the participants in November 2020.

3.3.3 Humanities Platform

Principal Investigators/Members/PhD members/Associate Members

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Nakoinz, Oliver	oliver.nakoinz@ufg.uni-kiel.de	PI
Kücükkaraca, Eileen	ekaraca@roots.uni-kiel.de	Full member
Müller-Scheeßel, Nils	nils.mueller-scheessel@ufg.uni-kiel.de	Speaker
Peterson, John	jpeterson@isfas.uni-kiel.de	PI, Co-Speaker
Piezonka, Henny	hpiezonka@ufg.uni-kiel.de	Full member
Renz, Matthias	mr@informatik.uni-kiel.de	Full member
Rinne, Christoph	crinne@ufg.uni-kiel.de	PI

Structural aims and achievements

As stated in the ROOTS proposal, “The Humanities Platform is intended as an instrument to make data openly available for the cultural-historical interpretation of the human-environmental interactions, which is one of the core concerns of ROOTS. [...] the platform is structured into three main pillars: 1) Research Data and Information Organisation; 2) Languages; 3) Library Infrastructure.” To achieve these aims, the members of the Humanities Platform have launched two main projects.

The first project, headed by the newly appointed Professor for Archaeoinformatics, Matthias Renz, is the “Center for Interdisciplinary Data Science” (CIDS). It aims at providing a hub for the collection, processing and dissemination of the digital data inventories generated by ROOTS members.

Activities CIDS 2020-2022

While initial thoughts about the Center for Interdisciplinary Data Science emerged earlier, ideas and activities became more concrete from the end of 2020. At the end of 2020, the goals and design ideas of the CIDS were presented during a ROOTS event. In the transition 2020/2021, new hardware was purchased within the budget to renew and expand the equipment of the CIDS room (LS1 - R. 205). This includes, among other things:

- two powerful workstations with software for 3D and graphics processing as well as for use in computationally intensive tasks
- 1x iMac, 2x Graphic Tablets
- 1x mobile 86" touch screen (Legamaster-8620) with conference system

- 1x VR headset
- 1x powerful server for use with virtual machines (approx. 5-10, also via remote)

In 2021 and 2022, the room was used, with noticeable restrictions due to the pandemic, for teaching events (Oliver Nakoinz, Jutta Kneisel, among others) and as a room for group meetings (ISAAK, Landman Project Core Team).

Also in 2021, a domain for CIDS was reserved (<https://www.cids.uni-kiel.de/de>) and the creation of a landing page is in preparation.

As the CIDS has no staff of its own, no activities in project coordination, research and teaching can be assigned to the CIDS per se. Rather, the CIDS is currently a platform that links competences in archaeology/archaeoinformatics (Christoph Rinne, Oliver Nakoinz, Hendrik Raese), data science/computer science (Matthias Renz, Steffen Strohm), project management and information systems (Hartwig Bünning), IT (Hendrik Raese, Philipp Kropp), modelling (Ulrike Loeptin, Heiner Dietze) and other people and their competences on the basis of regular exchanges (approx. two meetings per month). The meetings also serve to exchange information about requests and the corresponding planning and distribution of appropriate responses. For their part, the participants are active in various projects within the framework of ROOTS, SFB 1266 and other collaborations at the respective institutes.

In addition to CIDS activities, various project work also took place using the student assistant funds provided. The contingent of student assistant positions (2021/2022 filled by 4 persons (1)-(4)) was and is being used for integration and implementation tasks within the framework of the Radon (2021+2022), BigExchange and Interlinking Exchange (2021+2022) and NoNeK (2021+2022) projects, as well as in the further development of the Landman integration portal and its database. To the best of our knowledge, no student assistants were used in this context before 2021.

Radon (1)

Here, data sets from the comparatively large C14 databases RadoN and RadoN-B and a smaller dataset (B. Schulz-Paulsson) are brought together. The student assistant was involved in the creation of a common schema, the database structure based on the possibilities of the LandmanDB and the corresponding scripts for inserting the data. The process has also involved cleaning since the beginning, which is very time-consuming (standardisation of entries, detection of duplicates).

Project reference: Linking the RadoN databases (domain experts involved in the actual work: Franziska Engelbogen, Jutta Kneisel, Christoph Rinne).

Big Exchange (1)

Within the framework of this project, finds of various materials (Atlantic mussels, *Spondylus*, div. *Variscite*, Lapis Lazuli, oxhide ingots and others) in the Eurasian region with a temporal range from about 5500 BCE to 600 BCE are integrated. The student assistant is involved in data sifting, merging, database structure and insertion scripts, similar to Radon insertion scripts. Data collection is still ongoing.

Project reference: Big Exchange or Interlinking Exchange (domain experts involved in the actual student assistant work include Johanna Hilpert and Tim Kerig).

Climate model data (1)

In addition, model data from four climate models (provided by Ulrike Loeptien and Heiner Dietze) were taken up and the overall scheme extended accordingly with the aim of also linking these with the data sets and other data mentioned here.

Project reference: Indicators Project Group (SFB 1266 Retreat Project led by Franziska Engelbogen and Oliver Nakoinz)

NeoBzHouses (2)

In this project, house data originally collected with differing research foci and correspondingly different content and technical representations is integrated in 9 databases. The student assistant was present at all coordination meetings with data donors and was entrusted with the task of coordinating a common overall schema (mediated schema) of the house data, developing and documenting schema mappings and creating appropriate insertion scripts for the data along the new schema. The latter could not be completed by the end of the contract.

Project reference: Linking of the house databases (domain experts involved: Christoph Rinne, Giacomo Bilotti, Hendrik Raese, Jan-Piet Brozio, Jutta Kneisel, Magdalena Schmid, Nils Müller-Scheessel, Ralph Großmann, Tim Kerig)

NoNeK (3)

This project aims to make the NoNeK dataset available online, to use the opportunity to revise the NoNeK systematics and to create a software component that includes a suggestion system to classify sherds or to assist users in the classification of patterns found. For the training of this suggestion system, labelled training data is required. Since 1.11.21, the student assistant labels sherd images in such a way that it can be used as a webapp with extremely limited user control to implement the process of labelling via

crowdsourcing. In 2022, the focus will be on hosting the modified software and actual labelling.

Project reference: Reforming the NoNeK system and setting up a software support system for pattern recognition on ceramic sherds (participating domain experts include Moritz Mennenga, Doris Mischka, Lisa Nydahl, Hendrik Raese, Sophie C. Schmidt)

Implementation (Frontend) Landman (4)

Since the beginning of 2022, the further development of the data integration platform Landman has become a higher priority. The focus of the work is the review of the previous implementation and the associated problems (legacy code, obsolete components) and the development of a frontend on the Landman portal website that can be used by non-computer scientists.

Project reference: Creation of an information system for the integration, analysis and presentation of archaeological databases (Landman).

The second project focusses on the re-launch of the well-known interdisciplinary journal "Ethnographisch-archaeologische Zeitschrift" (EAZ). The EAZ will provide a novel, transdisciplinary, pluralist and international forum for these debates that is grounded in its long-standing history as a cross-field medium. It will integrate a multitude of approaches and thought styles from diverse scientific and Indigenous/descendent backgrounds. Founded in 1953 in Berlin, the EAZ has a unique background in integrating pre- and protohistoric archaeology, and social, cultural, and physical anthropology that stands in the tradition of the respective interdisciplinary approach launched in Germany in the mid-19th century. The re-launch of the EAZ at Kiel University as part of ROOTS will establish the journal as a forum for integrated transdisciplinary approaches to the study of humans and their worlds within dynamic socio-cultural and environmental settings, with a decidedly long-term and global scope. The journal will be dedicated to research and scientific communication at the interface of pre- and protohistory, historical and contemporary archaeology, ethnography, social and cultural anthropology, and philosophical reflection, in particular focussing on social, environmental and cultural connectivity. By bridging these disciplines and by overcoming their methodological and epistemological limits and boundaries, a deeper understanding of potential realities and complexities of past human life ways both in ancient and contemporary contexts can be reached. Apart from cross-cultural comparative and analogous reasoning and its critical reflection, relevant fields include multi-species approaches, the critical consideration of scientific colonialism and ethnocentrism, multi-vocality in study design and data interpretation, cultural heritage issues, community-based approaches, and ethical

questions concerning the integration of Indigenous knowledge, ethnographic work and archaeology.

In accordance with our philosophy of accounting for multivocal understandings of past and present, the authors are free to publish in any language of their choice in which they feel their ideas and findings can be best expressed in text form. This will also be reflected in the journal title which, in addition to the historical German one, will be complemented in each issue by translations of the title in changing languages.

The editorial workflow of the EAZ rests on two pillars: Open Journal Systems (OJS) and Fidus Writer (FW), both of which are Open Source and thus community-based efforts to provide editorial software solutions free-of-charge. OJS serves as the backbone of the workflow, provides tools for the communication between editors, authors and reviewers and integrates a web-server to publish the content of the EAZ free-of-charge. FW, on the other hand, provides a writing and commenting environment which is tightly connected to OJS. Thus, it enables a smooth reviewing process, and, in the end, the automatic production of the finished paper with as little human input as possible.

OJS and FW are already running on servers hosted by the Computing Centre of Kiel University, thus securing the long-term availability of the EAZ. The Cluster of Excellence ROOTS provides funding for the further development of special needs of the EAZ as, for example, an interface for bulk translation of papers in other languages than English. The print-on-demand of paper copies of the EAZ will be organised in connection to the newly founded Kiel University Press.

Thus, the EAZ ideally reflects the other two pillars of the Humanities Platform, Languages and Library services. The Humanities Platform has been funding a 50% editorial position (Anastasia Khramtsova) along with a student assistant since May 2021.

In preparation of the re-launch of the EAZ, the international conference “Boas Talks” was organised in November 2021 (see below).

In addition to the activities mentioned above, Eileen Küçükkaraca, funded full-time by the Humanities Platform, provided services to ROOTS in editing, translating and copy-editing.

Aims and plans for 2022 to 2025

It is planned to continue work on the CIDS, on the one hand, and, on the other hand, to establish the EAZ as a leading interdisciplinary journal in the intersection of social anthropology, philosophy and critical science.

The excursion “Boas Walks” organised by students during the conference “Boas Talks” will be published as a ROOTS booklet in 2022, with Henny Piezonka and Nils Müller-Scheeßel as editors. It is further planned in cooperation with the Communication Platform and the city of Kiel to make the excursion available as an app.

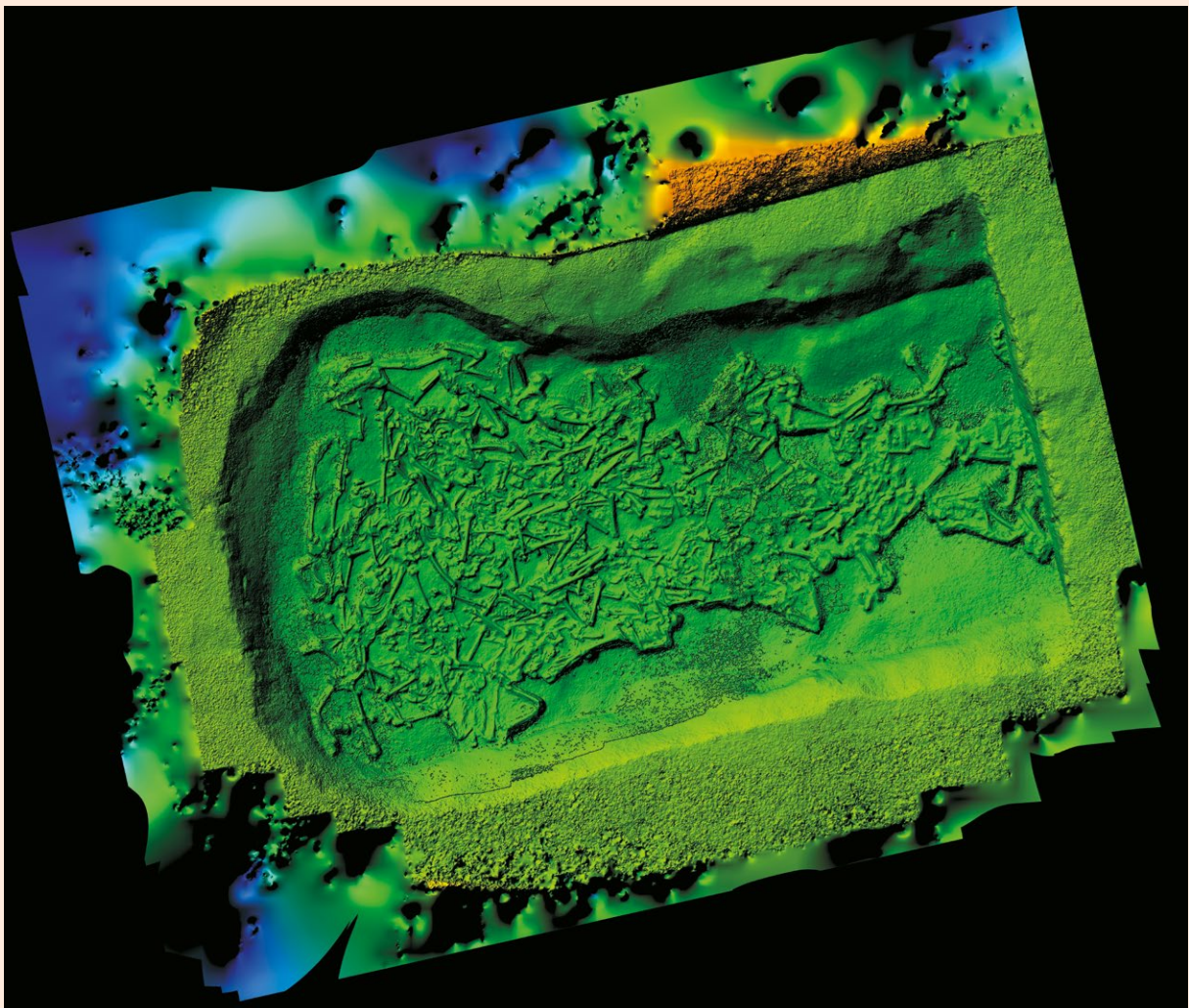
Workshops/conferences (including workshop and conference sessions organised abroad)

From 18-21 November 2021, the scientific colloquium “Boas Talks” took place in Kiel, organised by Henny Piezonka, Jens Schneeweiß, Vesa Arponen, Maria Wunderlich and Nils Müller-Scheeßel. It commemorated the 140th anniversary of Franz Boas’ doctorate at Kiel University and aimed at raising awareness for the planned re-launch of the EAZ, at attracting a collection of high-quality papers as a head start of the EAZ as well as finding appropriate board members for the EAZ. The conference was funded by ROOTS after a proposal in 2020.

Being held in hybrid format, eleven speakers participated in person, while seven delivered their talks online. The 18 speakers came from ten countries (Ethiopia, Australia, Canada, Germany, India, Italy, Norway, Russia, Sweden, USA) and paid their tribute to Franz Boas by fascinating talks covering the whole spectrum of the research and activities of Boas. The first papers have already been submitted for the first issue of the re-launched EAZ and are now in the review process.



The home of the thundering mountain gods of Southwestern Asia: Thunderstorms over the Zagros Mountains in the Kurdish autonomous region, Northern Iraq (photo: Greta Rettler).



Elevation model of a mass deposition of human skeletons in a Neolithic ditch near the town of Vráble, Slovakia. Almost all individuals are headless (photo: Till Kühl).

4 Young Academy

The ROOTS Young Academy (YA) is a core structure of the Johanna Mestorf Academy to fully integrate and support early-career researchers within the broad interdisciplinary frame of ROOTS in a highly stimulating research environment. The YA is designed as an open academic centre for interdisciplinary training and exchange among researchers and all ROOTS members. The YA continues and extends concepts of the Graduate School ‘Human Development in Landscapes’ (GSHDL 2007-2018). Aims of the YA include the education of independent young researchers in the interdisciplinary field of ROOTS, the empowerment of the young researchers to a successful career, and the development of new research profiles into novel interdisciplinary fields in particular.

Since ROOTS’ start in 2019, the YA has attracted a community of excellent young researchers, both on the doctoral and on the postdoctoral levels (see Table). Candidates are selected through a selection committee of ROOTS PIs representing the breadth of the ROOTS Cluster. Currently, the YA assembles 20 ROOTS PhD members, plus an additional five candidates who started their PhDs in the GSHDL and are approaching the end of their PhD phase. Moreover, a varying number of associated PhD members, that is PhD candidates working in other projects of ROOTS PIs, temporarily join the YA. PhD members are provided with 3.5-year contracts, which will be extended by three months to compensate for COVID-19 induced delays. It is therefore expected that the first PhDs will be completed by young ROOTS members from spring 2023 onwards. A second cohort is to start shortly (July 22). The selection process has been changed and now involves the ROOTS Advisory board to guarantee external and international expertise.

Seven long-term positions of 6-year duration have been provided for research associates affiliated to ROOTS subclusters (SC) and the Reflective Turn Forum. In addition, an array of shorter-term postdoctoral positions is provided in the form of research projects, namely in the frame of interdisciplinary projects, as well as in the frame of SC projects.

Doctoral Students		
Name	Supervisor	Former affiliation of the PhDs
Alinezhad, Khadijeh	Kirleis, Wiebke Weinelt Mara	Urmia University, Iran
Andersen, Anna-Theres	Schneeweiss, Jens	Kiel University
Bellini, Ginevra	Erfmeier, Alexandra Stukenbrock, Eva H.	Université de Poitiers (France), Universidade Federal do Rio Grande do Sul (Brazil)
Bockmeyer, Sarah	Furholt, Martin Müller, Johannes	University of Manchester (UK) University of Münster
Boelcke, Sascha	Klinkott, Helmar Feuer, Stefan	Kiel University
Brandt, Henriette	Makarewicz, Cheryl Furholt, Martin	University of Oslo (Norway)

Breitenfeld, Bastian	Piezonka, Henny Nakoinz, Oiver	Kiel University
Claaßen, Benjamin	Stukenbrock, Eva H.	Kiel University
Fiori, Stefania	Ricci, Andrea	Kiel University
Grund, Max	Schwedler, Gerald Müller, Ulrich	SFU Jena
Hillmann, Laurenz	Nakoinz, Oliver	Kiel University
Hinrichs, Moiken	Eriksen, Berit Valentin Furholt, Martin	Kiel University
Jäcker, Marie	Schwedler, Gerald	Kiel University
Jonjic, Darja	Nübler, Norbert Wichmann, Sören	Kiel University
Khan, Ariba Hidayet	Peterson, John	University of Dehli, India
Krause, Anne	Schwab, Andreas	University of Hamburg
Kurgaeva, Anastasiia	Eckmeier, Eileen	University of Tyumen (Russia)
Loy, Anna	Nakoinz, Oliver Eckmeier, Eileen	Free University Berlin
Müller-Liedtke, Catharina	Dahm, Margit Schwedler, Gerald	Kiel University
Mura, Sara	Haug, Annette	Amsterdam School for Heritage, Memory and Material Culture, Netherlands
Ricci, Gianluca	Schwab, Andreas	University of Göttingen
Saleem, Khurram	Kienle, Lorenz von Carnap-Bornheim, Claus	Kiel University
Schreiber, Tanja	Piezonka, Henny Kerig, Tim	Kiel University
Schwake, Florian	Kreuz, Patric-Alexander	University of Hamburg
Serbe, Benjamin	Müller, Johannes Kneisel, Jutta	Kiel University
Skorna, Henry	Müller, Johannes	Römisch-Germanische Kommission des DAI, Germany
Sliesariiev, Yevhenii	Müller, Johannes Kerig, Tim	Kyiv University
Walker-Friedrichs, Fiona	Eriksen, Berit	Durham University, UK
Wilkes, Fynn	Müller, Johannes Kerig, Tim	Kiel University, Germany
Windle, Morgan	Piezonke, Henny Schmölke, Ulrich	University of Sheffield, UK
Varkuleviciute, Karolina	Makarewicz, Cheryl	Oxford University, UK
Zentgraf, Dana	Ott, Konrad	Kiel University
Zerzeropulos, Katharina	Nakoinz, Oliver	University of Cologne
Postdoctoral Researcher		
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Former Doctoral students / Postdoctoral Researchers / Alumni		
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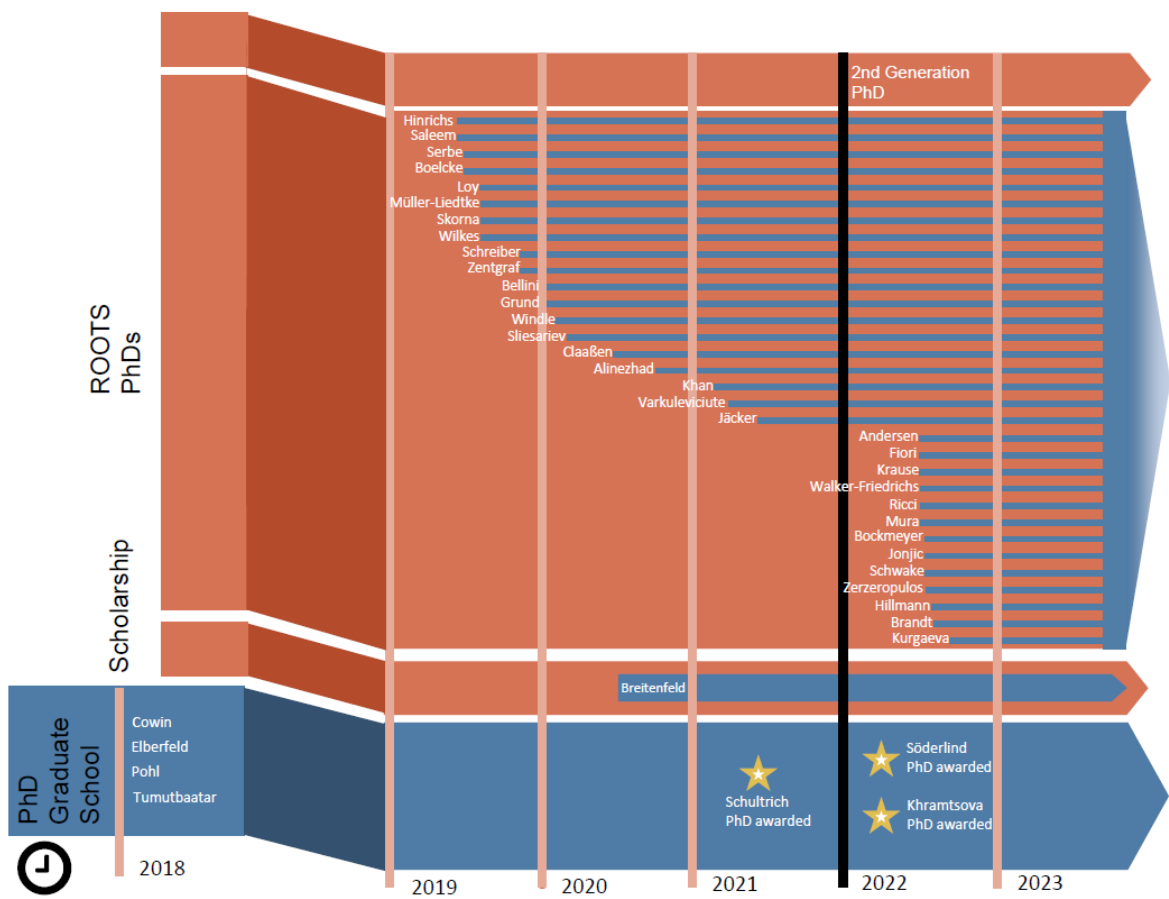


Fig. 07. Timelines of PhD projects in ROOTS 1st phase.

4.1 Teaching Concepts

4.1.1 Future Teaching, subject to decision by the ROOTS panel

The YA organises teaching and further training at all qualification-levels in ROOTS. During the current phase, a reorganisation of YA teaching became necessary which will start as soon as the new cohort of PhD candidates has arrived. The actual subject-specific training is in the hands of the respective supervisors and is not part of this programme. The teaching strategies proposed here have been jointly developed with individual ROOTS members from all qualification levels and agreed upon by their representatives.

Learning objectives and unique position of YA training: As an interdisciplinary and staff-strong project, ROOTS can offer specific features of doctoral training that cannot be found outside of structured programmes and hardly in programmes which have other foci. In addition to the specific composition of the subjects and persons involved, this applies, in particular, to the pronounced breadth of the disciplines involved and the diversity of approaches represented by the individual members of ROOTS. Another characteristic is the ever-present reference to current challenges, which should allow new application possibilities, research fields and career paths to be developed. The learning objectives are therefore defined to promote the abilities 1) to communicate appropriately in interdisciplinary and transdisciplinary contexts, 2) to work together in different roles, including leading positions, 3) to act appropriately and effectively in research institutions and networks, 4) to relate one's own work to the work of others, 5) to assess and develop one's own academic work as well as the work of others with regard to social, economic and political, thus societal needs.

Implementation of teaching: Teaching is to be centred on a joint project with a clearly defined product. For example, a ROOTS booklet on a cross-cutting issue is suggested as such an outcome (centred around issues, e.g. "war and climate", "kinship and resilience", etc.). The organisation of the actual work should be done by the PhD candidates themselves. The new cohort should identify a relevant topic and invite the teaching personnel. Inviting a certain proportion of ROOTS PIs is mandatory (at least 80%). Teaching should mainly take the form of a discussion between the group and the invited teaching person. The teachers' as well as the PhD candidates' work-load should roughly equal the work-load of the previous teaching units. Each booklet contribution should be written by an interdisciplinary team of PhD candidates (2 to 3 candidates each). Each PhD candidate is expected to lead one paper. After finishing the first draft of the contributions, the group has to convince the series' editors of the quality and the relevance of the contributions. The candidates will be supported in this process by the YA. The group of

PhD candidates will conduct a blind peer review themselves, supplemented by reviewers unknown to them from outside the group and with the help of the OJS platform (e.g. www.offa-journal.org). The success of such teaching depends on a clearly agreed timetable and defined intermediate outcomes. The successful publication of three papers is intended to serve as an incentive. The individual stages of this process will be certified for each PhD candidate by the YA when leaving ROOTS, in accordance with the procedures already in place.

4.2 PhD Projects

Daria Alfimova:

Quantitative Methods in Areal Linguistics: the Circum-Baltic Area

In the first part of my research project, I consider object marking strategies in Western Eurasio, primarily focusing on the Circum-Baltic (CB) languages. Object marking strategy is how the object of a certain verb is marked in a language. For instance, the English verb *to wait* employs the preposition *for* to mark its object (i.e. the one who is being waited for) whereas German verb *warten* 'to wait' marks the object with the preposition *auf* 'on' and the dative case.

The ways in which verbs and object marking strategies may be borrowed have recently enjoyed much attention. In addition, a number of notable typological projects on the areal distribution of argument marking strategies emerged, for example, the database of valency patterns ValPal, a project on semantic role clustering, the World Atlas of Transitivity Pairs, a database of bivalent verbs and their encoding frames BivalTyp and a database of Slavic argument flagging.

I argue that the pattern of dis(similarities)in object marking strategies are non-random and reflect complex language relations, including genealogy and/or language contact. They will expand our knowledge of language interference which, in its turn, will clarify the picture of social interactions in Western Eurasia and, more specifically, in the CB area. The latter is a linguistic area (or Sprachbund) in which certain linguistic traits are shared not only by adjacent languages but also by non-adjacent languages across the area. Object marking strategies of diverse predicates have never been consistently compared in and outside the area. The aim of my study is to fill this gap.

Khadijeh Alinezhad:

Identification of Hazards in Paleoenvironmental Archives with High Temporal Resolution in the Context of Societal Change; Case Study of Brandenburg (in the Late Antique Migration Period and the Bronze Age)

Archaeologically, the hazard definition is rooted in potential sources of threat to human-environment relationships. These relationships have been affected through history by a variety of hazards, resulting from natural disasters, volcanic eruptions, earthquakes, fires, floods, landslides, frost and drought, storms, and snowfalls. There is a consensus that disasters occur when raised hazards of them coincide with existing vulnerabilities. This means that the response of the affected communities is more significant than the natural characteristics of a disaster. Societies that are resilient could reduce the hazards of disasters and rebound to their starting point or even a better point.

On the contrary, vulnerable societies could have been confronted with environmental, societal, agricultural, and political turbulence and in result lose their power (e.g. the collapse of the Roman and the Eastern Turkey Empires). Volcanic eruptions are one of these natural disasters that have raised environmental hazards which have frequently impacted the human-environment relationship in prehistoric and historic times. Numerous paleoclimatic data derived from denrochronological records is consistent in that the first half of the 1st millennium CE represents a tumultuous time of environmental, societal, agricultural, and political turbulence and at least three large volcanic eruptions occurred in CE 536, CE 540, and CE 547, which had profound effects upon socio-environmental connections in the northern hemisphere. This cluster of volcanic eruptions injected a great deal of aerosol into the stratosphere that diminished the temperature by blocking solar radiation. Of course, the point should not be ignored that, depending on the extent of a particular eruption, its atmospheric/climate impacts can be of regional or even pan-regional scale even extending to hemispheric and global effects of the very largest eruptions or sequences of eruptions. The following post-eruption cooling, which also is termed Late Antique Little Ice Age (LALIA), provoked drought, famine, episodes of epidemic disease, the rise and fall of civilizations, and widespread social disruption across the northern hemisphere from CE 536 to CE ~660.

This period (LALIA) overlaps with the so-called Dark Ages Cold Period (DACP). A review of 114 paleoclimate papers indicates that cold climates were common in the northern hemisphere between CE 400 and 765, and as a result they apply the term DACP to this period. In order to differentiate the LALIC from the DACP, a rich network of both climate and environmental data is required to describe the human-environment interactions during the Late Antique Migration period (LAM). This cooling caused vast population

movements (demographic translocation) from the Mediterranean regions toward Europe during this period which is called the Late Antique Migration period (LAM). In Scandinavia, some researchers suggest that this anomalous phase can be considered as an additional environmental factor contributing to the appearance and spread of the Justinian plague, the transformation of the Eastern Roman Empire, the collapse of the Sasanian Empire, the movement of peoples out of the Asian steppe and the Arabian Peninsula, the spread of Slavic-speaking peoples, as well as the political upheavals in China.

Ginevra Bellini:

Testing the Neolithic Plant Invasion Hypothesis

Humans have introduced animal and plant species in different regions of the world for millennia. Some of these introduced species can pose an economic or environmental challenge and are therefore defined as **invasive**. In an **agro-pastoral context**, invasive weeds can decrease crop yield, reduce free space but also cause changes in the community composition and disruptions in biotic interactions. From an ecosystem service perspective, it is thus evident that plant invasions are an issue worth investigating. Management techniques for the eradication of invasive weeds are numerous and often successful, but preventing the introduction of such species altogether would be a more cost-effective and environmentally-desirable strategy. To do so, it is necessary to know **which species will become invasive** once introduced in a new habitat. Despite many efforts, to date, there is no answer to this question. A successful establishment is context-dependent and influenced both by the non-native **species' traits and** by the **environment** it is introduced to.

In this regard, several authors have emphasised that **European grassland plants** are particularly successful at invading temperate managed grasslands around the world. In 2018, MacDougall *et al.* proposed the **Neolithic Plant Invasion Hypothesis** (NPIH), which postulates that this preponderance of European species amongst grassland invaders is due to the worldwide introduction (starting from the 16th century) of both European agro-pastoralism and plant species with a millennial history of adaptation to management and disturbance. Such practices started developing in Central Europe around 5500 BCE with the introduction of cultivation techniques, domesticated animals, and crop species from Western Asia - and their associated weeds. Some of these plant species are now naturalised in Europe and known as Archaeophytes. Since Europeans started travelling to distant regions and continents (>1492 CE), over the centuries they brought back many other plant species to the "Old World" (Neophytes), some intended (e.g. ornamentals) and some accidental (e.g. pasture weeds). Many of these plants came from regions that were not subject to farming as consistently or as long as in Europe (e.g. the Pampa region in

South America and the Australian continent). Therefore, one can assume that the grassland plant species of such regions were naïve to intense agropastoralism (crops rotation, livestock fencing, etc.) until European colonisers arrive and started transforming the landscape more intensively., also introducing – intentionally or not – many plant species.

In this PhD project, I aim at **disentangling the importance of pre-adaptation** (history of “exposure to agro-pastoralism”), **disturbance** (management type and intensity) and **competition** (neighbourhood identities and interactions) **in the process of managed grasslands invasion**. This will allow us to understand which species might become invasive in agropastoral contexts and thus provide insight into possible prevention/mitigation measures. While a few studies have implemented a **multispecies approach** to compare traits of invasive and non-invasive plants, none of them have compared the response to agropastoral disturbance of plant groups differing in their histories of co-evolution with such practice. I will implement a multi-species approach selecting plants with a “very long” (Archaeophytes to Europe), “long” (European natives) and “short” (Neophytes to Europe) history of co-existence with grassland management practices and test whether their response to such disturbances might be connected to their invasive potential.

Sascha Boelcke:

The Cult of Asklepios as a Link between Research and Urban Development

The ancient healing cult of Asklepios (Aesculap(ius) in Latin) was established quite late in comparison to other Greek cults but developed in a fascinatingly fast manner and spread over the whole area of the Mediterranean Sea. The cult reached high levels of acceptance through all social classes due its simplicity regarding the sick patients: everyone was treated basically in the same way. But still, the question remains: How were the sanctuaries connected to cities and scholars in antiquity? It seems obvious that there is a very tight connection between cities and the sanctuaries and by giving it a deeper thought, it appears that the connection works on many different levels. One of these levels is of course research in ancient medicine (in libraries and other institutions), another is the development of both a city and a sanctuary as a unit and separated. Also, very important is the standing of the god, in this case Asklepios, within the city: in some places he is the most prominent figure, in other places he is just one of many.

Thus, many different scientific approaches merge to define the state of the art for this PhD project. First of all, there is the general research on the cult itself and its spread around the Mediterranean Sea. It started in the 19th century and is still ongoing, the most

recent works are from 2005 and 2016. Along the way, there were many smaller new views on the topic, who questioned the origin of the god and cult but had only little to no impact. A major breakthrough was reached in 1945 when the image of the healing god and his cult was reshaped, paving the way for several scholars originating in the fields of medicine and history of medicine. While there were not as many publications from those fields as from the fields of archaeology, philology, and history, the impact of Steger and Hart has to be mentioned. Also, an honourable mention has to be given to Schneider/Schneider (2018), although their impact remains to be explored.

The problem with all these publications is that they do not combine aspects from different fields very well. Their particular focus lies almost solely on the field that the scholar originates from. Thus, there are only a few (if any) hints to archaeological finds in the works of medical historian and vice versa. The impact of the cult itself on life in antiquity, in general, and on urban development in ancient times, in particular, is currently nowhere to be found. The development of urban growth, urban economies, and research and preservation of knowledge throughout the antiquity can only be retraced through publications by scholars of these particular fields and research interests.

In conclusion: The questions I put forth for the project were never asked and seldom mentioned. Several aspects were inspected in isolation from the others, e.g. only written sources or only archaeological finds. A combination of archaeological, epigraphical, numismatic and written sources has never been carried out before regarding the question of the impact of the cult on urban development and economic growth in ancient cities accompanied by a sanctuary of the healing god Asklepios. Thus, I can say that the state of research in this particular field is limited and my thesis will fill this gap by combining the existing facts in a new way to uncover the role of religion, the progress in ancient medicine, and the effects of medical research for urban development.

Bastian Breitenfeld:

Early Holocene Site Compositions in Inner Asia – an Eastern Mongolian Case Study

When considering the spread of important prehistoric innovations (e.g., pottery, polished stone tools, grinding stones, animal and plant domestication), Inner Asia is characterised by divergent adoptions and developments in particular environments, ecological niches and cultural interaction spheres. Evolutionary thought characterised hunter-gatherer research for a long time and still remains highly influential. Hunter-gatherer societies were largely seen as a uniform stage of human development, barely leaving space for

notions of diversity, variability and complexity before developing into sedentary agriculturalists.

Changes in subsistence strategies, technologies, social interaction and cultural material occur in variable contexts and particular situations and therefore cannot be explained by the western concept of Neolithisation. Mongolia's geographical location in the heart of Eurasia is of particular interest for the study of the development of human societies, because in contrast to many theoretical models, hunter-gatherers here did not develop into sedentary agricultural societies but seem to have adopted mixed economies based on animal husbandry. The spread of productive or intermediate mixed economies is poorly understood. Hunter-gatherer communities thus persisted until the advent of nomadic pastoralism at the brink of the Bronze Age. However, due to poor typochronological resolution, these developments are poorly understood and sites like Tamsagbulag underscore the possibility and complexity of divergent subsistence organisation. Based on this, a comparably recent summary of the Neolithic in Central Asia still suggests a culmination of hunter-gatherers in a productive agricultural subsistence mode, spanning multiple areas and is dependent on cross-cultural analogies with regards to functional interpretations. While in parts of northern China, the emergence and comparably rapid spread of sedentary societies began with the distribution of domesticated livestock (pigs) and plants (millet) during the Neolithic, contemporaneous groups in Mongolia were probably still largely engaged in non- or semi-sedentary foraging lifestyles. In southern Siberia, broadly investigated Neolithic societies are described as hunter-gatherers with developed mortuary customs and specialised subsistence economies (e.g. Cis and Transbaikalia). Although the Neolithic period in Inner Asia (ca. 8000 BP Inner Asia) is marked by the spread of new technologies (e.g. polished macro-tools, formal grinding tools, formal grinding stones and pottery) and the material suggests interaction across Mongolia, Inner Mongolia, northern China and southern Russia, recent studies highlight regionality in terms of subsistence economy.

A growing body of research has been concerned with the pre-pastoral communities, advancing pastoral communities, progressing from older research traditions by spatial modelling, climatic and environmental reconstructions, thereby considering the potentially significant role that environmental factors played in conjunction with cultural developments in past human communities and their decision making. Through the cooperative operative research of D. Odsuren and L. Janz, a novel periodisation scheme for Mongolia was established, deciphering some of the typological changes in the early and middle Holocene of the Gobi Desert based on the analysis of spatial patterns and schemes of functionality for habitation sites. The resulting so-called Oasis model reconfigured the diet-breadth model by dropping population pressure out of the

equation, which is commonly used to explain the emergence of productive economies not just in eastern Asia but worldwide. Multiple lines of evidence were used to reconstruct the prehistoric environmental and ecological context with the incorporation of many assumptions drawn from mostly human behavioural economy and optimal-foraging case models.

Benjamin Claaßen:

Genetic Variation in Ancestral Crops

The field of ancient deoxyribonucleic acid (aDNA) research has slowly established its place, not only in molecular biology, but also as a valuable tool in anthropological and archaeological studies. Despite its limitations and the difficulty of working with century old molecules, aDNA research overcame these burdens to increasingly contribute to the gain of knowledge in archaeology. Only recently, with the widespread availability of next generation nucleotide sequencing, it became possible to study the large and complex genomes of ancient plant cultivars. The studies of ancestral crop genomes open the possibility to study domestication and evolution of plants and make it possible to understand the origins of those cereal plants which have contributed to the advancements of humanity throughout history and can help us to reconstruct plant properties and cultivation methods in past societies.

The “Genetic variation in ancestral crops” research combines archaeobotanical methodology with modern molecular biology and genome sequencing to answer research questions regarding domestication and the evolutionary history of cereal crops, focusing on largely undescribed ancestral cultivars which drove agricultural development in Europe.

Despite a constantly growing field of aDNA research, the number of ancestral genomes of cereals that have been completely sequenced and reconstructed, so far remains small. Those include barley, and maize. To unravel the domestication processes of the most important historical crops in central Europe, *Triticum aestivum* (bread wheat) and *Secale cereale* (rye), and to explore the evolution of crop associated pathogens, the reconstruction of historic crop genome sequences is necessary.

Max Grund:

Small Town Economics in the late Middle Ages

European urban development had its most productive phase in the late Middle Ages. A driving force was the development of the entire economic system and above all, its trade

and credit relations. The urban economies as centres of these relations have been analysed for prominent cities with more than 7500 inhabitants. But research is lacking for urban economies in smaller cities with less than 2000 inhabitants which nevertheless were the majority of European cities.

Recent research has established solid results on the societal development that is represented by the economic differentiation and innovation of the financial system in bigger cities. A most evident indicator for economic development was the practice of loans, credits and rents in the later Middle Ages. Hans-Jörg Gilomen and Gabriela Signori have already studied credits in the late medieval Basel. Recently, Maria Weber published research on similar questions by investigating the city of Augsburg. Systematic approaches focussed on different financial actors, like townspeople, priests, peasants and churches, and on given and not given credits, loans and pensions in well documented and very big cities.

These studies are the starting point for my research. However, they were possible and done with the use of well-structured archives and material. I will pursue paths which were implemented in research just a few years ago by investigating these questions in light of smaller cities. Although there has been research in these smaller cities regarding law, settlement and culture, their economies have not been analysed yet. To bridge this gap, I will investigate the economical practices in small towns. To understand the few written sources that survived in small towns, it is important to understand their use and value for the contemporaries. With respect to the question of economy, my approach consists of a combination of content analysis and context analysis. I will examine the praxeology of written sources and the economical practices of different social formations in small towns. The most important question concerns the literary/bookish/writing strategies implemented to make economical interactions more secure. The question of the pragmatic use and the perception (trust/mistrust/ambivalence) of these books has never been questioned.

The ground-breaking nature of the project becomes evident in contrast to the existing works on city books. They were (theoretically) divided in different types (e.g. HOMEYER 1861, BEYERLE 1910), some of them were used for information concerning the histories of the different cities. A small number was investigated with respect to the language content (e.g. PROTZE 2008). However, the use (e.g. tradition, users, fees) and the perception of the city book entries, while using them to frame business dealings, has never been examined before. Similar questions of praxeology of business scribality were, of course, asked before – but with regard to other types of sources, e.g., personal debt and business books of merchants and craftsmen, pension books of churches, priests or city councils (but here for the case of pensions sold by the city council for the city's budget). It will be an aim of

the project to investigate if this information derived from the city books used by a small group will also fit the hypothesis of my study. While using a source used by several thousands of different business actors, I will be able to see from a few sources if a small number of players can be regarded as representative for big parts of a small city's population. And because of the entry types, I will also be able to investigate how these actors perceived the books themselves. My project investigates uncharted territory in two interwoven ways: the financial practices of different social formations and (the perception of) the underrated pragmatic writing related to it.

Moiken Hinrichs:

Craftful Minds – Tracing Knowledge Through Time

The Bronze Age is frequently seen as an age of creativity and specialisation, which also applies to flint craftsmanship. From the Late Neolithic to the Early Bronze Age, the skill and knowledge of flintknapping reached its peak, not only as a craft but also as an art. Newly invented metal tools inspired skilled craftsmen to copy the new forms and initiated a technological race which ultimately led to the perfecting of the art that was met by only a few very skilled knappers. From this point on, not everyone was able to produce certain tools beyond everyday needs, as the access to knowledge changed. Concomitant with the social status of the flintknappers, the produced objects and the craft itself changed. Over time, the advantages of bronze prevailed as the metal artefacts became more accessible to a greater part of the population. Although flint remained an important material for everyday tools, the significance of bifacial daggers as, i.e., social markers, or sickles as elaborate tools dissolved and the skill and knowledge needed for manufacturing those also slowly declined. Past research has mainly focused on the questions regarding whether the flint daggers were copies of the metal daggers – and if so, why – to regain the knowledge of their production and how flint tool production was organized. This project wants to approach different questions regarding the skill and knowledge needed to perfect and maintain the craft but also how it declines. To this end, waste products of bifacial daggers and sickles from the Late Neolithic to Early Bronze Age Southern Scandinavia will be recorded and analysed. Flint is a perfect material for technological studies, as every step of the production has been fossilised on the artefact; every decision made by the craftsman can be retraced through the negatives on the surface left by the working process and the corresponding waste products. This offers the benefit not just to be able to reconstruct knapping errors and their cause, but also the response to the unwanted accidents, which provides insight to the skill and the knowledge of the knapper. Correspondingly, flawless pieces also shed light on the skill of the craftsmen. Insights into technological differences between inventories can be gained by applying the *chaine*

opératoire approach. With this, technical choices can be recorded throughout the production process and thus be compared to other inventories. Technologies and techniques in action are not only rooted in the social systems of people but are also dependent on individual choices. Using a *chaîne opératoire* analysis on experimental and archaeological inventories, I will explore the possibility to detect different technical approaches to the material and investigate if it is possible to recognise different schools of learning or even to observe the technological fingerprints of different individuals. This will be done by comparing the technical traits in and between inventories and artefacts. With this, different levels of skill and knowledge can be recognised and compared. Another focus of the investigation deals with how the new metal technology affected flint craftsmanship. Was the perfection of the craft made possible through implements of copper which helped the pressure flaking of flint? This will be analysed through comparison with the experimental material, which knowingly has been worked with copper tips and potentially through new knapping experiments. Further analysis with the scanning electron microscope is planned on archaeological specimens to detect copper traces on the surface of the pieces. These analyses will be carried out in collaboration with the material science research group of Professor Kienle.

Marie Jäcker:

Sacred Buildings – Knowledge in Building and Financing Churches in the Late Middle Ages

The construction of medieval cathedrals has to be considered to have been embedded in a diverse religious, political, socioeconomic and cultural context. In recent years, considerable efforts have been made by researchers, such as Wim Vroom, to shed light on the financial organisation of ecclesiastical building operations with a special focus on Dutch building projects, or by Arnd Reitemeier with a focus on German parish churches. Studies on medieval cathedral building sites as centres for the development and dissemination of knowledge, in particular, are still scarce as they involve various spheres of research such as building and construction, building knowledge, art and accounting history. Günther Binding made a first proposition for the Early and High Middle Ages – albeit mainly a collection, nonetheless a useful one, of various features surrounding the building process in Europe in their entirety. In the realm of art history, transfer processes within and between different European regions have been investigated in a joint publication. Recently, this has been expanded by a temporal focus on the High Middle Ages and an emphasis on the role of the mobility of artisans, again mainly concentrating on the artistic arena. However, in her recent postdoctoral thesis on the Gothic network of the Ulm minster, Anne Brehm stressed a gap within studies on medieval building that

often does not consider the development and transmission of different knowledge categories. Thus, it can be stated that comparative research regarding the development and transfer of financial and building knowledge in European building regions with historical links and possible mobility is still lacking. This especially holds true for aspects concerning the structural and administrative aspects of cathedral buildings that were immersed in multi-faceted religious institutions. The accounts of the building institutions, in particular, are a valuable source for promising insights into economic, social and knowledge aspects of medieval studies and their analysis constitutes a recent topic of historical research. Owing to the production of lists of edited and unedited fabric accounts by W. Vroom and W. Schöller, an overview on the multitude of future research desiderata can be gained, thus hinting at the enormous potential of this type of medieval source. As a result of personal scientific research (contacting French and English archives), further unedited or previously not recorded sources in the respective research areas were identified through an analysis of the manuscripts of these sacred buildings. The necessary knowledge in building and financing churches in the Late Middle Ages can be revealed.

Ariba Hidayet Khan:

[In]equality, Multilingualism and Identity in Jharkhand: A Sociolinguistic study of the Chhota Nagpur Plateau

The Indian subcontinent is immensely rich, both culturally and linguistically. In addition to over 600 languages and many language families, it is home to numerous ethnic groups, cultures and religions. For this very reason, sociolinguists from around the world find special interest in working on the Indian subcontinent, especially eastern India, as this region is inhabited by a plethora of diverse ethnic populations with a vast linguistic variety, whereas the western parts of the country show considerably less diversity. Jharkhand, a state in eastern India, is home to around 32 different tribes and various non-tribal populations, who have co-existed for centuries, if not millennia. Continued interaction between such varied groups over years raises interesting questions of historical modifications stemming from their [in]equal social relations. Historically, parts of eastern India were more diverse than they are today. It is interesting to explore the reason behind both such diversity and its disappearance. In her work on language diversity in the Amazon Basin, Patience Epps argues that the reason behind an extensive language diversity does not have to be varied groups living in isolation but can, in fact, be related to their interaction and [in]equal relationships with one another. It is therefore very clear that the linguistic variety of any region is closely tied to social relations, identity and [in]equality, which brings questions of shibboleths and power dynamics to the fore, making it an ideal area for exploration from a social and historical perspective. In a

multilingual society such as this, people associate themselves with different languages, cultures and beliefs. Language becomes an important tool in presenting oneself as an 'in-group member of the community or as an outsider. Certain words, syntactic and phonological patterns and styles act as shibboleths in these situations which gradually begin to index a particular group. Johnstone *et al.* use three stages of indexical order in their study of mobility, indexicality and enregisterment in Pittsburgh, which sheds light on the understanding of identity formation, crucial for studying the sociolinguistic situation of Jharkhand. Agha provides a clear explanation of how distinct forms of speech become enregistered as indexical of a particular group of language users. Exploring the above-mentioned themes in Jharkhand opens up paths to discoveries about social [in]equalities and their interaction with language. What makes it more interesting for my research is Eckert's work on the three waves of variation study where, in the third wave, she presents agency as an important factor for individuals associating themselves with a particular or multiple group. The relationship between the socio-cultural patterns and linguistic diversity in Jharkhand has not yet been adequately described. Studying the situation and analysing it from a socio-historical perspective would yield significant discoveries about the social groups' own perceived linguistic identities, (identity in the field of linguistics refers to the use of linguistic signs and forms to express one's identity, see e.g. Peterson *et al.*, in press); and roots of historical modifications stemming from social [in]equalities. Therefore, this project is crucial to the field of sociolinguistics as it aims to explore socially constructed linguistic complexities and understand how they, historically, play a role in modifying people's identities.

Anna Loy:

Deciphering Defensive Landscapes. Conflict and Conciliation in the first Millenium BCE

Defining the human condition has been a theme in archaeology for a long time. After KIM/KISSEL (2018), there are, at the same time, specific capabilities that make humans so efficient in warfare and extraordinarily good in cooperation alike – the ability to communicate and perceive the social world as distinctly divided. Yet, finding instances of discord and cooperation in the archaeological record is not straight forward, let alone does it explicitly enable a clear interpretation of the evidence. Nonetheless, archaeology could aid in the creation of a more balanced perspective on the handling of conflicts by providing long-term diachronic evidence of the dynamics of warfare and conciliation in the past. Especially interesting for this are archaeological features of some ambiguity, even more so if they already portrait some form of heightened conflict potential. Fortifications lie just at this interface. Derived from the Latin '*fortificio*' [sic], they are places

reinforced, modified, or strengthened enough to defend against perceived threats. In archaeology, fortified sites are assumed to be connected to warfare and violent conflicts, and as such to hierarchical structures, and elites. Furthermore, they are believed to all require a serious amount of labour to build and maintain. However, while these presumptions describe some cases well, they are not right in all events. Fortifications can reach from the ephemeral and almost non-visible to permanent fixtures in the landscape. In this, they seem to be connected to the severity of perceived threats. Hence, thinking about escalative processes only impacting the building and usage of fortifications leads to a one-sided account of present and past conflict occurrences – because, contrarily to this notion, fortifications can also be used as a means to negotiate and define territories, represent a strong community, and intimidate possible enemies. They are, as such, not necessarily built to withstand episodes of violence. Some might even point more towards a de-escalative function. Teasing out this information presupposes a shift in perspective: Fortifications are embedded into a social and physical context. Understanding the characteristics of the resulting network needs bridging attempts between the macro and the micro scale – from the landscape to the individual site. The apprehension of relations between physical landscape and fortification, multiple fortifications, and fortifications and other sites enables this new perspective. This PhD project aims to bridge the gap in research by studying the connected but diverse fortified (social) landscapes around the border of the south-western Baltic Sea, including today's Denmark, Schleswig-Holstein, Mecklenburg-Hither Pomerania and the northern regions of Poland during the first millennium BCE. Research will be conducted via different R-scripts unravelling possible reasons behind placement of “war-related” features and finds combined with spotlights on a few regional studies. The Late Bronze Age and Early Iron Age/Pre-Roman Iron Age along the south-western Baltic Sea present themselves as times of change in archaeological interpretations. While the Early Iron Age does not comparatively captivate with a lot of prestigious finds, it does form the foundation of the heavily stratified society of the Roman Iron Age that is a lot more visible in the archaeological record. Hence further research into this so far insufficiently processed time and space will help deepen our knowledge considerably.

Gido Lukas:

Hazards of Neobiota in the Anthropocene

The history of neobiota (non-native species) has never been examined over a period of 10,000 years from a philosophical perspective.

The first scientific book about neobiota was published by the ecologist Charles Elton in 1958. As a result of this publication, biology and ecology dealt more with this topic, and

later invasion biology was established. Especially since the 1990s, the field of research experienced a large amount of growth which continues until today. To date, it is still unclear what exactly defines neobiota. Nevertheless, there are quite often communicative misunderstandings regarding their definitions. Some define neobiota as species which reach new areas. Others define neobiota as species that have been introduced. In the latter case, neobiota were consciously introduced by humans, while in the latter they were not.

Today, neobiota spread around the world through climate changes or globalisation. The consequences are described as economic, health or environmental issues or effects. These issues, worsened by climate change, will increase.

The problems are not only the issues mentioned above, but rather include unclear definitions or why someone should act if the exchange of natural entities is a "normal/natural" thing due to mobility. The previous treatment of, in particular, invasive neobiota are based on an anthropocentric position that requires justification and differentiation from other (e.g. physiocentric) positions. Eser (1999) has pointed out that neophytes, like foreigners, are exposed to xenophobia.

In contrast, a scientific field called philosophy of science analyses values in science and criticises concepts like objectivity. While scientists in ecology or invasion biology believe that they act objectively, scientists in philosophy of science believe that there are values hidden behind methods or ideas. Philosophy can help to analyse the problems associated with values in science, to mitigate misunderstandings, and to reorganise the topic.

Neobiota show us a less related problem: the supposed objectivity of science. I plan to investigate the topic called "values in science" with the help of Max Weber and his idea about value-free judgments in science and how these value-free judgments influence scientific work and work as a scientist. I want to show that science is a social task.

For this, my work will also include Ludwig Fleck's concept of "thought collective" and "thought style" and theories of Feminism Epistemology (Helen Longino and Sandra Harding). Both are further theories to Max Webers idea of "values in science".

Words such as invasive or exotic species, disturbance, biological invasion or neophytes are indicators for something that I call *Wertgeladenheit* (i.e. words that are loaded with values). Especially in the natural sciences, this is often overlooked. Finally, with the help of archaeological finds, I can prove that neobiota have always existed since humans conquered the world.

The ambition of this research project is to provide an enlightened scientific critique regarding the limits of science and to offer practical help on the basis of the neobiota-problem on how to deal with them in the future by examining the associated discourse transparently and critically. A connection thru time (from the Neolithic to medieval times and to today) with the example of neobiota has never been carried out before (connectivity).

Catharina Müller-Liedtke:

Spaces of Inequality in Urban Historiography from the Middle Ages – Socio-spatial Polarisation as a Historical and Linguistical Differentiation Process

The urban historiography of the Middle Ages is an object of research that has been extensively examined, especially in the historical sciences, regarding the most varied interests, but it has not been fully examined yet. The same applies to the sources per se. It is Johanek, who summarises that, so far, urban historiography has been edited inadequately. There is even more of a lack of attempts to clarify the special conditions of urban historiography, which also applies to the relationship between the author, the literary centre and the specific social structure of the medieval city. Literary studies, in particular, have not addressed this subject of research yet, although the subject area of 'city and literature' has been in their focus for many years. The demand for a broader interdisciplinarity, especially with the involvement of literary studies, becomes clear in various research papers. In this regard, Wilfried Ehbrecht emphasises that access to corresponding literary studies would open up new ways of understanding the sources. Ingeborg Glier has drawn up a panorama of German chronicles from the 14th century and Joachim Heinzle has also made some astute observations regarding a criticism of Herbert Grundmann's work with regard to his introduction and classification of historiography in the Middle Ages. These classifications are problematic because of generic interference. Moreover, historicity is constitutive for storytelling in the middle ages. Nevertheless, the field of urban historiography has not been adequately explored in German Studies yet. But it is especially urban historiography that is of special interest for medieval literary studies.

A major influence on this special literature can be attributed to the urbanisation boom, which lasted from the 11th to the 15th century, when the inhabitants of the cities were transformed into citizen associations, which distinguish themselves externally in social structure, lifestyle and political condition. Citizen associations developed their own intrinsic moral values and agency, which have been repeatedly quarrelled over. In relation to this, a new kind of historiography developed during the 13th century: This

unprecedented historiography captures the early forms of representation and experiments with them in order to grasp the new and intensely changing “lived-in world”, to pass on experiences for future generations and to preserve the memory of events and persons who have made the city and its reputation meritorious. Until the turn of the 15th century, literary historiography in the German language had been established in the cities of the empire. This historiography can be considered as providing a basis for the reconstruction of urban identity and will therefore be used as the investigatory corpus of the planned dissertation.

The planned PhD project can gain literary access to precisely those sources that have been inadequately examined in literary studies and can serve as a base for analysing mental concepts (e.g. the concept of inequality). The literary cityscapes are considered in their imaginations of space as well as being a setting with specific social differentiations and role configurations of the various groups of participants. Medieval town chronicles not only retain events of the individual story, but also the design models of urban action practices in the mode of the exemplary narrative. In certain topographical constellations, the carrying out of intraurban political and social conflicts takes place. It should be noted, however, that it is especially the qualitative properties of space that have been insufficiently researched so far.

Khurram Saleem:

Developing Advanced Methodology for Solid-state Material Characterisation of the Archaeological Artefacts

In archaeology, the determination of the original artefact composition is important to know the intrinsic structure of the centuries-old, soil buried artefacts and to trace their origins and mobility patterns. Monetary theories, trade relations, and theories about technological advancement can be made after material analyses of the actual artefacts beneath the patination. Nano-analytical tools can be utilised to extract information about the bulk microstructure, phase and composition of the artefacts. A methodology consisting of the analytical techniques is being developed for in-depth analysis of the material culture in past societies. The analytical techniques mainly include Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), Raman Spectroscopy and X-ray diffraction. For sample preparation and to keep the process quasi non-destructive for TEM analysis, Focused Ion Beam (FIB) will be used. FIB is used to extract a nano sized lamellae from an original artefact. The PhD project aims at testing and applying these methods in three case studies i) tracing the development of the Baltic networks based on the differences and similarities in the material culture ii) identifying the material of the Late Neolithic flint knapping tools by seeking the material traces on the flint

artefacts, and iii) tracing the trade networks by distinguishing between amber from different geographical origins including Denmark, Romania, Kaliningrad and Bitterfeld.

In project 1, laboratory and analytical research of artefacts from the Ostriv-1 cemetery and from the Scandinavian Baltic region is planned. They are mainly Cu alloys with a thick patination layer due to secondary alterations. The artefacts were found in a medieval cemetery by Ukrainian scientists in 2016. There is evidence that the population in the Ostriv cemetery included immigrants and that the buried artefacts have synergies with the Baltic artefacts pointing towards a possible connection between the two regions.

Due to this, it is hypothesised that the population found in the Ostriv-1 cemetery migrated from the Scandinavian Baltic regions. The purpose of my research is to test the hypothesis of the extension of the Baltic networks by tracing materials artefacts. A methodology based on FIB, TEM and SEM techniques is being developed to analyse the brass artefacts in order to compare the material differences and similarities.

Project 2 is a pilot study about the identification of the traces of copper on replica flint samples and the identification of the material of the knapping tool. Since copper knapping tools are not yet known in the Late Neolithic Danish material culture, identifying copper traces would be a revelation. The intricate designs on the Late Neolithic flint already suggest that copper tools were possibly used to produce them. This pilot study will help develop a methodology that will be applied to actual Late Neolithic flint artefacts to seek copper traces. For this, a digital microscope and SEM-EDX will be utilised to produce elemental maps of the surfaces of the flint blades and Cu traces.

Project 3 involves identifying amber networks by analysing amber using analytical methods. The focus of this project is to distinguish between the geographical origins of different amber deposits from Danish, Polish, Romanian, Kaliningrad and Bitterfeld regions. This could help identify the ancient trade routes in these regions. For the identification and characterisation of amber, an explorative research with Raman spectroscopy is underway. The most conspicuous features of the bands for amber are at 1450 cm^{-1} and 1646 cm^{-1} . The band positions and intensity ratios in the spectra of amber from different regions will be compared to identify the origins.

Tanja Schreiber:

Wealth, Control and Conflict: Evaluating Fortified Hunter-Gatherer Settlements of Western Siberia (6000 BCE–1600 CE)

The doctoral project addresses the complex relationship between conflict and inequality in acephalous societies, dealing with fortified settlements of hunter-gatherer groups in

West Siberia. The fortified sites can be found in this region over a time period of more than eight millennia. Thus, they depict an unusual, and so far largely unstudied phenomenon of continuous defensive behaviour among forager communities, with an initial phase in the 7th–6th millennium cal BCE and a continuity into historical times, when ethnographic sources affirm their persistence. The emergence of fortified sites together with a “bundle” of cultural innovations, such as pottery manufacturing, pit houses, ritual mounds, etc., thus marks the beginning of major socio-political, socio-economic and cultural changes at the onset of the occupation of West Siberia. While the early stages of these fortified settlements are currently being investigated by the project ‘Natural Resources and Social Inequality’ within the subcluster ROOTS of Inequalities, only few studies have been carried out comparing the West Siberian sites diachronically. Mostly, they have been studied with a focus on individual archaeological “cultures” or geographical regions. Within international research, the investigation on fortification systems built by hunter-gatherers progressed especially in the last two decades, mainly due to a growing interest in North American indigenous warfare. Although a number of reasons for the construction of fortifications in the spheres of hunter-gatherers is known, archaeological and ethnographic research proves that social inequality and resulting conflicts do play a major role for the emergence of defensive architecture. Therefore, the doctoral project offers great potential to better understand the causes for and the short- and long-term consequences of inequality and conflict, respectively its conciliation. In the previous funding period, the research concentrated mainly on ecological aspects of warfare as part of the preparation for the EAA 2021 (including the recording of site location within the natural landscape as well as theoretical considerations of seasonal resource abundance and its relation to conflict, territoriality, ownership and social inequality within hunter-gatherer groups).

Due to the remarkable preservation of house pit depressions and fortification elements in the surface relief in the West Siberian taiga, we have the unique opportunity to systematically measure house-size distributions as well as the area of fortification systems of hundreds of sites without invasive methods. Archaeological as well as ethnographic examples confirm a positive correlation between household size and household wealth. This correlation applies especially to forager groups with higher levels of sedentism, such as those in West Siberia. This situation provides us with the unique opportunity to apply quantitative methods of wealth measurement (e.g. the Gini coefficient) in non-sedentary communities on a diachronic scale. Diachronically analysing the correlation between monumental defence construction and the level of social and economic inequality within mobile and semi-mobile communities will result in a better understanding of the dynamics, both of intra-group structures and possible inequalities, and of intergroup conflict and its potential consequences.

Benjamin Serbe:

Prehistoric Amber Connectivities – Networks and Interaction in the European Bronze Age

Communication forms a major part of human society. As in earlier times, it is still the basis for trade, exchange, transfer of ideas and conflict today. Thus, the reconstruction of communication leads to an understanding of human society and the relationships between each other and it forms an important part of archaeological science. Amber itself is a good choice of material to work with in this regard, as it only occurs in certain areas, is easy to transport and shape, and has a more representative than a practical value. This combination of characteristics allows amber to be a great proxy to investigate communication networks and the transfer of ideas and technologies.

In fact, this approach was already used in a certain way to discuss the general translocation routes of amber in prehistory, first by J. M. de Navarro (1925) who proposed a dissemination along waterways. The connections between Northern and Southern Europe was of special interest, because of the occurrence of amber objects in Mycenaean shaft graves. This specific north-south route is a long-discussed topic since an initial publication by J. M. de Navarro, but it has been significantly enhanced during the last century. In this spirit, other investigations of amber-related exchange routes were investigated for different areas. In recent years, the general discussion on the exact course of the “Amber Road” ceased due to critique on the general concept of an existing system of pathways.

A second major subject of archaeological amber research is the general distribution of artefacts in certain areas. These studies show a change in the exploitation and usage of amber in history. Starting in the Palaeolithic, different regions started to exploit local amber resources. In the Neolithic, a limited exchange started, but first with the beginning of the Bronze Age the start of a larger and farther exchange is visible in Europe, reaching Mycenae in the Late Bronze Age (around 1600 BCE) and onwards to the Levant, Egypt (around 1600 BCE) and Assyria (880 BCE).

This is commonly seen in the context of exchange of bronze and bronze technology. The methods of choice for the present project will be mainly distribution mapping and network analysis in order to investigate prehistoric relationships between people. Distribution mapping provides a fast and easy to use method for the correlation of the geographic distribution of certain technological and typological aspects, so it might be possible to track certain aspects, traits and influences. The network analysis – first applied in sociology – is well established in the archaeological sciences in various studies. The creation of a network in an archaeological context is a complex matter and different

approaches were used in different studies. By testing a variety of methods, the best fitting model will be chosen for the analysis. The aim is to connect different societies based on similarities in amber artefacts and typogeographical distance and thus to add an additional layer of detail to simple distribution mapping. Using this method, a set of measurements (centrality values) can be generated for different regions and time slices. These measurements provide an objective and comparable way to analyse the role of different regions and the spread and routes of different amber technologies and, vice versa, the transfer of ideas – the final aim of this project.

Henry Skorna:

Understanding Social Inequality and Violence from the Mesolithic through the Early Bronze Age in Southeast Central Europe

In archaeological and anthropological research, the emergence of inequality in prehistoric societies has been tackled by using different theoretical models. Recently, Collective Action Theory has been used to underline the importance of smaller groups with shared interests in influencing decisions made at a larger scale. Earlier, Marxist political approaches as well as functional approaches were applied. Lately, research aims to include methods from economics in order to measure inequality in the archaeological record. Examples of this applied the Gini coefficient as an economic statistical method on archaeological sites to compute the degree of inequality based on burial goods and house-size distributions.

While these studies mostly rely on one proxy, Ralph Grossmann uses a multi-proxy approach in his latest work to study social inequality from a diachronic perspective in a similar way that this research project is planned. Apart from burial goods, the size of graves is used to calculate a separate Gini coefficient. In addition to that, spatial analysis, isotope analyses regarding diet and origin as well as bioanthropological data are included in the investigation of five burial grounds from south-western Germany. As most other studies use univariate methods to measure inequality, multivariate inequality approaches are scarce. Especially with regard to the use of isotope analyses, only a few studies, e.g., GAMARRA *et al.* (2018) explore the link between social differentiation and diet. So far, multi-proxy approaches, including economic statistical methods like the Gini coefficient, have not been applied within my areas of research. While single cemeteries are well studied, partially also with richness indices, this has not been done on the temporal and spatial scale.

The archaeological research of prehistoric conflicts and violence has become more common in the last two decades. To study past conflicts, researchers have turned to

graves, hoards, material culture from domestic sites, and the evidence of trauma on skeletal remains. Among others, H. Peter-Röcher stated that an increase in conflict is connected with the appearance of complex societies. The proposed study aims to investigate social inequality and violence within the research areas in Eastern Slovakia, Moravia, parts of Lower Austria and Southern Poland which are located at important interfaces between Central and Southeastern Europe. This study relies on already published data of burial sites and settlements of the mentioned regions as well as on improving and enlarging the said data sets through work in archives and in the field. Additionally, the results of an isotope study with samples from the Bronze Age cemetery of Mytna Nova Ves, conducted together with ROOTS member Fynn Wilkes, will add more data. These datasets will allow a deeper understanding of the development of the prehistoric societies, their nutrition, access to and control of resources as well as existing networks; all vital aspects relevant to comprehending prehistoric social inequalities.

Yevhenii Sliesariiev:

The Age of Changes. Conflict and Conciliation between the Baltic and Pontic Seas in the 4th – 3rd millennium BCE

Tracing conflicts in past societies by archaeological remains is quite a difficult task. Tracing conciliations appears to be even more difficult as there are no written sources and no clear archaeological markers (as, for example, weaponry or defensive structures in the case of conflicts) in prehistory. Therefore, a model is needed which is able to help us in the reconstruction of conflict/conciliation situations. For this reason, it has been decided here to focus on the management/distribution of raw materials as one of the main parts of the economical organisation of past societies, and presumably, as one of the main reasons for the appearance of conflicts.

As a chronological starting point for the research, the emergence of Trypillian mega-sites was chosen as a clear indicator of social changes within Trypillian communities 6. Economic growth changed social organization, and therefore, presumably, changed coping mechanisms in the face of conflicts (e.g. the emergence of enclosures). The phenomena of the mega-sites could be perceived as a result of conciliation, bringing people together for better economic organisation (including raw-materials distribution management) and safety matters.

The idea of the control over resources as a trigger for conflicts/conciliations is not new in archaeology, but it has never been used on for the given timeframe and region.

Thus, to trace the connection between raw-material management and conflict potential as well as conflict resolution, it has been decided here to study flint industries through the

chronological perspective starting from the appearance of the mega-sites in the region. The recently excavated Stolniceni site offers a perfect collection of siliceous artefacts made from various objects and contexts for my research. The Stolniceni collection also represents various raw materials, some of them originating from distant deposits. Examining the collections from the sites of following Trypillia stages, and then of later communities from the region (Yamna, Katakombna, Corded Ware cultures) will help us understand how different communities managed raw material extraction, control and distribution in a chronological perspective and it will presumably reveal the role of resources in conflict emergence and resolution.

As a comparative material example, it has been decided (in consultations with my supervisors) to include the collection from the Sultana tell (Gumelnitsa culture) situated on the Lower Danube to understand the differences/similarities in resource management.

Fynn Wilkes:

Social Inequality in the Carpathian Area between the Neolithic and the Bronze Age

Social and economic inequality has been discussed for decades in archaeology. While in the past, social inequality was often linked with ethnological and sociological concepts like elites or households, recent research develops towards a more economic approach to deal with inequalities. The current dominance of economic approaches is derived from a prominent definition of inequality, which sees the unequal access to goods as the driver for increasing social complexity.

The current development towards a focus on economic inequality in archaeology can be seen in several studies as well as in the recent study of Ralph Grossmann, which analyse archaeological data with the help of economic tools. The frequent use of economic measures on archaeological datasets is not seen uncritically and methods underlie a continuous development. Further, it is important to note that recently, besides this economic approach, others – such as the capability approach – have been applied in archaeology.

For the Carpathian Basin, different researchers worked with a regional or temporal focus on social inequality. The development of inequality is often linked to the development of social complexity. This means that with an often discussed increasing hierarchisation of societies, inequality rises. In general, most studies addressing this topic argue that measures of inequality continuously increased since the Neolithic. While this development is widely described, its causes and impacts have rarely been addressed so far.

Previously, the majority of researchers approached the topic by focussing on only one proxy. Only recently, a study by Ralph Grossmann dealt with social inequality by using a wider set of proxies. Nevertheless, the analyses carried out are almost entirely univariate, leaving multivariate inequality measures untouched.

Karolina Varkuleviciute:

Diet and Animal Management Practice Reconstructions of Late Prehistoric Eurasian Populations

Late prehistory in Central Asia presents some interesting cultural and economic human activities that have interested archaeologists during the last few decades, and even more so in the last few years. While the communities in the region are generally described as nomads, this nomadism is facilitated by the domestication of horses and the herding of sheep, goats, cattle and camels. The economic focus of the groups seems to be focused on pastoral exploitation of domestic ruminants. This is based on the faunal assemblages dominated by sheep, goat and to a lesser extent cattle with a highly variable presence of horses by site and region. This exploitation of domesticates was likely combined with vertical transhumance to accommodate the dietary needs of the herd animals, with evidence of wintering in higher elevations from at least the mid-3rd millennium BCE.

Late prehistory and especially the Bronze Age has also brought some trade of domesticated cereals across Asia. Domesticated foxtail and broomcorn millet were brought to West Asia and Europe from Northern China, while, domesticated wheats and barley spread to East Asia from the Near East. Millet could have been an attractive cereal to the pastoralists, especially as fodder, as it requires relatively low effort to cultivate it compared to wheat or barley. Furthermore, there is isotope evidence that millet was used as fodder for caprines, especially during winter months.

Stable isotope analysis ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) has been widely used to reconstruct diet, environmental conditions as well as certain animal/plant management practices in the past. This technique in addition to radiocarbon dating and archaeobotanical research has been used to date the domestication of millet in Northern China and how it spread to Western Asia. Stable isotope research has also allowed us to better understand the diet of the nomadic pastoralists of Central Asia. Evidence shows a shift in diet from the Neolithic/Chalcolithic to the Bronze Age, when human $\delta^{13}\text{C}$ values increase and $\delta^{15}\text{N}$ values decrease, likely indicating the introduction of livestock breeding, millet introduction and a decrease in fish consumption. There is also some regional variation in the isotope values, such as seemingly lower $\delta^{13}\text{C}$ values during the Bronze Age in North Kazakhstan compared to more southern regions, which might have depended on the

difference in the environmental conditions and different animal husbandry and dietary practices.

With my project, I would like to expand on the currently published bone collagen stable isotope data and include sequential animal tooth enamel sampling ($\delta^{13}\text{C}$ and $\delta^{18}\text{O}$). This will allow me to further explore the dietary trends of humans in Central Asia as well as animal management practices, such as foddering and mobility. The particular focus of this project is to better understand when and how millet was introduced to Central and Western Asia (and potentially Europe later on in the project). The analysis of both human and animal specimens will help us to determine if millet was primarily introduced as a human food source or animal fodder, if this change over time and what proportion of the diet was represented by millet. The project also aims to explore the persistence in the use of wild resources, in particular, aquatic resources. This has not been widely explored due to the lack of archaeological fish samples, but hopefully modern samples will help us to more accurately determine the range of river fish values and their contribution to human and animal diet.

Morgan Windle:

Human-reindeer Interactions in Contemporary and Ancient Siberian Communities

Rangifer tarandus (reindeer) have helped shape the complex socio-cultural fabrics of hunter-fisher societies in Arctic and Subarctic regions, where, through an intimate partnership that is grounded in mutualism and symbiosis, reindeer are animate persons with roles as both herd members and wild game. In the West Siberian taiga, small herds of reindeer are kept almost exclusively for transportation and help facilitate forager lifeways. As a result, modern hunter-fisher-herding communities coexist with reindeer, co-creating culture through a range of unique niche-constructing activities and intertwined multispecies practices. Until recently, a dearth of applicable techniques to investigate reindeer husbandry archaeologically has resulted in reindeer being understudied, particularly with regards to their domestication.

Prevailing anthropocentric frameworks to define relationships between humans and other animate beings are being increasingly critiqued for their erasure of the potential range of human-nonhuman systems. Human-reindeer relationships are a primary example of this type of erasure, despite archaeological evidence from Iron Age sites in the West Siberian tundra demonstrating that cohabitation may have existed for at least two millennia, suggesting reindeer herding is not only not a recent development but neither is their herded modus. Central to this issue is the study of 'domestication'; a looming

archaeological narrative in which the primary motif is a wild to domestic trajectory, placing humans as a primary initiator and sole arbiter of this process. Domestication definitions necessitate that animals eventually become so removed from their natural habitat that they cannot thrive without human aid and are genetically and morphologically distinct from their wild counterparts. As reindeer do not follow this archetype, they are described as an 'exception' in human-animal studies and domestication trajectories. Considering these critiques as well as recent improvements in osteological and biomolecular techniques for an investigation of reindeer, there is a need to reconsider the coexistence observed between humans and reindeer and situate the complimentary intersection of hunting and animal husbandry in the circumpolar world within domestication research. The range of enduring practices amongst modern taiga herders may be able to provide inferences and help to inform us on the minutiae of reindeer management and the formation processes of human-reindeer systems in the archaeological record. Moreover, taiga herding could offer insight into the spectrum of processes that impact human-nonhuman 'hybrid community' formation and domestication phenomena. Through a collaborative partnership with Indigenous Sel'kup communities in West Siberia, this project will be comprised of three data components – ethnography (C1), osteology via morphometrics and pathological analyses (C2), and stable isotope sciences via $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ analysis (C3) – to inform us about the past and present intra- and interpopulation variability of reindeer, as well as the lives of domestic animals and their relationships with humans. Grounded in a theoretical framework incorporating aspects of niche-construction – and Natureculture theory – the project's aim is to conduct an interdisciplinary investigation of Siberian reindeer to clarify domestication markers therein, helping to define the species' role in the Circumpolar North.

Dana Zentgraf:

Garden Rhythms and Kairos: Time Awareness as a Prerequisite for Environmental Virtues

The most recent publications concerned with gardens emphasise that humans can gain special attitudes while engaging in garden-practises*: environmental virtues. Virtues – an ethical concept from such ancient philosophers as Aristotle, Epicurus or Seneca – are defined as a trait of character that influences a person's worldview, their actions and is the measurement to value other's actions. Acting virtuous means to do something morally good or to refrain from something morally bad because it is a person's deep wish to act rightly, not to follow rules dogmatically. Thus, virtuous actions are formed by affects as well as by rational decisions. They shape a person's attitude towards the world around them.

Virtue ethics has been neglected especially since Immanuel Kant formulated a deontological ethical approach and later because James Stuart Mill's concept of utilitarianism gained popularity in ethics. During the 1950's, virtue ethics experienced a revival that grew strong within the area of environmental ethics.

Within this frame of environmental virtue theory, authors argue that virtues as wonder, humility, perservance or mindfulness can be trained when one works in a garden with respect to ecology and sustainability. One claimed theory is that a person who develops environmental virtues will handle the non-human environment in a morally better way than a person without those traits of character. This process has been studied by environmental philosophers within the example of gardens during the past years.

The latest publications emphasise that one can develop environmental virtues in a garden but also in other natural places, e.g. in forests. For them, the garden is one example among many where one can train environmental virtues. So far, the discourse is missing a historical dimension as well as a concrete study of the garden-practices that are claimed to affirm the virtues of a gardener. My project attempts to bridge this gulf.

Since the epoch of the Anthropocene has been identified, it has been acknowledged that humans are powerful drivers who have been shaping the planet. Christophe Bonneuil and Dipesh Chakrabarty most prominently showed that social history and earth history are not separated.

In contrast, looking at the historical development in Europe, it is significant that the artificial separation between humans and nature is a quite young way of thinking (a paradigm of the Industrial Revolution) and needs to be rethought. Before that time, Western Europe thinkers were aware of the interrelation between humans and their environment. Those ideas have gained new scientific interest in the light of Anthropocenic challenges because they provide a theoretical framework to re-evaluate human-nature relations as intertwined.

Engaging with nature, it is argued, can influence one's evaluation of nature and, hence, lead to a more environmentally conscious behaviour and even a more profound way of life. My project aims to investigate how human attitudes towards their environment change while interacting with non-human nature in a garden. I claim that gardening and other garden practices train environmental virtues because humans have to act according to the garden's time and rhythm. I will show how time awareness is a prerequisite for environmental virtues.

(*The term "garden-practices" is based on Thomas Church. The term includes everything one does in the garden, from horticultural practices to reading or garden parties).

Doctoral Students (2nd Generation)		
Name	Supervisor	Working title
Andersen, Anna-Theres	Schneeweiss, Jens	Of White Elephants and Objects of Desire – A Diachronic Exploration of Diplomacy in Archaeo-Historic Sources
Bockmeyer, Sarah	Furholt, Martin Müller, Johannes Becker, Valeska (Mentor)	Lives in Pieces – Pieces of Life. Relational Personhood in the Funnel Beaker West Groups (3600-3000 BCE)
Brandt, Henriette	Makarewicz, Cheryl Furholt, Martin	Diachronic changes in diet and mobility in the Northern Carpathian Basin from 5500 to 4000 BCE
Fiori, Stefania	Ricci, Andrea	Tracing pathways: the funerary landscape and the spreading of metal technology in the Southern Caucasus (4th-1st mill. BCE)
Hillmann, Laurenz	Nakoinz, Oliver Wichmann, Sören (Mentor)	Prehistoric and historic carrying capacity in Europe: Impact of technology, soil fertility and climate on human carrying capacity
Jonjic, Darja	Nübler, Norbert Wichmann, Sören	Differentiation and dispersal of Russian dialects. A quantitative analysis
Krause, Anne	Schwab, Andreas	Kleine Fische. Kommentierende Textformen in den Recentiores der Halieutika Oppians
Kurgaeva, Anastasiia	Eckmeier, Eileen	Anthropogenic impact on soils within the prehistoric settlements at the verge of the Anthropocene in the Eurasian Loess Belt
Mura, Sara	Haug, Annette	Sensing death at Monte Sirai: experiencing Punic mortuary rituals
Ricci, Gianluca	Schwab, Andreas	Who were the Greeks? Traces of <i>Hellenikón</i> in Ancient Greek Drama
Schwake, Florian	Kreuz, Patric-Alexander	Reuse and Spoliation in Greek Sanctuaries from the 5th to the 2nd Century BCE
Walker-Friedrichs, Fiona	Eriksen, Berit	Agricultural methods and tools in the Nordic Bronze Age
Zerzeropulos, Katharina	Nakoinz, Oliver	Imperial Roman Economics?

4.3 Postdoc Projects

The long-term, post-doc work forms the centres of their subclusters. Synergies with the PhD work are sought. The individual post-doc projects should contribute – not only in a scientific perspective, but in the perspective of the YA – to the immediate goal of being increasingly eligible for an appointment to a professorship. The increase in the number of post-docs with a habilitation is therefore to be welcomed. The attractiveness of ROOTS is evidenced by the title-teaching of the habilitated at universities in Berlin, Leipzig, Göttingen and Kiel. In the future, it is desirable that the external private lecturers are also given the opportunity to supervise doctoral students in the Cluster of Excellence. This would strengthen the respective working groups.

PD Dr. Tim Kerig:

Quantification of Social Inequality in Prehistoric Societies

The aim of the project is to describe, measure, and explain the evolution of social inequalities in prehistoric Europe. We will constantly gather and process data from literature: 1) up to now more than 4000 graves from Central Europe, 2) several hundred houses and associated finds from the LBK, which later should be combined with data gathered by other members of the subcluster, and 3) complete grave goods from Mycenaean circles A and B. I just started data input from Southern German and Lower Austrian Early Bronze Age graveyards. As planned, the integration of graveyard data had priority in the first phase of the project; in the future, settlement features in particular are to be collected. Within the OIRP 2020 “Big Exchange”, we also gathered important data sets of raw material distributions indicating exchange networks. The importance of the problem of the unequal distribution of raw materials or agricultural resources as a supposedly “natural” source of social inequality becomes increasingly evident. Here, a network perspective offers important insights into the emergence of inequalities. This research will be carried out using cutting edge artificial intelligence (AI) methods: As part of a larger grant from the State of Schleswig-Holstein, a tandem-project of Matthias Renz with Tim Kerig received funding for the next three years. An international working group on raw material exchange networks was initiated and established that will seek additional funding as well. More traditional measuring of social inequality started for the LBK and the Late Iron Age (LT) graveyards. Especially for the LBK, it turned out that the small graveyards do not produce significant results, but the larger ones do. This interesting problem cannot be solved simply by aggregation – it seems as if the smaller graveyards do not represent stable populations, an effect most probably due to the migration-character of the small groups of Early Neolithic settlers. A comparable problem of the

representativity of the so-called family graveyards is also present in the Late Iron Age material.

Work on Mycenae stagnated due to the unavailability of the external cooperation partner M. Schmidt from September 2020 onwards due to severe illness. Nevertheless, I developed a new chronological model of the graves from Gräberrund A and cyclos B – for the first time based on frequency seriation – and measured how wealth was increasingly used in competition for societal positions. The submission of the results for publication is imminent.

I have part of the GINI project led by Tim Kohler (Washington State University) and Amy Bogaard (Oxford). Together with Andrew Bevan (University College London), a British-German application on the joint evolution of storage and social inequality has been submitted in 2020 (rejected, despite a highest possible rating), but it will be re-submitted in 2022. In my understanding, the ROOTS subcluster Social Inequalities also profits much from the joint work on shared basic concepts, first from economics (PIs Bröcker and Requate), currently from the social sciences. I also edit the wiki “ABC of Past Social Inequality” which forces us, me, to use a consistent set of concepts.

As a first interpretative step, a basket of commodities was constructed which allows us to compare economic performance as an important restriction to a society's productivity as well as to the total wealth. The results of this part of the project have been presented and discussed at the EAA 2021 in Kiel in our own session on social inequality and agricultural productivity.

Archaeological and ethno-archaeological fieldwork in Kurdistan was possible in December 2019 and in autumn 2021. In 2020, neither the excavations nor the ethno-archaeological programme on social inequality and agricultural practices were possible. I therefore decided to develop a local PhD programme at Soran University as part of our empowering strategy. Due to the very low scientific standards of our colleagues so far, I asked the staff and students to survey the area during Corona-times and to produce a database and a simple GIS. In 2021, the excavation of the cave site Ashkawtarash could be completed and the excavation at the tell Gird-i Dasht started. At present, a drastic change in inequality seems to have taken place around 1000 CE, probably in connection with the emergence of local chiefs and principalities re-using the ancient city of Gird-i Dasht.

The above mentioned OIRP 2020 “Big Exchange” has been carried out – under the critical eyes of our co-PIs Jutta Kneisel and Oliver Nakoinz – together with Johanna Hilpert. We managed most of the data integration and have just started with analytical work. We are becoming increasingly skeptical about the use of Social Network Analysis in archaeology. In our work, we can hardly fall back on standard solutions, because our approach asks for

novel parameters which turn out to be more time consuming than expected. The results of this work have been presented at an international ROOTS conference in the first half of December 2021. Another direct outcome of the project is a second successful OIRP application on “preadaptation” in the development of exchange networks. We ask how already existing exchange relations can be used as a kind of evolutionary shortcut – how existing paths (or path sections) were used for the transmission of new goods or knowledge, and how this can be measured.

In the second project phase from 2022 onwards, extended data collection, methodological and analytical work are scheduled, while the last months are dedicated purely to additional analysis and writing. As planned originally, the main focus of the project is on the relation between the evolution of productivity and social inequality on a European scale. During the first phase, a regional restriction in data collection to Central Europe was necessary to control unexpected effects – corresponding to my personal knowledge. In the second phase, sampling and analysis will be done in a larger transect from Scandinavia to Sicily, now including data on architectural energetics. Including state societies and urban structures seems necessary to add more contrast to the picture, which will make the project much more relevant. I will seek support for this work on Iron Age Italy and will restrict the effort to architectural energetics. In the final process of the analysis, data sets from other parts of ROOTS (especially from PhD theses) will be used to again push the geographical borders of the project. The core of the project is accompanied by work on agricultural practices and inequalities in exchange networks. Both add important different aspects: A focus on daily work practices on a micro-level as well as a perspective on how local communities are tight in systems of larger exchange relations. During the second phase, a convincing narrative will be developed. At the end of the project, a quantitative model, explaining the narrative, should work.

PD Dr. Philipp Kobusch (replaces Dr. Nicolas Lamare):

Concepts of Urban Living in Times of Political and Cultural Transition. The Example of Ancient Hispania from the Roman Conquest to the Early Imperial Period

The study of ancient cities in Hispania has so far concentrated primarily on public spaces, sanctuaries and necropolises. Residential buildings as an area that massively shaped the daily life of the inhabitants have been almost completely ignored. Up to now, residential architecture has mainly been studied without a further contextualisation only from a typological point of view.

In contrast to such typologising approaches, the project outlined here seeks to understand and characterise residential complexes as spaces of action in an urban context. The aim is to retrace processes of establishing and changing concepts of living, which took place in the course of exchange processes after the Roman occupation. Furthermore, by contextualising the houses within urban spaces, the role that housing played within urban society can be analysed.

The project presented here therefore seeks to reassess urban residential architecture in the southern and eastern provinces of Hispania (Tarraconensis and Baetica) from the Roman conquest onwards to the Early Empire. The aim is to shed light on residential architecture as a central place of action in its interdependence with the rest of the urban space. Through an analysis of the different concepts of housing, it will be attempted to trace changes and adaptations in the individual cities and regions, which had far-reaching consequences for the daily life of the inhabitants and their coexistence within the city.

The starting point is the premise that residential architecture, on the one hand, and concepts of cohabitation, concepts of housing and the social structure of the community (the family itself but also vertical social division within society), on the other hand, must be seen in a direct relationship of dependence. Therefore, for the re-evaluation of the evidence here, a clearly new approach is chosen, in which no attempt is made to examine specific architectural forms for their (typological) origin and development, but in which certain concepts of action and use are placed in the foreground. Two steps are envisaged for this purpose.

In the first part of the work, the focus will be on the question of the affordances of the house architecture and its furnishings. This means that the role of selected specific phenomena will be analysed diachronically and transregionally. The following aspects are envisaged, some of which refer to relatively specific contexts of action typical of upscale living, while others concern more complex structuring of the residential sphere:

- 1) the Convivium; 2) Bathing; 3) the levels of luxurious equipment and their spatial distribution, visibility and accessibility; 4) the relationship between economies and living quarters and their spatial organisation; 5) the relationship between cult/ritual and housing: House shrines and altars; 6) the display of aspects of literacy and culture; 7) other factors which can only be proven in exceptional cases – but in their rarity they can be quite significant. These include, for example, the presence of figural decoration, which could fulfill a narrative function, but remains rather rare in Hispania, especially in comparison to Italic examples.

In this way, the social structuring of the houses and the practices located there will be illuminated. As a rule, houses were inhabited by families, whose membership could differ

significantly. Families, however, can generally be understood as the nucleus of social relations in an (urban) community, so that the interactions tangible here could certainly shape a community. In addition, the observation of single phenomena creates a common level on which the different house types can be compared, even if they elude a common typologisation. This approach is based on the comparison with pre-Roman housing, on the one hand, and with tendencies of other regions of the Roman Empire, primarily Italy, on the other. This will allow a stronger contouring of the peculiarities of the area under investigation.

In the second step of the project, the urbanistic integration of the house complexes will be analysed. This includes the relationship of the houses to the streets and their accessibility and visibility from the street space. This also includes the spatial relationship of individual houses to complexes of public or sacred space, which could have a great influence on the usability and significance of the individual house complexes. Finally, the distribution of individual housing units within the urban area can also be considered in order to elicit the social distribution within the city. In addition, the analysis of the connection to urban infrastructure, especially to the water supply and drainage systems, can provide information about the organisation and responsibilities for housing within the city.

This analysis is to be carried out exemplarily on the basis of better preserved, selected cities in order to show the spectrum. The aim is to select two cities in each case that are similar in size, status and function, if possible, in order to be able to better classify the individual phenomena and the spectrum of different possibilities: a) Provincial capitals with the status of *colonia*: Córdoba and Tarragona; b) smaller coastal towns with an older tradition: Baelo Claudia and Sagunt; c) Small inland towns: Bilbilis and Clunia; d) Other cities, such as Mulva (Munigua) or Tiermes, for which it will be difficult to find comparable counterparts, are to be regarded as unique cases. Precisely because of their special position, however, they are of particular interest for the question of individual decisions for certain concepts and can be understood as a kind of control group.

In order to be able to discuss these results in a larger, empire-wide context, and thus to be able to outline the commonalities and particularities of the Iberian Provinces more precisely, an international conference is planned in the third year of the contract – subject to funding as an onsite event. It will deal specifically with the question of different concepts for integrating house complexes into the urban space.

In addition, a smaller workshop as a networking meeting will address the phenomenon of cult in the context of houses in the Western provinces. This workshop will be located at

the beginning of the second year of the contract and will include researchers from Spain, France and Germany as well as Great Britain.

Depending on funding, an additional sub-project in the form of a medium-scale excavation (3 campaigns) can be added to this broader synthesis project. In cooperation with D. Ojeda Nogales (UNED Madrid), the residential buildings of Torrepraedones (Andalusia) will be investigated. The town has never been built over in modern times and thus offers an ideal field for intensive archaeological field research. Previous work has focused primarily on the extra-urban sanctuary and the large public areas of the city. The residential areas have remained unexplored so far. Initial test excavations carried out by David Ojeda Nogales in cooperation with P. Baas show that a continuity from Iberian to Roman times can be grasped here. A large-scale investigation of a specific area therefore offers the possibility to excavate a chronological sequence within the residential area and in this way to trace in detail the changes in residential architecture and its forms of use in one example. Smaller test sondages at other sites in the city could also make it possible to classify the results and complement and extend the stratigraphic results. David Ojeda Nogales already holds an excavation licence for this site. Therefore, within the framework of the four-year position, an in-kind application to support the excavation would be sufficient.

The results will be published annually as preliminary reports in the journal *Anuario arqueológico de Andalucía (AnArqAnd)*. After three campaigns, a detailed final publication is planned in the form of a longer journal article that places the results in a larger context.

Dr. Nicolas Lamare:

Urbanity and Environment in Ancient North Africa: The case of Sufetula-Sbeitia / Archaeology of Antiquity

The project focused on the cities of North Africa (Algeria-Tunisia-Libya) in a broad chronological framework between the period of the first Roman colonies of the 1st century CE and the end of the 4th century with a look until the end of the Byzantine rule in the region around the late 6th century CE. There were two goals regarding the Urban Roots subcluster and the overall aim of Roots. Major research questions were: How did people use urban spaces? How did daily practices (routines) evolve regarding new forms, new characteristics of cities over the Roman and Late antique period? How did climate, environment and water resources evolve and impact the city and the people? The aim, besides working with bibliographies, was to implement a fieldwork campaign in Tunisia to acquire new data on North Africa.

My aim was to develop a project on the site of Sbeitla in Tunisia (magnetometry, excavation). A first study trip in November 2019 allowed me to visit the site again and to meet several colleagues in Tunis. Following this meeting, I submitted a research project which was approved by the Institut national du patrimoine de Tunisie and a convention was signed in April 2020 between the CAU and the INP. The Covid crisis then prevented me from returning to Tunisia for the duration of my postdoc.

Thanks to the internal funding offered by ROOTS for the development of interdisciplinary projects, with Guillermo Torres (Dietary ROOTS) I obtained a budget for the project "Water quality and health conditions in ancient times: an assessment of Roman Empire aqueducts via metagenomic analyses of fossilised biofilms from Sufetula (Sbeitla, Tunisia)". Based on a study of the carbonate deposits of the aqueduct of the ancient city, the project is complementary to an aspect of my postdoc research: to study the operating chronology of this aqueduct through an analysis of the different limestone layers in collaboration with Gül Sürmeli Hindi (Marie Curie Fellow, University of Oxford). Within the framework of the interdisciplinary project, the objective is to analyse, for the first time, the preserved fossil biofilms, in order to determine whether the quality of the water distributed in the aqueduct was affected by the development of micro-organisms that may have had an impact on the health of ancient societies. As access to the site was impossible, the samples could not be collected. As the project continues under the responsibility of Guillermo Torres, I am planning to collect samples in the spring of 2022 which can then be analysed in Kiel to complete the project.

Apart from this research work, a large part of my time was devoted to the administration of the subcluster (data collection for the website, practical organisation of the Lecture Series "Bridging the gap: Urbanity between Past and Present", listing of book purchases, etc.). Various presentations of my project also took up part of my time (presentation of the cluster at the first ROOTS Retreat, Urban talks, Urban ROOTS retreats).

The requirement to write a monograph during my postdoc period was hardly in line with my goal of employment in France. A second monograph, after the publication of the PhD, is not the main aim outside of Germany or English-speaking countries: peer-reviewed articles are more valued for recruitment to the CNRS, for instance. This work on the implementation of a book consumed a large part of my time and prevented the publication of various papers. The beginning of a monograph has been written which cannot be completed as it stands. It would be necessary to reflect on the candidates' desiderata during recruitment; ROOTS' stated desire to see its former candidates employed should be adapted to the conditions of recruitment of these candidates in their country of origin, or in the country in which they wish to be integrated. Nevertheless, I was able to publish or submit some contributions related to my research questions

Dr. Bente Sven Majchczack:

Socio-economic Interaction in the Wadden Seas

The project cooperates closely with the ongoing DFG-project "Rungholt", led by University of Mainz (Dr. Hanna Hadler; Prof. Dr. Andreas Vött) in cooperation with the Applied Geophysics group at Kiel (Prof. Dr. Wolfgang Rabbel, Dr. Dennis Wilken), the Archäologisches Landesamt Schleswig-Holstein (Dr. Ulf Ickerodt; Dr. Stefanie Kloöß) and the ZBSA (Prof. Dr. Claus von Carnap-Bornheim; Dr. Ruth Blankenfeldt) by conducting joint field research in the Wadden Sea area. During 2021, several field campaigns were conducted in the North Frisian Wadden Sea area. The tidal flats around Nordstrand and Hallig Südfall (the so-called Rungholt-Watt) was visited for single-day investigations in March and June and for a duration of two weeks in September together with the Rungholt-Project. The investigations focused on documentation (drone mapping) and find collection (classic field survey and metal detecting) on exposed archaeological features near Hallig Südfall, as well as on geophysical (magnetic gradiometry, EMI, seismics) and geomorphological (coring, Direct Push) exploration of covered archaeological structures and geological stratigraphy. We documented extensive settlement remains (dykes, terps, field systems) of the High-Late Medieval Period. In May and July, two field campaigns of one week each were conducted on Hallig Hooge. The first campaign focused on geophysical exploration of early to late medieval settlement remains buried under the Hallig sediments and on remains of terps, a dyke and salt peat quarries in the tidal flats. The second campaign was an archaeological excavation on the Hallig, in which we documented the impressive layers of a so far unknown high to late medieval terp, which was a specialised production site to turn salty peat into salt as a trade commodity. This was the first excavation of such a terp that revealed the stratigraphic sequence of approx. 150 years of salt production. Besides these major investigations, a short field campaign of two days was done on the island of Amrum in June, testing magnetic gradiometry and GPR on Iron Age house sites in the dune area of the island.

Fieldwork Planning for 2022: The focus of the ROOTS-Project will continue with the case study on the early settlers in the initial marsh landscape in the area of Hallig Hooge, with the added emphasis on the medieval salt peat extraction and the subsequent increased hazard of flooding. To broaden the prospection data in the tidal flats around the Hallig, one week of a geophysical field campaign will be conducted in the beginning of May. During this campaign, our colleagues from Mainz University will also conduct a coring campaign on the salt production terp, to get a broader picture of the sites stratigraphy and determine the extent of peat extraction underneath the Hallig sediments. We will also test a new excavation method to be used for small sample trenches in the tidal flats, which will require buying some special equipment. The cooperation with the Rungholt-Project

will be continued. The activities for the investigation of the tidalflats around Hallig Südfall are comprised of the participation in a 7-day geoarchaeological/geophysical campaign at Nordstrand in September, and up to 8 days of geophysical and archaeological prospection, which will be carried out as single-day activities with drone photography and shallow-water seismics, depending on favorable weather/tide conditions. As a new activity, the project is part of the Erasmus+ Blended Intensive Programme “Geoarchaeological prospection of North Frisian medieval settlement patterns using geophysical methods”, held as a field and online course in the beginning of September between the CAU Kiel Applied Geophysics work group (Prof. Dr. Wolfgang Rabbel), Ghent University (Prof. Philippe de Smedt) and Vienna University (Prof. Immo Trinks). In this field course, we will investigate preserved settlement terps and field systems in the Eiderstedt Peninsula as a comparison to similar sites in the Wadden Sea area. The costs are largely covered by special Erasmus-funding.

Included in the budget for 2022 is the salary for one student assistant (Hiwi) during the months of January and February, who prepares GIS data for medieval landscape reconstruction in the North Frisian Wadden Sea area. A new Hiwi is hired for 2 months during mid-April to Mid-June, who will analyse seismic data from the North Frisian Wadden Sea in search of medieval dyke systems, as a follow-up of a successful case study in his Bachelor’s thesis. Further funding is planned for the salary of 4 months of Hiwi assistance to work on legacy excavation data of the Norderheverprojekt, which conducted terp excavations in the Halligen area as well as on Nordstrand and Pellworm. Preparations for a grant application (DFG-Forschungsgruppe) are still in progress in collaboration with the partners mentioned above. A joint workshop with the Terp research group in Groningen/Netherlands had to be postponed and is still in planning, but a separate application for funding might be necessary. Further participation in international conferences in 2022 is planned for the Internationales Sachsensymposium, held in Krakow/Poland in September.

PD Dr. Jens Schneeweiß:

Conflict Research at the Boundaries of the Slavic World

The main overarching research question is to identify conflict potentials in territorial and cultural border areas of the Slavic world and the main strategies that were developed to deal with them. The investigations concentrate on two spatially and temporally distinct focal issues: a) the cultural border between the Eastern Slavs and the Scandinavians in the Viking Age, and b) the territorial border between the Western Slavs and the Germans in the High Middle Ages.

On the one hand, two case studies examine fortification landscapes along river courses that served as long-distance trade routes (Volkhov, Daugava). Here, conflict resolution strategies particularly in the cultural boundary sphere are being investigated. Conflict potentials arose from the clash of different languages, cultural conditioning, subsistence strategies, and economic interests. Based on the premise that conflicts did not escalate as long as all parties involved in trade were satisfied, the question is explored to what extent a functioning fortification system was necessary and useful for the maintenance of trade. On the other hand, my research focuses on a settlement landscape characterised by a special village form ("Rundling"). Its emergence is closely related to the successful German expansion policy into Slavic settlement areas. Using the Rundling as an example, the hypothesis is explored as to whether Henry the Lion's settlement policy towards the Slavs was so successful because it relied on de-escalation instead of confrontation. The greatest potential for conflict resulted from Christianisation, as it demanded fundamental changes in all areas of life.

For the two fortification landscapes on the Volkhov and Daugava rivers, the first result will be a GIS-based atlas. It will include standardised topographic maps of all fortified archaeological sites and their immediate surroundings, thematic maps on key issues and digital modelling of the waterways in the past. It creates a uniform and comparable working basis for all subsequent analyses. This is currently the greatest desideratum. Both study regions are being investigated in cooperation with partners from Latvia, Poland and Russia. Fortunately, a working meeting in Saint Petersburg and Moscow could take place in February 2020 just before the first lockdown. Since no field work abroad was possible in 2020, the possibilities of modern remote sensing methods with satellite images have been explored so far, and third-party funding applications have been prepared and submitted. A bilateral DFG-RFBR application for the Volkhov area was submitted in February 2020 and rejected in December 2020. The resubmission of a revised version is planned in the near future. A DFG-NCN proposal for the Daugava region was submitted in December as part of the Beethoven Programme. It contains a strong linguistic component represented by Ilja Serzant's ROOTS Professorship. The GIS projects are set up at the GIS department of the ZBSA. Overall, the extensive restrictions in 2020 led to a delay in the development of this international cooperation project. In the Hanover Wendland, potential deserted village sites have been magnetically prospected and initial sondage excavations have been carried out. The aim of these activities is to find a village that was already deserted in the Middle Ages, whose shape, character and history can then be investigated in more detail. So far, our ideas about the inhabitants and the original horseshoe shape of the Rundlings have been mainly based on retrospective cadastral map evaluations and historical arguments. Archaeological investigations in the villages or on deserted village sites are an important desideratum. In 2020, field work could only take

place to a limited extent. So far, only one potential site has been identified that fulfils several of the desired criteria. At the same time, there was intensive interdisciplinary cooperation on the reorganisation of the permanent exhibition in the Rundlingsmuseum in Lübeln, which will be continued this year.

Dr. Lisa Shindo:

From the Ancient Uses of Wood to the Restitution of Environmental Hazards - A Dendrochronological Approach

Today, the forest in mainland France covers 31% of the territory. It has never been so extensive since the 10th century. However, since the beginning of the Anthropocene, the climate has been changing rapidly and this trend, which accelerated in the middle of the 20th century, is leading to significant variations in temperature and water resources, strongly impacting some mountain forest stands. Thus, in recent years, a global awareness of the value of forests has emerged. The Paris agreement (adopted one year after the 2015 COP21) calls on signatory countries to “conserve and, where appropriate, enhance greenhouse gas sinks and reservoirs [...] including forests”. Indeed, forests store 20% of the world’s carbon emissions each year and wood products also sequester CO₂ during their entire life span. While natural climatic and environmental phenomena have played a major role in the evolution of forests, human activities have also had consequences that prevent the proper regeneration of forest stands. Thus, as early as the 13th century, people made the link between deforestation and environmental risks. However, it was in the 19th and 20th centuries that this interest in the issue of deforestation developed most passionately through publications, which led to the creation of the French Restoration of Mountain Areas (RTM) service to stabilise and revegetate sloping soils in France. Today, the following facts are established for the mountains: the ancient nature of land clearing (since at least the end of the Neolithic period), the long history of torrentiality and the beneficial role of the forest in combating erosion. The uses of wood and the current appearance of mountain forests are thus the heirs of more than 2000 years of demographic fluctuations and human practices that have had a lasting impact on our environment and which still mark it today. The current management of these mountain forests is therefore based on a good knowledge of their past evolution and it is necessary to restore the old silvicultural practices.

The state of forests follows variations in demographic pressure and human activities since the end of the Neolithic: agropastoral activities, mining activities, and construction activities. In the textual sources, the extension of unproductive land, protection, grazing, grubbing and torrentiality are indications of deforestation; demographic falls, on the contrary, favour spontaneous reforestation. From the 17th century onwards in Europe,

the numerous conflicts generated a very high demand for wood, in particular for the war fleets (a medium-sized ship requires between 3,000 and 4,000 oaks!). For example, several very precise surveys show that there were more than 5,000 oak trees that could be used immediately by the Navy in 1689 around Digne city, and this figure fell to less than 500 in 1725. Alpine mining operations also consumed timber and firewood, and impacted the surrounding forests. But populations are not solely responsible and the climate also had an impact on the forests. Thus, the Little Ice Age was characterised by a general drop in temperatures, accompanied by high rainfall between ca. 1560 and 1850. These parameters were not favourable to tree growth and accelerated the erosion of land exposed by deforestation.

My last project, "mining pollution", aims to characterise and quantify mining pollutants fixed by trees, in order to describe former mining operations. Following the first X-ray fluorescence (XRF) tests carried out by Clemens von Scheffer on archaeological woods, we chose to work on current living trees in order to establish a model. The dendrochronological cores were taken during the summer 2021 and I will analyse them in the next months. However, due to an equipment problem and the departure of C. von Scheffer, the project may be blocked. From a methodological point of view, I have recently published a way to distinguish between archaeological woods from two different regions (the Alps and the Massif Central). The long-distance trade of wood from source forests (very often in the mountains) to urban areas on the plains and the coasts has been documented since antiquity. Questions about the organisation of these exchanges of wood and people are still relevant today. My work provides an additional tool to understand the relationships between mountains and plains. Finally, the dendrochronology laboratory is physically operational. However, despite several interventions during courses, I have not yet succeeded in motivating students to come and learn about dendrochronology.

Dr. Chiara Thumiger:

History of Ancient Medicine

This project focuses on a key, but comparatively underrated aspect of ancient medicine and anatomy: the gastric area of the body and the process of food ingestion and assimilation. Other functions and vital processes have attracted more attention in historiographies of medicine, such as the role of the brain in cognition, cardiocentric models in competition with encephalocentrism, blood circulation, the humours and respiration. Despite its well-known importance and involvement in a variety of aspects of animated life, the gastric sphere, instead, has not been a central topic. My aim is to redress this balance, exploring the topic from the most concrete and material – the construction

of different bodily anatomies and physiological models; the pragmatic, social and economic aspects of human food intake – to the most abstract – psychological and cultural, even metaphorical ‘guts’. This topic is innovative in a number of ways. First, it focuses on an aspect of the human body and its physiology that are seldom addressed, despite their obvious centrality. Secondly, it combines the philology of ancient texts, history of medicine, and material and cultural history in a broader sense, while including considerations of current neuroscientific suggestions to bring ancient theories in dialogue with modern views about the body. Thirdly, it explicitly joins medical models and non-technical perceptions and metaphors of the body and finally, it aims to bring together the history of ancient doctrines about the body and the concrete, material history of ancient life in one of its most basic aspects, the consumption of food and drink and its processes. Thus, this study intends to further a dialogue between different areas of history, while strongly affirming the relevance of ancient texts to contemporary questions.

The lines of inquiry that I propose can be subdivided, for the purpose of presentation, into anatomical, medical, environmental and cultural issues; in terms of practical inquiry, the issues are interrelated and illumine one another. Anatomical: Guts and the human body in ancient medicine: localisation, organs, processes, pathologies. What are the shapes taken by the mapping of the ‘third’, lowest *stratum* of the human body (located inferior to head and heart) often taken for granted by readers and historians? Medical: The holistic prominence of urine and feces (and other excreta) in ancient medicine (as far as prognosis, diagnosis, dietetics, as well as case studies are concerned): a cultural and medical-historical analysis; Nutritional dietetics and its cultural/anthropological variables; Noteworthy gut-related medical data: eating disturbances (hunger, food deprivation and excessive food intake), fatness and thinness, pathologies and anomalies of the excretory system; Mental disorders and guts: *stomachikon*, *boulimos*, *melancholia*, disease of the *hypochondria* and other examples; Guts and psychological connectionism – the ‘gut brain’ axis: the tradition and history behind a brand new topic in neuroscience. Environmental: The economy and politics of food availability and consumption in dialogue with ancient medicine; the ‘belly of the earth’: analogic and metaphorical relationships between guts and environment as a key to human ecological existence.

Over the course of six years, I plan to produce a monograph devoted to the topic of ‘ancient guts’ in the articulations that I have outlined, as well as a number of articles and presentations on related topics, in line with my current level of productivity. I also propose to organise a conference on the topic of guts in an interdisciplinary and comparative perspective, aimed at bringing the history of Graeco-Roman medicine in dialogue with other anthropologies, with cultural and literary history, and with current discussions in

neuroscience. I would welcome the opportunity to teach topics in cultural history and history of (ancient) medicine.

Dr. Guillermo Torres:

Genetic Adaptation of Humans over the Last 10,000 Years

I started my postdoctoral position in Computational Genetics within the Subcluster Dietary ROOTS on August 1, 2019. My research is based on the premise that the transition from nomadic to sedentary lifestyles about 7000 years ago in Europe has exposed us humans to a wide range of nutritional, environmental, geographic and immunological challenges. These challenges have contributed to genetic and consequently phenotypic differentiation between human groups and populations at both temporal and geographic scales. The research achievements in this framework since 2019 are:

- (1) The first point here should be the design of a methodological approach (i.e. a customised gene capture) that captures specific regions of the human genome, particularly those containing variants associated with metabolic diseases, nutrition-related pathways (i.e. carbohydrate and lipid metabolism), disease risk, and population ancestry markers.
- (2) To process the genetic information obtained with the customised gene capture (1), a workflow (pipeline) has been successfully implemented. To date, I have processed ancient DNA (aDNA) samples from 270 individuals dating from 1500 to 5000 BCE and analysed variants associated with immune and metabolic diseases to identify significant shifts in allele frequencies (>10%) over time. For instance, striking frequency shifts were observed for variants in *IL23R*, a gene that regulates immune response outcomes. We are currently conducting an *IL23R*-specific gene capture to investigate whether i) the linkage disequilibrium in the gene structure changed, ii) its variants were under selection or iii) the shifts were caused by admixture with other populations.
- (3) A considerable number of adapted metabolic and phenotypic traits are complex. This means that they are explained by a large number of variants with small effects. One way to assess the likelihood of carrying a complex phenotype is to evaluate the joined effect of multiple variants through a polygenic risk score (PRS). This is particularly relevant when we consider polygenic adaptations – the determination of PRS for modern populations could allow us to also estimate the risk of the phenotype under study in ancient populations. To develop a workflow for the identification of such polygenic adaptations in aDNA, I first explored the

concept of PRS using a modern dataset (4950 genotyped samples). I calculated PRS for seven diseases such as arterial atrial fibrillation, coronary heart disease, colorectal carcinoma, ischemic stroke, Parkinson's disease and type 2 diabetes (T2D) disorders. A publication will be submitted shortly. In a next step, I will adapt the workflow to aDNA and calculate risk scores for ancient populations.

One way to understand and explore the environment that surrounds us is to study symbiotic microorganisms. They respond and adapt faster than we do to environmental changes, such as food sources, diseases and geographical conditions. Below, I will highlight my research findings in this area:

(1) I was able to reconstruct a human oral microbiome from a birch bark mastic which dates to the Neolithic. This ancient "chewing gum" was enriched with common microbes from the oral cavity, especially those that contribute to plaque formation. I also detected bioindicators of poor oral hygiene, but no cariogenic (*Streptococcus mutans* and *Lactobacillus spp.*) or periodontitis-associated (*Porphyromonas gingivalis* and *Fusobacterium nucleatum*) bacteria. Furthermore, I reconstructed the genome of *Streptococcus sanguinis* with a 7.8-fold depth. This indicates a high abundance of this bacterium. The presence of *S. sanguinis* together with its high abundance and the general microbial profile detected suggests a high plaque mass, but healthy (caries-free) teeth with no signs of periodontitis or inflammatory diseases in the oral cavity. A publication is in preparation.

(2) Dental calculus, an important archive of the human oral microbiome, was collected from 233 individuals. The samples dated from 7000 CE to modern times. I have compared the ecological structure of oral microbiomes through time and would like to highlight the following findings

(a) Both the diversity of the oral microbiome and pathogens associated with inflammatory diseases decreased over time.

(b) Microbes associated with starch and polysaccharide metabolism, cariogenic and opportunistic pathogens are more abundant in medieval and modern than in Neolithic samples.

(c) I also found some environmental bioindicators, such as microbes associated with water sources with different salinity and/or algal blooms.

The findings are the basis of two publications, which are currently in preparation.

(1) Water quality and health condition in ancient times. The project aims to characterise microbial communities associated with water quality and/or environmental changes in ancient aqueducts that may have affected the development of human societies in the past as well as urban lifestyles. Unfortunately, the project is delayed because of the COVID-19 situation. Due to travel restrictions, the samples could only be collected recently in Tunisia. Samples will be prioritised for processing once they arrive at our lab and then will be analysed by me. This project is funded by a ROOTS internal grant (successful proposal 2019).



Field work on the Gumelnița tell settlement of Chiselet (ca. 4650-4250/4150 BCE) near Sultana, Romania (photo: Sara Jagiolla).



Finds from the Gumelnița tell settlement of Chiselet (ca. 4650-4250/4150 BCE), lower Danube, Romania. Depicted here are a flint dagger, a zoomorphic figurine, a bone awl with haft, a ceramic sieve vessel, and a fragment of a harpoon made of bone (photo: Agnes Heitmann).

5 Interdisciplinary Research Grants and Interlinkage Groups

5.1 Overarching Interdisciplinary Research Projects

To stimulate research activities between subclusters, ROOTS invites internal calls for joint research projects, for which the proponents are PIs of at least two subclusters. Proposals are possible in a financial range up to 75k€, and with project runtimes ranging up to two years. This ROOTS internal funding, in particular, is also used as seed funding / pilote studies for external funding proposals. Funding decisions are met by the ROOTS executive board upon suggestions from an internal ROOTS committee, which has been complemented by external reviewers since 2021. The 1st round was initiated in 2020, followed by a 2nd in 2021, and a 3rd round is currently under way. As a result, the 10 following projects are presently in progress:

Since 2020:

Big Exchange: Searching for Knowledge, Social Inequality and Politics behind Exceptional Large-Scale Networks in European Prehistory / Tim Kerig, Jutta Kneisel, Oliver Nakoinz, *Johanna Hilpert*

“Boas Talks” / Henny Piezonka, Vesa Arponen, Nils Müller-Scheeßel, Jens Schneeweiß, Maria Wunderlich

Water quality and health conditions in ancient times: an assessment of Roman Empire aqueducts via metagenomic analyses of fossilised biofilms from Sufetula (Sbeitla, Tunisia) / Guillermo Torres, Nicolas Lamare in cooperation with Mohamed Ben Nejma

Gardens, Human Senses and Eudaimonia / Konrad Ott, Chiara Thumiger, Timo Felber, René Ohlrau, Wiebke Kirleis, *Dana Zentgraf, Laura Schmidt,*

Testing hypotheses of socio-environmental hazards in fostering social inequality across Late Neolithic and Bronze Age Europe / Mara Weinelt, Johannes Müller, *Ralph Großmann*

Since 2021:

Interlinking exchange: The search for communalities in prehistoric networks (Europe, W-Asia, N-Africa – from 8000 to 1 BCE) / Johanna Hilpert, Tim Kerig, Lorenz Kienle, Jutta Kneisel, Oliver Nakoinz, Matthias Renz, Andrea Ricci, *Yamirka Rojas-Agramonte*

Between domestication and invasion: Rethinking the socio-environmental ROOTS of crops, weeds and invasive species / Sofia Filatova, Wiebke Kirleis, va H. Stukenbrock, Alexandra Erfmeier, Konrad Ott, Ben Krause-Kyora, Katrin Schöps, Jens Schneeweiß, and Guillermo Torres

The Forest Finns as a Model for the Early Slavic Migration / J. Schneeweiß, M. Schmid, V. Arponen, B. Krause-Kyora, H. Piezonka, W. Kirleis, E. Eckmeier, S. Filatova, J. Meadows

Food production pathways (FPP), dietary dynamics, and climate change in the southern Levant / Cheryl Makarewicz, Ralph Schneider, Henny Piezonka

3DARK DEPTH - Describing, Discussing and Developing Analytical Research Knowledge of the Dark Earth Phenomenon in Theory and Practice / Jens Schneeweiß, Eileen Eckmeier, Pawel Cembrzynski, Ben Krause-Kyora, Wiebke Kirleis, Katrin Schöps

Since 2022:

Cattle, mobile connectivities, and Neolithic pastoral herders of the Baltic-Pontic (MOBILEGAP) / Cheryl Makarewicz, Johannes Müller

Analog Modeling of the Neolithic and Bronze Age Socio-Environmental Interactions in Northern Central Europe, 4000-1500 BCE / Vesa Arponen, Jutta Kneisel, Oliver Nakoinz, René Ohlrau, Ilka Parchmann, Maria Wunderlich

Strengthening connectivity: Pits in the landscape as an expression of social cooperation and conflict avoidance (Socializing events or linear borders? The seizure of the landscape with fire pits and pit alignments) / Jutta Kneisel, Tim Kerig, Oliver Nakoinz, Wolfgang Rabbel, Andrea Ricci

The Cluster of Excellence ROOTS regularly invites its members to apply for funding in support of research projects that address ‘Social, Environmental, and Cultural Connectivity in Past Societies’ with a duration of up to 2 years. The maximum funding that individual projects may apply for is 75,000 EUR. Projects must address at least one of the following overarching research themes beyond single subcluster topics in order:

(1) to explore the roots of social, environmental, and cultural phenomena and processes that substantially marked past human development within a broad interdisciplinary conceptual framework; (2) to investigate archaeological and historical “laboratories” under the basic assumption that humans and environments deeply shaped each other, creating socio-environmental connectivities which still persist today; (3) to gain a better understanding of interwoven past socio-environmental dynamics and thus shed light on the “roots” of current challenges and crises under diverse economic, ecological, and social

conditions; (4) to answer the essential questions about our own role and fragility in the global system, and how to deal with the consequences of climate and environmental change, increasing urbanisation, social developments, conflict potentials, and the role of stability and mobility in identity processes; (5) to abstract general patterns of human behaviour and coping strategies in response to changing conditions from diachronically explored patterns; (6) to enable a re-assessment of modern phenomena based on knowledge which takes past changes into account; (7) to more closely combine research cultures predominantly using empirical analyses and theoretical concepts.

The proposed projects should, for example, seek to define and explain diagnostic phenomena and processes encountered in case studies across the different ROOTS subclusters in search of their wider applicability and application.

Table 1 of Overarching research projects funded until 2021 by the Cluster of Excellence ROOTS.

ID	Interdisciplinary Research Projects	Funding period
1	Big Exchange: Searching for Knowledge, Social Inequality and Politics behind Exceptional Large-Scale Networks in European Prehistory	2020
2	Implementing connectivity for ROOTS: "Boas Talks" - Scientific colloquium commemorating the 140th anniversary of Franz Boas' Doctorate & Relaunch of the Ethnographisch-Archaeologische Zeitschrift	2020
3	Water quality and health conditions in ancient times: an assessment of Roman Empire aqueducts via metagenomic analyses of fossilised biofilms from Sufetula (Sbeitla, Tunisia)	2020
4	Gardens, Human Senses and Eudaimonia: Epicurus, Gardens and Smellscape	2020
5	Testing hypotheses of socio-environmental hazards in fostering social inequality and migration across Late Neolithic and Bronze Age Europe	2020
6	Interlinking exchange: The search for communalities in prehistoric networks (Europe, W-Asia, N-Africa – from 8000 to 1 BCE)	2021
7	3DARK DEPTH - Describing, Discussing and Developing Analytical Research Knowledge of the Dark Earth Phenomenon in Theory and Practice	2021
8	Food production pathways (FPP), dietary dynamics, and climate change in the southern Levant	2021
9	Between domestication and invasion: Rethinking the socio-environmental of ROOTS of crops, weeds and invasive species	2021
10	The Forest Finns as a Model for the Early Slavic Migration	2021
11	Cattle, mobile connectivities, and Neolithic pastoral herders of the Baltic-Pontic (MOBILEGAP)	2022
12	Analog Modeling of the Neolithic and Bronze Age Socio-Environmental Interactions in Northern Central Europe, 4000-1500 BCE	2022
13	Strengthening connectivity: Pits in the landscape as an expression of social cooperation and conflict avoidance (Socializing events or linear borders? The seizure of the landscape with fire pits and pit alignments)	2022

1 / Big Exchange: Searching for Knowledge, Social Inequality and Politics behind Exceptional Large-Scale Networks in European Prehistory

Subclusters involved:

ROOTS of Inequalities, Knowledge ROOTS, ROOTS of Conflict and Conciliation

Principal investigators:

PD Dr. Tim Kerig, Dr. Jutta Kneisel, PD Dr. Oliver Nakoinz

Post-Doctoral researchers:

Dr. Johanna Hilpert

External collaborators: -

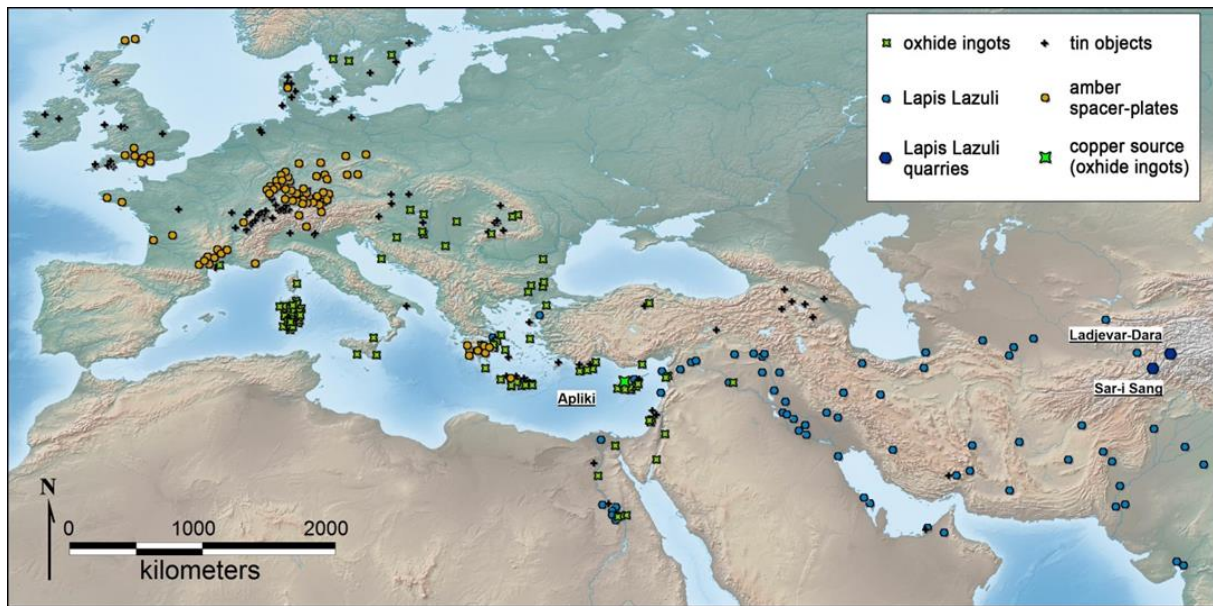


Figure 08: Paneuropean distribution of exemplary goods in the Bronze Age: oxhide ingots incl. representations (Sabatini & Lo Schiavo 2020; Sabatini 2016); Lapis Lazuli (Casanova 2019, Massa & Palmisano 2018); amber spacer-plates (Kristiansen 2016); tin objects (Berger 2019; Nessel 2019). Background map made with Natural Earth, design Hilpert.

Project outline

Networks connect, e.g., production at a source to demand in a distance, regardless if it is the supply of abundant goods, like small tools, or highly valued diplomatic gifts. Distribution patterns of artifacts and/or raw materials are an expression of these networks as the spread of objects and ideas follow and form their internal organisation in a reciprocal way.

The project aims on the most important examples of outstanding large-scale networks in European prehistory. It collects already available datasets as well as digitises published data to standardise and describe those networks with indices. Network parameters will be synchronised with then already available ROOTS indices of social inequality (e.g. Gini coefficients of settlement and graveyard data) and warfare (e.g. fortifications, rates of change in weaponry development, trauma-data). To fulfil the objectives, the project uses a questionnaire approach. Currently, generating ideas on the knowledge involved requires qualitative reasoning. The project will identify network-related variables for modelling social processes behind large networks, thus contributing to a more general aim of ROOTS: How are connectivity, social inequality, knowledge and violence affected by each other and dialectically interrelated?

2 / Implementing connectivity for ROOTS: “Boas Talks” - Scientific colloquium commemorating the 140th anniversary of Franz Boas' Doctorate & Relaunch of the Ethnographisch-Archaeologische Zeitschrift

Subclusters involved:

ROOTS of Inequalities, Knowledge ROOTS, ROOTS of Conflict and Conciliation, Humanities Platform

Principal investigators:

Dr. Henny Piezonka, Dr. Vesa Arponen, Dr. Nils Müller-Scheeßel, Dr. Jens Schneeweiß, Dr. Maria Wunderlich

Post-Doctoral researchers: -

External collaborators: -

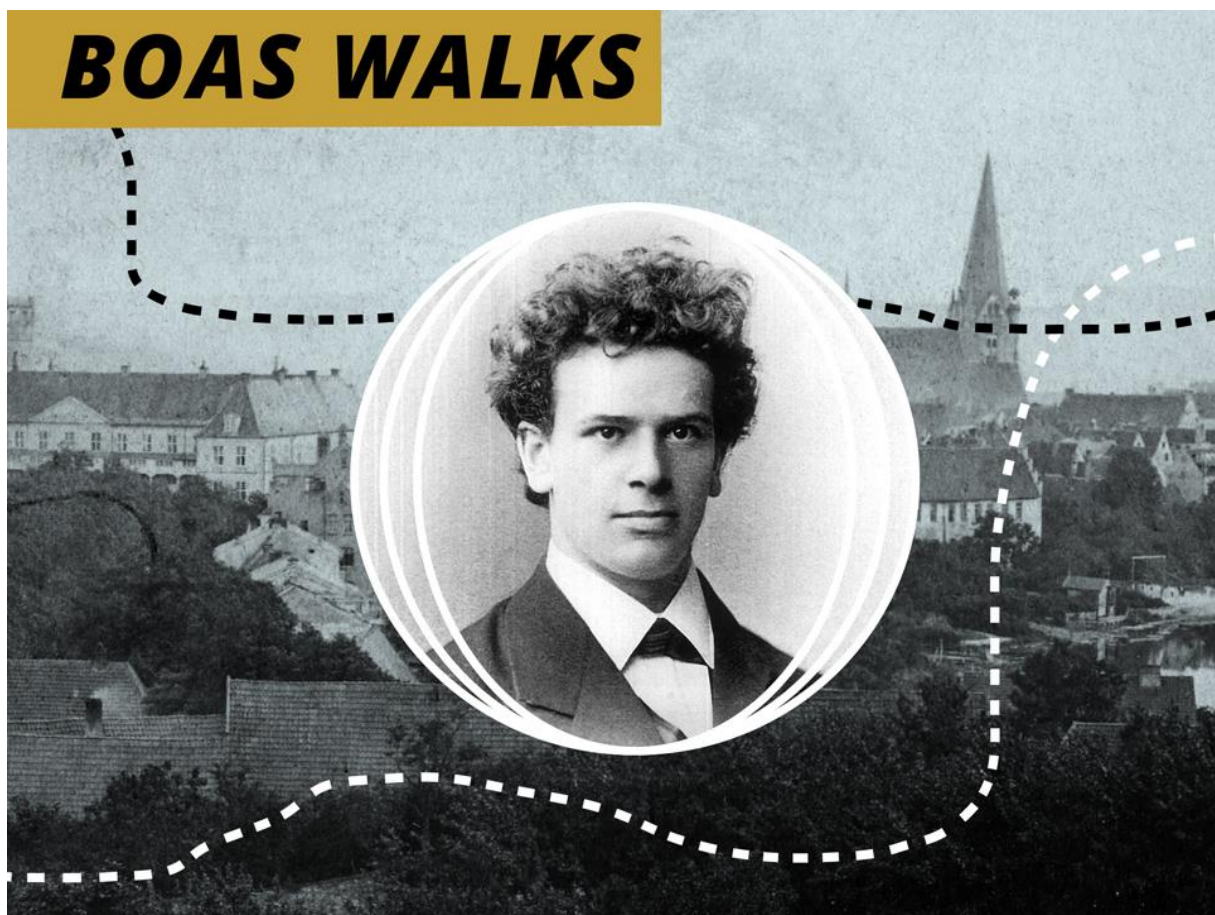


Figure 09: Boas Walks Figure

Project outline

Although Franz Boas only spent a brief time in Kiel throughout his prolific scientific career, he completed his first career milestone here. He received his doctorate from Kiel

University in 1881 for his dissertation *Contributions to the Perception of the Color of Water*. The methodological and interpretive frameworks that he developed at Columbia University along with the legacy among his students had a decisive influence on the development of cultural anthropology. Boas emphasised that “the data of anthropology teach us a greater tolerance of forms of civilization different from our own”. This is particularly relevant today against the backdrop of current methodological and theoretical trends as well as in light of further global environmental, societal and political developments.

Within the post-modern humanities, integrated discourses in a Boasian sense that bridge archaeology, social and cultural anthropology, linguistics and philosophy are becoming increasingly relevant. The overarching aim is to accomplish a more complete and comprehensive understanding of the human condition and its variability across space and time. Fields, such as ethnoarchaeology, archaeological archaeology and historical anthropology, make contributions to this agenda, e.g., by evaluating the relevance of cross-cultural comparisons, by incorporating multi-vocal scopes and shared authority in research designs, by integrating *longue durée* perspectives, and by critically reflecting the position of the researchers themselves and their relation to the “others” they study. In this respect, an anthropologically situated archaeology is becoming increasingly relevant in societal and political discourses.

In November 2021, 140 years after Boas’ doctorate, we renew Kiel’s early connection to this outstanding scholar with a scientific colloquium. Drawing on his later seminal works, we will discuss developing trends, recent advancements, and enrich points of contact between the archaeological and anthropological frameworks.

In keeping with current plans, the “Boas Talks” colloquium will take place in Kiel “analogously” over two days, featuring 15-minute talks from invited guests, followed by discussions and plenty of opportunity to debate and develop ideas in a relaxed colloquium atmosphere.

3 / Water quality and health conditions in ancient times: an assessment of Roman Empire aqueducts via metagenomic analyses of fossilised biofilms from Sufetula (Sbeitla, Tunisia)

Subclusters involved: Dietary ROOTS, Urban ROOTS

Principal investigators: Dr. Guillermo Torres, Dr. Nicolas Lamare

Post-Doctoral researchers: -

External collaborators: Mohamed Ben Nejma (Institut national du Patrimoine, Tunis)

Project outline

From ancient to modern times, human populations have exploited water springs not only for recreational purposes or for religious practices but also for medicinal reasons and as drinking water supplies. Because water springs are transition areas between groundwater, surface water, and the terrestrial ecosystem, they display a particular microbial community signature that consists of both endemic species and those deriving from the surrounding environments. In modern as in ancient times, water sources like this have been coupled to aqueducts, and unfortunately, by the time the water reaches the consumer, its quality may have differed dramatically from the source point, for example, bacterial cells can attach to each other forming biofilms on the surface of the pipes. In Roman times, there were beliefs and empirical knowledge concerning the quality of water. However, the quality of aqueduct water from ancient cities has never been properly assessed, leaving open questions regarding the biotic and abiotic composition of the water channels.

The project will be based on the study of fossilised biofilms from the aqueduct of the ancient city of Sufetula (Sbeitla, Tunisia) from the 1st to the 6th century AD, in order to characterise the water quality and detect possible pathogen contamination. To tackle this research endeavour, our study will analyse carbonate deposits preserved in the aqueduct conduit. This study is a first test on this material that will highlight the potential of such analyses to improve knowledge about health conditions in antiquity. The project aims to a) identify the microbiome of ancient aqueducts through metagenomic analysis where microscope analyses were not conclusive, b) to identify possible correlations between seasonal weather (stable isotopes) and the development of certain microorganisms, c) to assess the quality of the aqueducts' water in Roman times and late antiquity, and d) to identify the possible diffusion of contamination.

4 / Gardens, Human Senses and Eudaimonia: Epicurus, Gardens and Smellscape

Subclusters involved: Reflective Turn Forum, Urban ROOTS, Knowledge ROOTS, Dietary ROOTS, Roots of Inequality

Principal investigators: Prof. Dr. Konrad Ott, PD Dr. Chiara Thumiger, Prof. Dr. Timo Felber, Prof. Dr. Wiebke Kirleis

Post-Doctoral researchers: Laura Schmidt, M.A., Dr. René Ohlrau

PhD candidates: Dana Zentgraf, M.A.

External collaborators: -



Figure 10: Casa del Bracciale d'Oro nell'Insula Occidentalis di Pompei, ambiente 32 (image by concession of the Ministero per i Beni e le Attività Culturali e per il Turismo - Parco Archeologico di Pompei)

Project outline

Since ancient times, next to serving pure economic needs, gardens have been perceived as locations of pleasure and joy. Gardens affect most or all human senses. This project wishes to research the deep historical roots of one specific garden characteristic by exploring how humans have recognised the benefits offered by pleasant garden scents in their daily life during three different stages in European history: antiquity, medieval times, and modernity. On the premise that humans, nowadays as much as in the past, share the need to be surrounded by pleasant environmental sensorial stimulations, the project focuses on the history of the perception and appreciation of gardens as an instrument toward the achievement and enjoyment of a 'good life'. We aim to extend our results from archaeological investigations to a reflection on the concept of a 'good life' in the Anthropocene in general.

Gardens undoubtedly offer high value to human life. Gardening is an easily accessible, dynamic and flexible activity. These characteristics made gardening a successful strategy for human survival and wellbeing across different times and places. Secondly, in addition to their dietary contributions, gardens are also places of sensorial enjoyment of a synaesthetic kind: singing birds, murmuring fountains, colourful flowerbeds and, last but not least, the intense scent of aromatic plants, such as rosemary bushes, are traditionally experienced as an enhancement of feelings of calmness, peacefulness, and contentment.

As such, gardening and the enjoyment thereof leads towards eudaimonia, 'happiness' or 'flourishing' in the fullest and deepest ethical sense, to the point of being favoured by philosophers as a locus of intellectual discussion (Epicurus' 'Garden', *kēpos* being only the most famous example). Moreover, gardens are recognised medically for the multiple therapeutic benefits they offer. Here, we see a connection between eudaimonia and health, as explored in recent psychosomatic medicine.

In comparison, the pleasing fragrances and scents offered by gardens are obviously contrasted with the unpleasant smells of other parts of city. The reconstruction of vegescapes that are deeply interrelated to the smellscapes of ancient towns from a material point of view can be supported by archaeobotanical investigations that allow tracing different activity areas in the densely settled space.

These include potentially smelly waste depositions in the streets, swampy areas alongside water courses where animals gather, with people coming to dump waste or to wash dishes, clothes or themselves and at the same time collect water for different purposes, or muddy market places where ruderal floras were established. It is by far more difficult to archaeobotanically trace ancient gardens directly. This is where written sources or iconographic depictions come into play.

On a socioeconomic account, the project explores the 'Garden City' movement, which developed a utopian alternative to the unpleasantness of the modern industrial city during the late 19th century. With his book *To-morrow: A peaceful path to real reform*, Ebenezer Howard envisioned vast planned polycentric urban agglomerations which integrated gardens and the countryside into the city. The Garden City concept is heavily influenced by utopian back-to-the-land communities and socialist ideas such as Kropotkin's industrial villages.

Howard's vision of town planning was intended to solve many issues of the late 19th century, among them the detrimental working conditions reducing the health of citizens, especially factory smoke. As Howard (1898, 10) put it "Town and country must be married, and out of this joyous union will spring a new hope, a new life, a new civilization". With the Garden City movement, we explore the opposition between city and countryside which envisions gardens even more as places of escape and peaceful recovery due to the construction of an alternative, ideal environment.

This project concentrates precisely on the sensorial dimension of olfactory experiences and scents, a relatively underexplored sphere, which has lately become the object of increased attention in sensorial scholarship, and how varying smells and fragrances affected the quality of human life in different time periods. Our framework is thus provided by a philosophical approach to a eudaimonistic appreciation of the human

environment. Furthermore, it is based on the premise that gardens are eminently of 'human' creation as special environments defined by human activity, within which we act and interact on different levels.

The study of ancient views on the influence of garden scents on human life, in general, as well as in philosophical and medical cultures will be one part of the project. As an important complement and chronological consequence, views on gardens from the Middle Ages will also be discussed. During medieval times, a close connection between courts and monasteries, which enabled the reception of ancient texts and ways of life including garden experiences, is noteworthy. In his *De vegetabilibus* (ca. CE 1260), Albertus Magnus (I, 149) mentions "green pleasure gardens" (*viridaria*) which "are places arranged not for their great benefit or their crop, but for pleasure" ("*sunt autem quidam utilitatis non magnae aut fructus loca, sed ob delectationem parata*"). The role of olfactory experiences is present in literary sources where medieval gardens are described or evoked. In medieval times, in fact, authors presented gardens as a promise of happiness. Hartmann von Aue, for instance, speaks in his *Iwein* (ca. CE 1200) of a spacious garden in which cultivated vegetation with its blossoms and grass offers copious opportunities for leisure and sensuality ("*vil süezen smac*" / "sehr herrlichen Duft", ll. 6435–6451). Such idyllic garden motifs of the chivalric romance time with the pattern of the *locus amoenus*, as a projective place of longing, evokes pleasure, love and a lost 'Golden Age'. What role did the sense of smell play in the construction of this picture of gardens? Which elements of reception, adaptation or change emerge from the ancient.

Last but not least, the outcome of our historical research will be connected to contemporary studies in the field of environmental ethics with a focus on the values of gardening as an overarching theme. Environmental ethics, in fact, has recently highlighted the importance of eudaimonic values with respect to different types of semi-natural environments. Among them, gardening has become a fashionable topic both in theory and practice, as one can see in transition towns – towns which have devoted themselves to a forerunner role in becoming low-carbon, environmentally friendly, smart and inclusive communities. Moreover, within the phenomenology of nature, there is growing interest in smell-scapes. Environmentalists have consistently combated air pollution but, in contrast, have neglected the positive impacts of natural smell-scapes from the sea, forests, and gardens – just to name two possible environmental and ethical starting points of our topic. The topic of garden scents has great potential as we connect ancient ways of having a 'good life' with contemporary environmental ethics and the philosophy of health.

5 / Testing hypotheses of socio-environmental hazards in fostering social inequality across Late Neolithic and Bronze Age Europe

Subclusters involved:

ROOTS of Socio-Environmental Hazards, ROOTS of Inequalities

Principal investigators:

PD Dr. Mara Weinelt, Prof. Dr. Johannes Müller

Post-Doctoral researchers:

Dr. Ralph Großmann

PhD candidates: -

External Collaborators: -

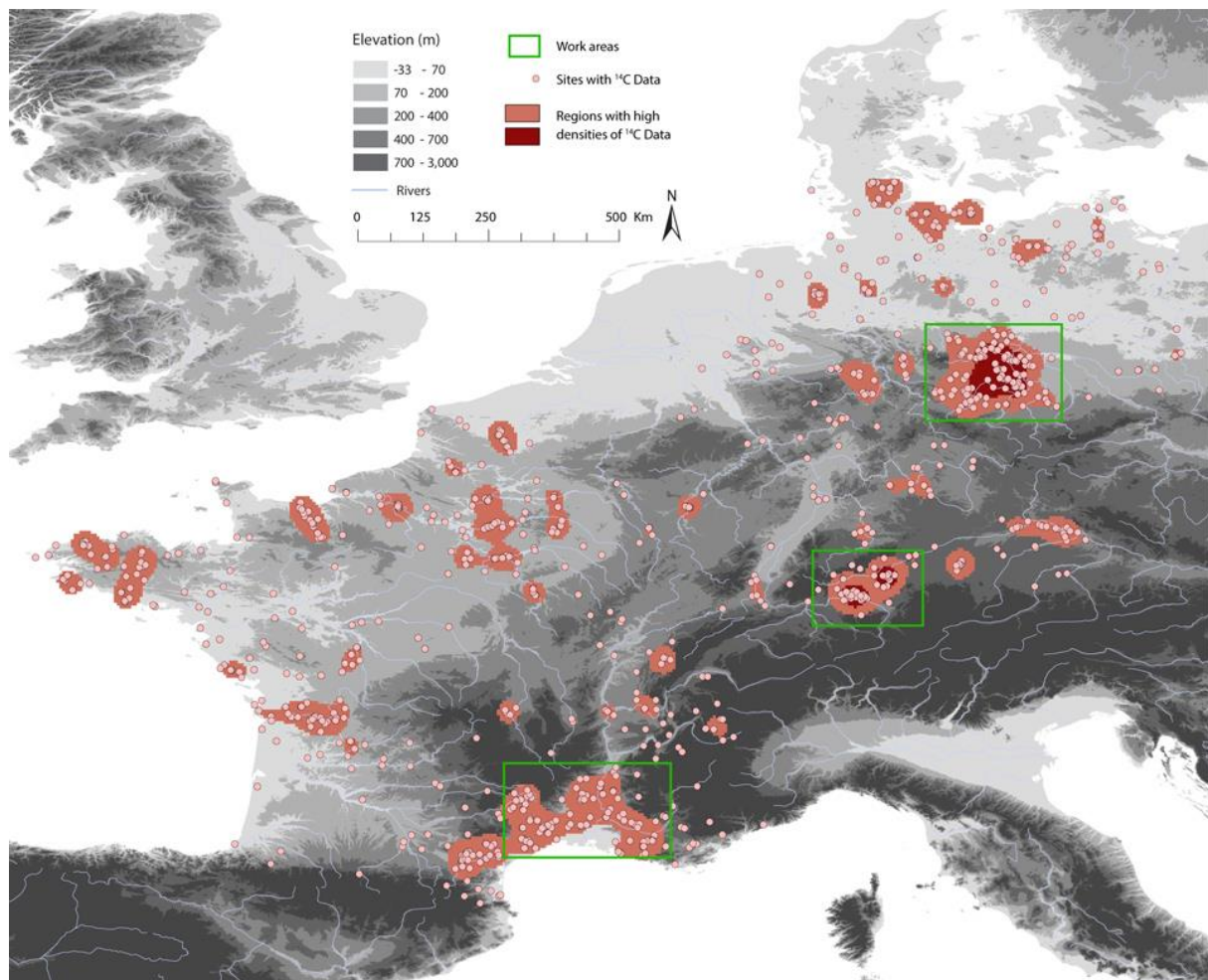


Figure 11: Distribution and varying concentrations of ¹⁴C data per site for France and Germany between 3500 and 1500 BCE and the focused study areas (Source: Radon/Radon B, Kiel University).

Project outline

This project links the research agendas pursued by the subclusters “ROOTS of Socio-Environmental Hazards” and “ROOTS of Inequalities” and aims at building a coherent database to empirically test hypotheses of socio-environmental dynamics in a trans-European perspective. Under the lens of socio-environmental connectivity, it is a key aim to explore how past societies have coped with climate and environmental hazards. Arguably, episodes of increased socio-environmental stress related to resource scarcity fostered social inequality and led to a decay of socio-environmental connectivity, possibly triggering migration.

The project focuses on the period between 3500 and 1500 BCE and compiles data about settlement structures and settlement intensities as well as burial rites and technical innovations. Furthermore, the database includes detailed regional climate reconstructions of precipitation and temperature changes, land use intensity, as well as a large number of 14C data from archaeological contexts as assembled in the RADON and RADON B databases hosted at the Institute of Pre- and Protohistoric Archaeology, Kiel University.

Based on this data foundation, social inequalities are calculated with respect to house size and household differences. This approach already provided estimates of social inequality both on regional and global scale. The project focuses on several regions with high agglomerations of settlement records, also on a diachronic perspective. Hence, a transect from Central Germany, the Alpine Foothills and to Southern France is discussed. By comparing these regions, we can identify Late Neolithic to Bronze Age settlement dynamics and changes in settlement structures which probably differ on a regional level. These changes likely led to transformations of social inequalities, which may have also been interrelated by shifts in agricultural production. Additionally, these results are correlated with climatic and ecological data to evaluate the impact of environmental hazards and especially of the 4.2 kyr climate event.

6 / Interlinking exchange: The search for communalities in prehistoric networks (Europe, W-Asia, N-Africa - 8000 to 1 BCE)

Subclusters involved:

ROOTS of Inequalities, Knowledge ROOTS, ROOTS of Conflict and Conciliation

Principal investigators:

PD Dr. Tim Kerig, Prof. Dr. Lorenz Kienle, Dr. Jutta, Kneisel, Prof. Dr. Oliver Nakoinz, Prof. Dr. Matthias Renz, Dr. Andrea Ricci

Post-Doctoral researchers:

Dr. Johanna Hilpert

External collaborators:

PD Dr. Yamirka Rojas-Agramonte (Institut für Geowissenschaften | Petrologie und Geodynamik, CAU Kiel)

Project outline

Prehistoric exchange networks satisfied demands for raw materials of daily use as well as for prestige and luxury goods (e.g. flint and ground stone varieties, conchilia, ivory, metals, semi-precious stones). Building on an already existing database of these networks, the project looks into a special and hitherto hardly recognised socio-economic phenomenon in networking: communalities.

Communalities are expected to have had most important effects in economic networks as, e.g., 1) they strengthen already existing ties between exchange partners, 2) already existing ties can be immediately used for the new exchange of goods not distributed so far, using effects of path-dependency and avoiding investments and information costs for the establishment of new partnerships, 3) transaction costs are reduced by simultaneous transactions of several goods, 4) mixed transport allows differentiated adjustment to transport capacities in relation to expected returns, thus 5) triggering the development of comparative advantages.

We define communalities as those parts of networks where different goods flow together between exchange partners, sometimes exchanged even in the same transaction. New and general insights into the economics of prehistoric exchange are expected from the interdisciplinarity between the archaeology of raw material distributions, novel data science approaches and the advice from geo- and material sciences. To which extent are communitality effects crucial internal societal processes, acting as important drivers? If so, communalities can be suspected to be evolutionary shortcuts to build complex social, political, and economic relationships.

The project adopts a network perspective in close collaboration with the archaeologies, data sciences and advisors from geosciences and material sciences regarding raw material provenance.

7 / 3DARK DEPTH - Describing, Discussing and Developing Analytical Research Knowledge of the Dark Earth Phenomenon in Theory and Practice

Subclusters involved:

ROOTS of Conflict, ROOTS of Hazards, Urban ROOTS, Dietary ROOTS, Technical Platform, Communication Platform

Principal investigators:

Schneeweiß, J., Eckmeier, E., Cembrzynski, P., Krause-Kyora, B., Kirleis, W., Schöps, K.

Post-Doctoral researchers: -

External collaborators:

Schlütz, Frank NIHK

Project outline

There are far-reaching cultural-historical implications associated with the anthropogenic Dark Earth Phenomenon: It served as a basis for pre-Columbian civilisation (Terra Preta), as a subject of social and gender studies (African Dark Earth), as marker of late antique transformation of urbanity (Roman Dark Earth) or as a key element in Viking Age subsistence economies (Nordic Dark Earth, Palaeo-Urbanozems) – to mention just some examples. Finally, it is believed that the "miracle earth" can solve some of our current environmental problems in a sustainable way. But, is it all the same? Is it all different? We want to use the potential of Roots to conduct, further develop, present and discuss own research on Northeast-European Dark Earth in Kiel. An international workshop will bring together representatives of the different research areas, enabling the formulation of current research questions and common standards, as well as to document the current state of research in a standard publication.

8 / Food production pathways (FPP), dietary dynamics, and climate change in the southern Levant

Subclusters involved:

Dietary ROOTS, ROOTS of Hazards, ROOTS of Inequality

Principal investigators:

Cheryl Makarewicz, Ralph Schneider, Henny Piezonka

Researchers:

Karolia Varkuleviciutce, Pascal Flohr, Michaela Ecker, John Meadows

External collaborators:

Reuven Yeshurun, Max Price, Lidar Sapir-Hen, Dan Contreras, Phillip Edwards, Bill Finlayson, Christine Winter-Schuh

Project outline

The FPP project provides a novel assessment of the relative contributions of climate-induced resource stress and human niche constructing activities in generating food production pathways. Between 11,000 and 6000 cal BCE, the first experiments in plant cultivation, animal management, and intensification in food production took place in the context of the Younger Dryas and early Holocene shifts in climate regimes. The project will investigate the local amplitude of environmental change associated these climate changes, and its intersection with the anthropogenic modification of the landscape associated with the transition from hunting-gathering to food production, and the degree to which intake of major dietary macronutrients – proteins, carbohydrates, and fats – changed in tandem with hypothesised shifts in resource availability and food production.

9 / Between domestication and invasion: rethinking the socio-environmental ROOTS of crops, weeds and invasive species

Subclusters involved:

Dietary ROOTS, ROOTS of Hazards

Principal investigators:

Wiebe Kirleis, Eva H. Stukenbrock, Alexandra Erfmeier

Post-Doctoral researchers:

Sofia Filatova, Rosemary Wilson

External collaborators: -

Project outline

The dawn of agriculture brought with it an array of domesticated plants as well as species of arable weeds and species colonising European grasslands. Despite the established recognition of similarities between these groups of plants, it is not standard to highlight their mutual origin and ecological traits. Our interdisciplinary team from the Cluster of Excellence ROOTS proposes to bring together experts from different fields for a two-day international workshop “between domestication and invasion”. The objective is to explore and establish correlations between the social and environmental dynamics that have driven the intertwined development of crops, arable weeds and plant invaders. We aim to stimulate cross-disciplinary discourse between archaeology and disciplines concerned with modern plant breeding and cultivation, genomics, ecology, and environmental ethics. We envisage the publication of our results as a peer-reviewed proceedings and, as an addition, to use our expertise to develop an educational module for advanced pupils.

10 / The Forest Finns as a Model for the Early Slavic Migration

Subclusters involved:

ROOTS of Conflict and Conciliation, ROOTS of Hazards, Dietary ROOTS, ROOTS of Inequalities, Reflective Turn Forum, Technical Platform

Principal investigators:

Jens Schneeweiß, Vesa Arponen, Wiebke Kirleis, Ben Krause-Kyora, Henny Piezonka, Eileen Eckmeier, Sofia Filatova, John Meadows

Post-Doctoral researchers:

Magdalena Schmid

External Collaborators:

Stig Welinder / Mid Sweden University, Elena Ponomarenko / University of Ottawa, Ingunn Holm / Directorate for Cultural Heritage Norway

Project outline

This project draws on ethnohistorical-geoarchaeological studies on the subrecent Forest Finns in Sweden and Norway in order to understand migration movements of early Slavs in the southern Baltic region in the middle of the 1st millennium AD. The Forest Finns will serve as a model for method development of analytical approaches on the archaeological visibility of mobile groups, their subsistence and materiality, as well as on their socio-cultural dynamics and crisis management in the context of climatic changes that will be tested on the example of early Slavs. By employing a multi-proxy approach including fieldwork, laboratory analyses and theoretical reflection, an attempt is made to, by way of analogical inference, address a hypothesis on the early Slavic migration during Late Antique Little Ice Age. The results of the research on early Slavs and Forest Finns as marginalised social groups will be made accessible to the broader public in a ROOTS booklet, and published in scientific articles (Open Access).

5.2 Interlinkage Groups

Although the subclusters (SC) are engaged with their own topics and develop their research questions and methods, ROOTS also investigates overarching themes. These are projects that expand alongside SC investigations, and which require bundling expertise not only of several researchers from different subclusters, but also from external collaborators. External impetus, additional expertise, and international exchange within these cross-sectional workgroups is provided through JMA guest chairs (i.e. professorships to be temporarily occupied by international experts and hosted at the JMA). Alongside the already defined three cross-sectional workgroups in the original

application (mobility and migration, resources and economy, ideology and identity), additional themes are identified and investigated as ROOTS progresses. The interlinkage groups focus on producing public outreach material such as booklets and synthesising research papers.

1 / Mobility and migration

This workgroup analyses the role that mobility and migrations played along different spatial and temporal scales within socio-environmental connectivities of places, regions, and continents by integrating SC approaches into a general frame. The triggers for such processes will be identified in order to explain the phenomenon of small and large-scale population movements in different prehistoric and historic contexts. This includes environmentally, socially, and culturally induced migrations that are addressed in the subcluster research agendas (for example the role of “climate refugees” in the SC Socio-environmental Hazards).

2 / Resources and economy

Both environmental and social resources are the main constituents of socio-environmental interlinkages. Economies play a central role in the connectivity between humans and the environment. The application of the connectivity model allows us to reconstruct different causal scenarios or simulations to test the effects of the different ‘drivers’ on economies and resources. Quantitative differences in subsistence and other economic resources (including technologies) will inform us about economic differences in general. Both thresholds in the limitation of resources and sustainability of economic systems with their environmental relations are analysed for the subcluster scenarios.

3 / Ideology and identity

All subclusters address questions of ideology (in the sense of specific cultural concepts of individuals, groups, classes, and other entities) and identity (in the sense of self-descriptions and external ascriptions of individuals, groups, classes and other entities). Knowledge in the sense of episteme, techne and praxis constitute basic categories in the formation of ideologies and identities. Urban ideologies and identities are analysed as formative principles that contribute to the shaping of urbanity. Moreover, diets can also be organised on the basis of ideologies and used for the marking of identities. Social inequalities and conflicts are often aligned around ideologies and identities, which were constituted in many cases by ruling classes.

4 / ROOTS of Routes

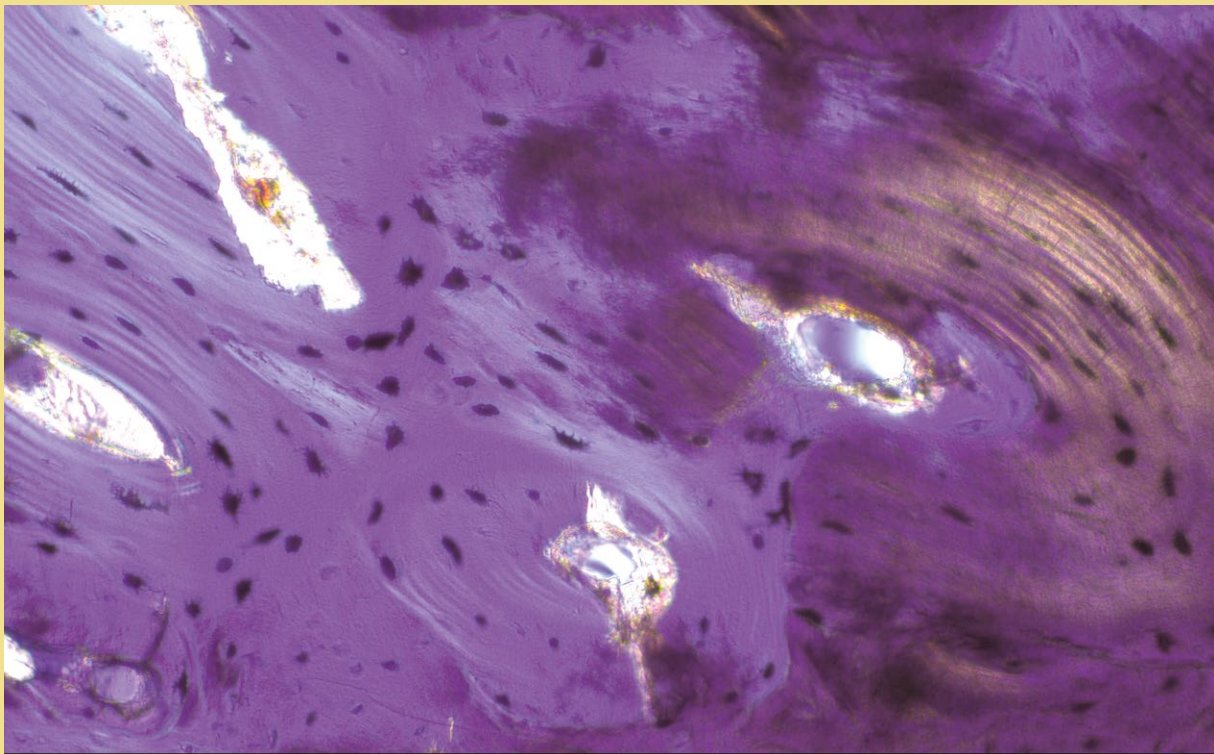
With routes and networks, ROOTS captures the infrastructural basis of connectivity. The underlying concept of this interlinkage group sees connectivity or the absence thereof expressed by routes and networks which can be experienced and measured.

In an upcoming ROOTS booklet, various areas are investigated by this premise: Places, names, and language roots; Trade routes related to globalisation processes such as the northern European Ochsenweg, the Silk Road, or burial mounds demarcating prehistoric routes, also related to potential processions. Another focus lies on the distribution and change of patterns in routes in relation to environment and climate, as well as economic factors such as changes in goods and innovation of transportation. Such changes, for example, expressed by forced migration, are relevant today. In terms of changing demand, light is shed on ember and early metallurgy. From a mental perspective, knowledge transfer by libraries and networks of knowledge are investigated.

5 / ROOTS of circular economy

What actually is waste? "Waste" is not a universal quantity, but a selective performance of culture. It is an attribution of the one who calls an object waste ("Is this art or can it go?"). The evaluation as waste is not limited to physical objects, but can also be related to animals, plants, to humans, their actions and experiences. The conscious or unconscious attribution of an object or subject to a value category determines a person's relationship to them. This also results in certain behaviours to dispose of them. For our society today, with its challenges of waste problems and resource depletion, the topic is highly relevant.

The booklet entitled "Stories of Waste and Value / Roots of a Circular Economy", which is in preparation, takes up this topic and bundles different ROOTS perspectives in a popular science way. The contributions are divided into four sections: 1) Hidden dirt, hidden knowledge (this is about scientific methods), 2) Facing stereotypes (this is about countering common prejudices), 3) Use. Reuse. Refuse. (here the focus is on recycling) and finally 4) Learning from the past? Today's challenges for the future (this is about the relevance of archaeological-historical research for present issues). A special challenge for the authors of the booklet is that almost all contributions have been co-authored or are being co-authored by scholars from different disciplines. The resulting discussion offers additional added value for the authors and perhaps surprising insights for the readers.



“Universe of bone tissue”: Histological section of burnt human compact bone under polarised light. The femur examined belongs to human remains found at the Tripolye mega-site (ca. 3800-3600 BCE), Kosenivka, Ukraine (photo: Katharina Fuchs).

6 Quality Management

6.1 Research Information System (RIS)

6.1.1 Development of Publications

Keeping track of publications of ROOTS members is part of quality management as described in the Full Proposal for the Cluster of Excellence ROOTS on page 106: “Scientific progress will be regulated through a process, which includes fund allocation based on scientific performance (e.g. publication outcomes, research impact, achievement, progress, and contribution to the overall ROOTS research aims).”

There is an agreement at Kiel University that all publications by researchers should be entered into the “Current Research Information System” (CRIS, <https://www.fis.uni-kiel.de/en>). With the help of the CRIS, on the one hand, the publication strength of ROOTS can be documented and, on the other hand, relevant publications can be identified, e.g. for larger, interdisciplinary research proposals of applicants. It is also possible to maintain individual publication lists via the CRIS, thus enabling the CRIS to provide general benefits for each scientist.

The CRIS was described within mailings to the members to ask for active cooperation. The response was very good so that a large number of publications could be entered into the CRIS. The range of entries varies from reviews of books, book chapters, books, articles in the ROOTS Booklet Series, to articles in scientific journals. This means that most ROOTS member publications within CRIS are not ROOTS publications, but are associated with the member’s institutes. Only the publications that were financed by ROOTS and therefore contain a reference to the funding are marked as ROOTS publications. At the moment (as of the end of April 2022), there are over 680 entries in the system from 2019 to 2022, 8 of them are ROOTS publications. In the future, the share of ROOTS publications will increase. In addition to the existing publication types, it is planned to also enter published datasets into CRIS. This is still being coordinated with the CRIS team to clarify the requirements.

6.2 Centre for Interdisciplinary Data Science (CIDS)

Recent research activities increasingly depend on effective data management and efficient data access and analysis. Especially in the interdisciplinary research environment of the Excellence Cluster ROOTS, these tendencies are amplified by the implications of reproducible research goals and data heterogeneity.

From mid-2020, a team of dedicated researchers connected in the Center for Interdisciplinary Data Science (CIDS) with the aim to create a platform to gather and provide competences and services to support researchers along their research process and the interlinked research data life cycle. Identifying several main stages of this life cycle, the CIDS service goals cover:

- Support in tasks regarding a database or information system required to fulfil conditions linked to the FAIR Data Principles
 - Creation of an information model for the upcoming data input task
 - Implementation of information models as a database (application)
 - Setup of user interfaces for data acquisition, querying and analysis
- Support in applying quantitative methods
 - Development of project specific, data driven analysis methods based on techniques in data mining, machine learning, artificial intelligence and statistics
 - Support in applying statistical and analytical methods
 - Support for an interpretation of experimental results
 - Postprocessing of results for visualisation and multimedia presentation
- Knowledge transfer and guidance towards additional topics
 - Transfer of knowledge or contacts for cooperation partners
 - Acquisition and allocation of resources (space, hardware, software) for data collection and analysis
 - Raise awareness and to a certain extent guide through fields of contextual conditions like data privacy, data sovereignty, legal guidelines, licensing, organisational and technical contact points, etc.

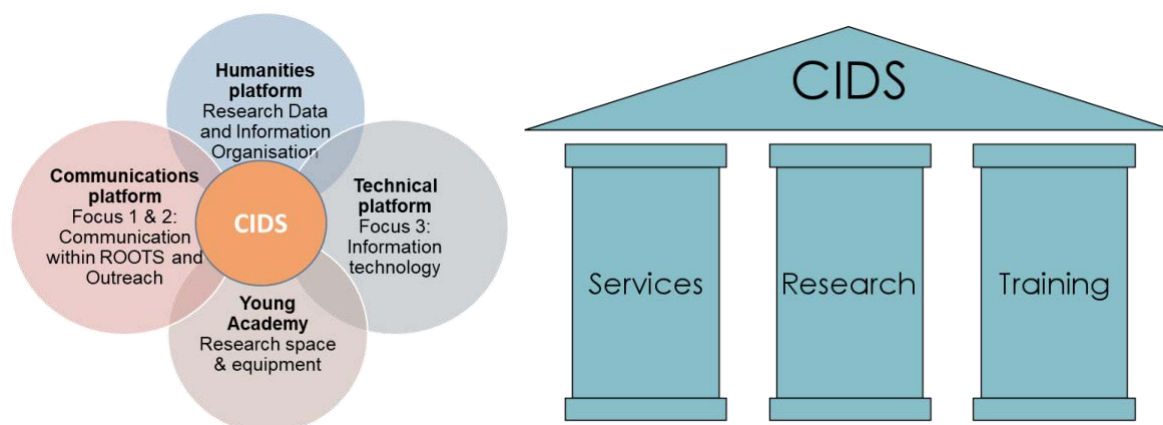


Figure 12: Positioning of the CIDS in ROOTS and central goals

CIDS members cover a broad variety of competences in Data Science, Computer Science, IT, Project Management and Archaeology. They provide their knowledge and experience in smaller side projects additional to their everyday activity in research and teaching. The low degree of institutionalisation, as in no regular personal being located at CIDS, is a major factor in slowed down progress towards those goals which imply labour intensive deliveries like implementation tasks and data integration of larger heterogeneous data collections.

A collection of activities, which are coordinated through CIDS and progress with repeated reporting and feedback, can be found in the report of the Humanities Platform on CIDS and student assistant activities (3.3.3) as well as the report of the Technical Platform on data management (3.3.1).



Indigenous Sel'kup collaborator I. Irikova taking a photo of expedition team members O. Karadzova, A. Kimpitskaya, E. Zaitseva, and E. Brenchutina during ethnoarchaeological fieldwork on their reindeer herder summer settlement in the Siberian taiga, Russia, summer 2021 (photo: O. Kruglov).

7 International Collaboration

7.1 JMA Chairs

External impetus, additional expertise, and international exchange is, amongst others, provided through ROOTS guest chairs (i.e. professorships to be temporarily occupied for a period of three to six months by international experts hosted at the JMA).

The JMA Chairs are crucial in further consolidating the role of ROOTS for scientific discourse, exchange, and advancement. Together with additional DFG Mercator Fellows, Humboldt Fellows, and Humboldt Professorships, the JMA chairs both benefit from and contribute to the ROOTS research environment by conducting their own research as well as by supporting ROOTS researchers, thus inspiring new interdisciplinary research strands. Young researchers greatly profit from the exposure to such a collaborative environment, which also offers them the opportunity to be integrated into the international scientific community already in an early stage of their careers.

Name	University	Department	Stay
Mundo, Ignacio	Universidad Nacional de Cuyo: Mendoza, Argentine	Departamento de Dendrocronología e Historia Ambiental	Nov 2020 until Jan 2021
Damm, Charlotte	UIT - The Arctic University of Norway	Department of Archaeology, History, Religious Studies and Theology	Sep 2021 until Nov 2021
Kohler, Tim	Washington State University	Department of Anthropology	Sep 2021 until Nov 2021
Lampugnani, Vittorio M.	ETH Zürich, Switzerland	Department for History and Theory of Architecture	Mar 2022 until May 2022
Lewis, Carezza	University of Lincoln, UK		Jun 2022 until Jul 2022 and Oct 2022 until Dec 2022
Avramidis, Pavlos	Patras University, Greece	Department of Geology	Jul 2022 until Sep 2022
Feinman, Gary	University of Illinois. Chicago	Field Museum Chicago	Nov 2022 until Jan 2023



Excavating the Iron Age and Islamic cave site Ashkawtarash ("The Black Cave") near Soran, Iraqi Kurdistan. All removed sediment is carefully sieved to detect smaller artefacts (photo: Greta Rettler).

8 Furthering of Gender Equality

Kiel University pursues rigorous quantitative aims for a fair gender balance across all academic levels. The university's and faculties' main efforts are directed to the acceleration of the process towards a more equilibrated gender balance at the university's higher academic levels where women are still severely underrepresented. The Head of the Central Office for Gender Equality, Equal Opportunity & Family and Gender Equality Commissioner deals with gender equality, equal opportunity, gender consulting services, mentoring, promotional offers, data and facts, counselling, family services, and welcome services. These services are accessible via the website: <https://www.gleichstellung-chancengleichheit-familie.uni-kiel.de/en/>. It is a priority of the Equal Opportunities Officer to support the university's process towards gender balance and to monitor the ROOTS commitment in particular.

It is a declared aim of the Cluster of Excellence ROOTS to especially support equal opportunity. In 2020, Frigga Kruse was elected as a ROOTS Equal Opportunity officer, aiming to identify specific measures for ROOTS to improve equal opportunity in the cluster. As an active member of the ROOTS Executive Board, the Officer is well placed to do so.

ROOTS has committed itself to fill at least 50% of all newly established positions with female candidates, as well as to guarantee a gender balanced composition of ROOTS decision boards (Executive Board). Currently, gender numbers in the ROOTS cluster are fairly balanced at the PhD level (57% females). At the postdoctoral level, 2 out of 7 long-term positions could be filled with females, whereas at the PI level, nine out of 25 founding members are females. Yet, only one out of four new professors /new PIs is a female. Overall, 41% of ROOTS members are females, 23 out of 52 are mid-level faculty (44%), and 11 out of 39 are on the professor level (28%).

In 2021, the Officer was instrumental in formulating a transparent **Code of Practice** concerning the ROOTS Call for Internal Research Proposals. In addition to the Code, documents pertaining to the Call itself, a research proposal template, and an evaluation score sheet were developed. The procedure worked well for the subsequent call and will also be employed for the next call.

Specific ROOTS measures

The Full Proposal suggests specific ROOTS measures to foster gender justice. These include:

- the establishment of a ROOTS via:mento;
- pro-active recruitment measures (finding committee) to identify and encourage suitable female candidates to apply for all vacancies;
- the identification of topics of high gender relevance by the ROOTS communication platform (as addressed, e.g. in the context of Social Inequality or Dietary ROOTS topics) for its public research effort.

A ROOTS via:mento

The Equal Opportunities Officer has, in the meantime, spoken to Dr. Ruth Kamm (mentoring program via:mento; GenderConsulting). A separate via:mento Ocean, which is often cited as an example for a possible via:mento ROOTS, was a structural necessity in order to permit the employees of GEOMAR to participate in the program. As ROOTS members are by and large employees of Kiel University, a separate construct is not needed. Instead, ROOTS members will be actively encouraged to join the upcoming via:mento cycle.



Megalithic long mounds from ca. 3400 BCE at Putlos near Kiel (photo: Sara Jagiolla).



Heat, dust and human bones. Excavation of a triple burial in Vráble from a late Linear Pottery Culture (LBK) site in Southwest Slovakia after documentation and shortly before removal of the bones. In the excavation cut, two students from Oslo and Kiel withstand the tough conditions (photo: Sebastian Schultrich).

9 Perspectives

Building on the Kiel tradition of socio-environmental research, ROOTS has already developed into a lively centre of cooperation in the first years of its existence, despite the circumstances of the pandemic. Both the numerous projects of the subclusters and the interlinkage groups that have emerged from various joint retreats and internal general funding attest to the high coherence of the cooperation, which dynamically opens up new content.

In contrast to other large-scale projects, which had difficulties due to their holistic claim to explanation, a balance of specialist expertise, the knowledge of what we can and cannot do, and the development of scientific narratives, which decidedly also enable holistic perspectives, becomes visible in ROOTS. ROOTS as an attractive centre, which also supports and attracts other third-party funded projects of other formats, mediates the connection between social, cultural and environmental research on past societies and environments and the utilisation of this knowledge for debates about our recent present.

In the future, new necessities and possibilities for internal and external cooperation will arise from this competence centre. The overlap of the thematic fields of the subclusters and the interlinkage groups illustrate the strength of the joint cooperation in terms of content. Accordingly, new cores of research will emerge from this by 2024, which will certainly no longer correspond to the current “headings” of the subclusters. Dietary, Inequality, Urban, Knowledge, Hazards, Conflict and Conciliation – these concepts will certainly be replaced by new ones – which have their roots in several ROOTS 1 subclusters. This perspective orientation will lead to overcoming the current focus on certain disciplines in certain subclusters and – based on ROOTS 1 – to an increase in the linkage of cultural and natural sciences directly in the subclusters. Connected to this is certainly the further development of the current instruments for conducting the past-present debate, i.e. primarily the Reflective Turn Forum.

In addition to the described outstanding competence in the specialised laboratories and thinking spaces, without which ROOTS 1 would not have been possible, new connections of additional infrastructures are consequently envisaged. Structurally, there will certainly be a debate about the further development of competence without replacing what is already established.

In summary: The growth of the Graduate School "Human Development in Landscapes" towards ROOTS 1 is qualitatively comparable to the growth required from ROOTS 1 to a possible ROOTS 2.

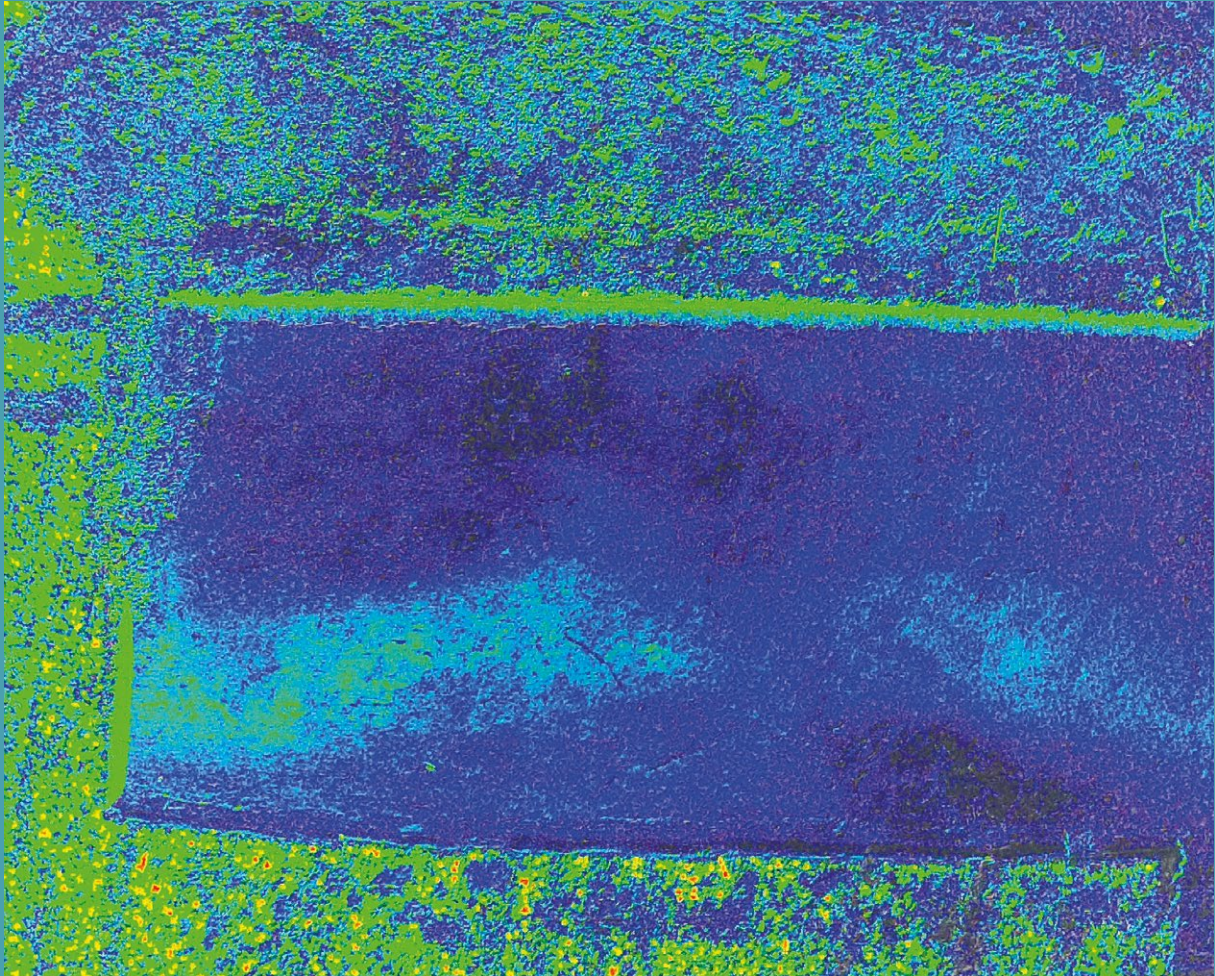


A visit to the Neolithic site of Tapphe Melay Souz, Kohgiluyeh and Boyer-Ahmad Province, Iran (photo: Romy Plath).

10 ROOTS Publication Strategy

An important objective of ROOTS is the transfer of knowledge. This is achieved through ROOTS publications, including a peer-reviewed publication series “ROOTS Studies”, the “ROOTS Booklet Series”, intended for a wide audience, and in individual contributions in, e.g., high-ranked, peer-reviewed journals. The scientific results of the overarching, interdisciplinary research of ROOTS, mirrored in the agendas of the diverse research subclusters and platforms that explore processes of social, environmental and cultural phenomena, are published in edited volume, monograph and booklet formats.

The first volume of the ROOTS Studies series by Ralph Grossmann: ***Insights into Social Inequality: A Quantitative Study of Neolithic to Early Medieval Societies in Southwest Germany*** (2021) and the multi-authored booklet: ***Distant Times So Close: Pandemics and Crises Reloaded / Entfernte Zeiten so nah: Pandemien und Krisen*** (2020) represent initial products of ROOTS publications. A number of upcoming volumes from the various research groups are in preparation, for example, the peer-reviewed edited book *Connectivity Matters! Social, Environmental and Cultural Connectivity in Past Societies* (ed. Johannes Müller, in print).



Thermal drone image of a ditch feature at the Neolithic settlement site near Vráble, Slovakia (photo: Till Kühl).

1 Appendix

1.1 Publications by ROOTS Members

Publications ROOTS members (2019 – mid-2022)

The reference list is not in alphabetical order according to first author, but by the name of the ROOTS members (**bold**)

* → funded by ROOTS

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PhD theses supervised	Max Grund Marie Jäcker
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	2019 Fellow of the Canadian Institute of Advanced Research
Boards	2021 - Member of the International Scientific Board of the French collaborative research programme "Tulip Laboratory of Excellence" 2020 - Vice speaker and steering committee member of the International Max Planck Research School (IMPRS) and the DFG graduate school TransEvo RTG2511 2019 - Member of the Plant Expert Panel of the German Research Council (Fachkollegium Pflanzenwissenschaft DFG)
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