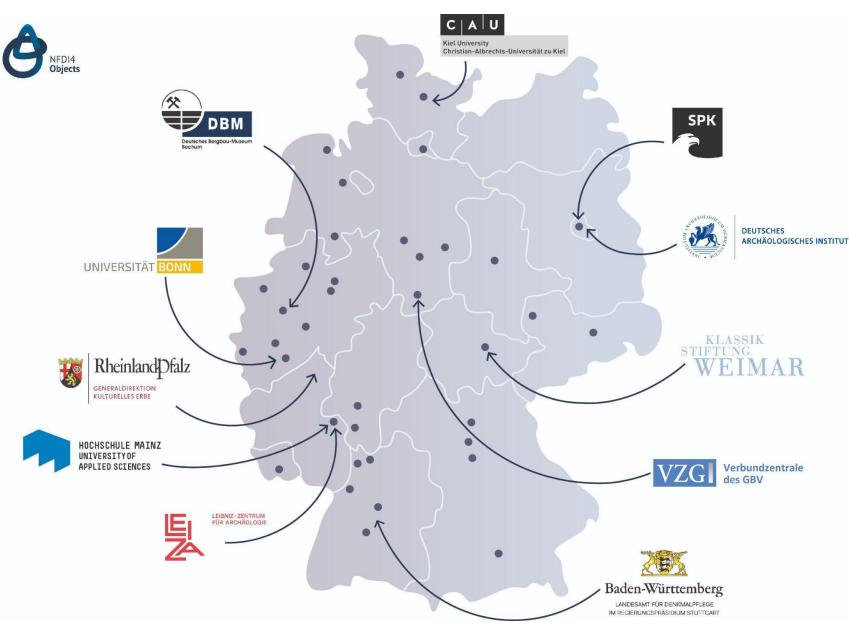# Ontology development in NFDI4Objects

Research Data Infrastructure for the Material Remains of Human and Environmental History

Anja Gerber, Günther Görz, Josef Heers, Jakob Voß, Sarah Wagner

Our focus

NFDI4Objects aims to meet the infrastructural needs of researchers and practitioners who contribute to the **material heritage from around three million years of human and environmental history**.

What connects us

The specific needs of our community are derived from the connection between objects and their (archaeological) **contexts**, often **complex object biographies**, **varying** levels of **expertise** and **research traditions**.

https://www.nfdi4objects.net/

Our Aims

- Enable sustainable and **long-term international access to the digital results** of research projects according to the needs of the users

- **Improve digital research and work processes** within specialist communities (esp. archaeology, anthropology, building research, geoarchaeology, archaeobotany, archaeozoology, archaeogenetics, archaeophysics, palaeopathology, archaeometry, conservation and restoration research, ethnoarchaeology as well as institutions of cultural preservation and provenance research; members: https://www.nfdi4objects.net/index.php/ueber-uns/konsortium)

- **Establish the FAIR data principles** and digital transformation of working methods

NFDI4Objects Knowledge Graph & Ontology Team

Task Area 5: **TA5 Storage, Access & Dissemination** (VZG Göttingen)
- Gerald Steilen
- Jakob Voß
- Josef Heers

Task Area 6: **Qualification, Integration & Harmonisation** (Klassik Stiftung Weimar / CDI der FAU Erlangen-Nürnberg)
- Dirk Wintergrün (KSW)
- Anja Gerber (KSW)
- Sarah Wagner (FAU CDI)
- Günther Görz (FAU CDI)

Also involved:
Task Area 2 **Collecting**
- Florian Thiery (LEIZA)

Task Area 1 **Documentation**
- Tobias Arera-Rütenik (Universität Bamberg)

Object Biographies:
a research driven approach for data modelling

- **Objects** (cultural artifacts, animals, plants, ...)

- **Phases and contexts**

  ○ Creation, production, use, ...
  ○ Excavation, akquisition, museum/collection, presentation, ...
  ○ Research, reception, ...

- **Actors** (who does what, when and with what?)

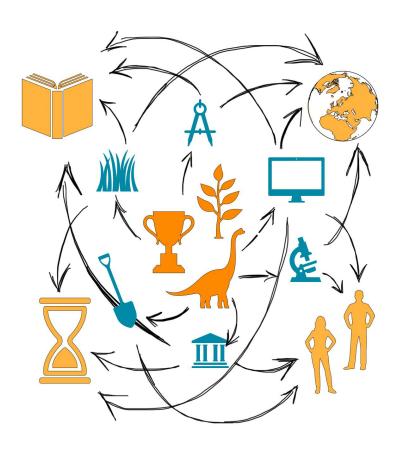- **Sources** (research data, archival material, publications)

Fig.: Schematic representation of an object biography
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Key Question: Data

What data is or will be made available?

- Object data from institutions that are part of NFDI4Objects

- A large part of the data already exists (partly unpublished) and is being revised with the aim of joint publication

- Data on object biographies (including provenance), which are currently being generated and processed specifically on the basis of use cases

- Selected details not public (e.g. specific coordinates, sensitive information)

How will the data be published?

- Following FAIR data principles
- Via Knowledge Graph APIs (Cypher & SPARQL)
- As Data Dumps

Key Question: Status of development

Used Ontologies, Data modeling and integration

- CIDOC CRM as Ontology for data integration

- Extensions (such as N4O Objects Ontology https://nfdi4objects.github.io/n4o-core-ontology, Nomisma …) and deprecated concepts/properties are mapped to CIDOC CRM

- Knowledge Graph implemented in two ways

  - Property Graph restricted to CIDOC CRM + controlled extensions

  - Full data in RDF (as modeled by data sources, no consolidation)

Other relevant ontologies

- CRM extensions

- SKOS for controlled vocabularies

Key Question: Ontology Mappings

- Everything must be mapped to CIDOC CRM

- Working with and on LIDO to CIDOC CRM mapping (current prototype uses X3ML)

- No mappings to schema.org, DataCite (mapping these with CIDOC CRM would be welcome)

Key Question: Modeling of Entities, Terminologies & Controlled vocabularies

- Objects (E22 Human Made Object) see Data Model for Minimal Data Set (TWG in progress) and Object Biography https://github.com/nfdi4objects/n4o-core-ontology/tree/main/pathbuilder_template_objectbiography
- Persons/Organizations/Geographical Entities (according to CRM E21 Person, E74 Group, E53 Place), each with at least Appellation (E41) and Link to Authority File/Vocabulary
- Link to Authority File/Vocabulary via Identifiers from agreed upon terminologies (GeoNames, Iconclass, GND, Getty…)
- Known terminologies are ingested into the Knowledge Graph (e.g. from DANTE)
- Current list at https://nfdi4objects.github.io/n4o-terminologies/

Cooperation between the MoU consortia

Coordination

- in ontology development and data modeling
- working on real use cases, eg.
  - how does Text+ describe the inscripts of objects? How is the text linked to the object?
  - how is archival material and the contained historical information modeled in N4M and can this be linked to sources used in N4O object biographies?

Documentation

- Prototype of Knowledge Graph: https://nfdi4objects.github.io/n4o-graph/

Relevant resources

- Gerber, A., & Wagner, S. (2023). N4O Ontology & Knowledge Graphs (TA6) – Object Core & Object Biography. Posterpräsentation auf dem 1st NFDI4Objects Community Meeting vom 16.-17.11.2023 in Berlin. 1st NFDI4Objects Community Meeting, Berlin. Zenodo. https://doi.org/10.5281/zenodo.10117502
- Voß, Jakob. 2024. "Property-Graphen: eine kurze Einführung." VZG Aktuell. https://doi.org/10.5281/zenodo.10971391
- Voß, J., Thiery, F., Gerber, A., Wagner, S., & von Hagel, F. (2024, April 2). Terminologien in NFDI4Objects. In Squirrel Papers. Zenodo. https://doi.org/10.5281/zenodo.10906912
- Wagner, S. (2024). Digitale Objektbiografien für NFDI4Objects. 15. Jahrestagung für Universitätssammlungen 2024, Neue Rollen, neue Ziele? Universitätssammlungen im Spannungsfeld von Forschung, Finanzen und Politik, Zürich. Zenodo. https://doi.org/10.5281/zenodo.11471183
- Wagner, S., & Gerber, A. (2024, Januar 30). NFDI4Objects Core Ontology und Objektbiografien. Zenodo. https://doi.org/10.5281/zenodo.10591898Wagner, S., & Gerber, A. (2024, Januar 30). NFDI4Objects Core Ontology und Objektbiografien. Zenodo. https://doi.org/10.5281/zenodo.10591898

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Links

GitHub: https://github.com/nfdi4objects

Website: https://www.nfdi4objects.net/

Helpdesk: https://www.nfdi4objects.net/index.php/helpdesk

Newsletter: https://www.listserv.dfn.de/sympa/info/n4o-newsletter

Community Meeting September 2024: https://cfp.nfdi4objects.net/N4O-CM2024/

NFDI4**Objects**

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