Report and mission statement following the workshop "Securing Data in Ancient Mesopotamia: New Technologies for Secured Cuneiform Texts", held at the Lorentz Center 14-18 march 2022

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Background

The workshop was convened with a specific historical question in mind: "How did ancient Mesopotamian scribes and other text-users protect the information that they stored on and inside cuneiform clay tablets?"

The theme was chosen for its potential to bring a wide range of scientific domains together. In ancient times, clay tablets bearing cuneiform text were incised, imprinted, encased, wrapped, copied and otherwise manipulated in order to validate them and to protect them from damage, forgery and unwanted access. Text-based scholarship has traditionally focused on the information that was conveyed through writing, while neglecting the material, cognitive, technological, and social processes of data control that accompanied the written text since the dawn of history.

Shifting text-based into object-based investigation of cuneiform clay tablets requires a research strategy that goes far beyond the methods of text analysis that are traditionally used by historians, linguists, philologists and epigraphists. It requires a collaboration with archaeologists, geo-scientists, physicists, computer scientists and experts from the social, cognitive and applied sciences. The Lorentz workshop was conceived as a place to bring that expertise into the conversation and, if successful, to explore future collaborative action.

While developing the workshop's program it became clear very quickly that participants experienced the envisioned shift from text-based to object-based research of the cuneiform tablet as urgent and significant, while the theme of ancient data security became more of a side topic. We therefore decided to open up the workshop to contributions that pursued non-textual research of the clay tablet in general, while letting go of the specific research question of data security. Lifting that theme proved liberating; it stimulated conversation on a range of different methodologies and technologies that promise to push our understanding of the cuneiform clay tablet as an artifact into novel directions.

Outcome

During the workshop several areas were identified where collaboration is likely to produce new knowledge that can bridge significant gaps in the state-of-the-art or that can improve current methodologies. Detailed reports of the sessions can be read in the conference proceedings that

are deposited in zenodo, DOI 10.5281/zenodo.6323315. . In the present summary statement, some avenues for new research, and research collaborations, are highlighted, along with steps that can be taken towards their realization.

3D imaging and heritage preservation

Optimizing existing 3D imaging techniques (Mara, Homburg) will contribute to a better digital representation, and preservation, of the surface structure of clay tablets with its complex incisions (wedges), traces of human use (finger and hand-palm prints), imprints of contact objects, faded pigments, burn marks, etc. An additional challenge is to combine data obtained by optical 3D surface acquisition with 3D volumetric data captured by means of see-through techniques in order to produce a digital twin that transmits the entire range of information contained in the clay artifact. It is expected that perfecting these techniques will be beneficial in the area of heritage preservation and protection by creating a "digital twin" holding a wide range of information enabling the (re)contextualization of tablets. This is especially relevant for a large number of tablets in all the collections established decades ago.

Ancient finger and handpalm imprints

Bennison-Chapman's keynote on finger-prints, as well as the intervention of the forensic team, generated much interest. The potential for capturing and studying ancient imprints, intended as impressions of 'epidermal ridges' from the skin of the hand (palm and fingers), is still largely unexplored in the context of cultural heritage research. Most of the existing studies have focused on two-dimensional representations and commercial software for image processing. Identifying demographic patterns such as broadage (adult/child) and biological sex in the use-traces of ancient texts (and non-written artifacts, like tokens), using both see-through techniques and surface imaging, has ground-breaking potential.

See-through techniques

There was wide agreement among participants that see-through techniques offer the potential to unlock "secrets" (previously hidden things) contained on the inside of the clay tablet. One line of research that generates much interest is the use of clay inclusions as proxy data on the ancient climate, an endeavor in which Chikako Watanabe's group has booked advances over the past decade. The continuation of research on enveloping (Michel, Mynarova/Zemanek, De Boer) and on the manufacturing processes of clay tablets (Michel, Taylor) is also felt to be important. As previously pointed out, as more and more of the "inside" of the clay tablet is being explored, there

is a need to adapt data storage systems accordingly. Text annotation and 3D imaging of surface information is not yet prepared to handle information about the inside of an object (Bruhn, Mara).

Cooperation through the class room

The group expressed interest in exploring cooperation through the class room, particularly in the area of digital methods and 3D acquisition techniques for studying cuneiform tablets. As part of this action, we envision the production and publication of guidebooks, offering "best practices" for the application of state-of-the-art methodologies. One of the guidebooks could be a modus operandi for p-XRF data acquisition and utilization to better secure information on the provenance of clay tablets (van Os, Stratford and Hameeuw together with Braekmans). Another one could focus on best practices for tablet conservation and consolidation.

Funding: exploring the "Erasmus+" network for exchange of students and staff. Summer schools or the (casual) sharing of curriculum modules are a low-cost strategy to create bottom-up synergies between members of the consortium and train researchers of (potential) future projects. The "Marie Curie Doctoral Network" scheme is interesting but it is too ambitious for a consortium at our (modest) level of operation. Erasmus Mundus might hold more promise (joint MA degrees) but is probably quite labor intensive.

Archaeology of cuneiform archives

The contextual analysis of tablet groups from archaeological sites is under-researched and merits renewed scrutiny. A better understanding of the ancient processes of deposition is required to map the conditions in which we, in the present-day, encounter the cuneiform "archives" of the past. This includes studying the effects of destruction, deposition and recycling within their specific cultures of archive-keeping that emerged, disappeared, and re-emerged in the ancient Middle East, and is potentially game-changing. More broadly, the contexts in which tablets are discovered offer exceptional cases to study practices of discard and post-depositional processes in archaeology. This line of research has also hardly been explored yet. (Klinkenberg, Prechel, Waerzeggers). Another area of interest is the incorporation of data pertaining to archaeological stratigraphy and find spot information in databases of cuneiform texts. Anderson is currently working on building up a list of properties in Wikibase that can accommodate this type of (re)contextualization with linked data.

The clay tablet as multi-faceted data capsule

An idea for an "umbrella project" consists of setting up a collaborative project that explores the cuneiform clay tablet as a multifaceted data capsule on the ancient human and natural environment. Sub-cells in such a project could consist, e.g., of teams focusing on the inside of the tablets (see-through techniques, chemical analysis of clay composition, biological inclusions intentionally added or not), on the study of use- and user-traces left on the surface (finger and palm imprints, ink traces, 3D imaging techniques), the archival "condition" of the tablet, the archaeological context. This also involves bringing the "multifaceted data" together using linked data URIs.

Next steps

As to funding schemes, the following were identified as being suitable for one or more of the topics outlined above:

- COST: for networking between members of the consortium;
- Erasmus+, Erasmus Mundus: networking through teaching;
- funding for collaborative, transnational projects:
    - WEAVE: bi- and trilateral cooperation within Europe; several constellations within our group feature among participating countries, incl. Germany, Czech Republic and Belgium;
    - ERC Synergy
    - *DFG Wissenschaftliche Netzwerke* (research network funding in Germany allowing to connect with 10-20 partners on an international level)
    - NEH Collaborative grant (through Adam Anderson)
- personal grants through the ERC (Adv, CoG, St), NWO (veni, vidi, vici) and smaller fellowships, e.g. Gerda Henkel Stiftung
- in the heritage sector, the following schemes can be considered:
    - JPICH Cultural Heritage, Society and Ethics (researchers from at least 3 countries and one associate partner, e.g. NGO; multidisciplinary research)
    - Twinning: increase visibility of research institutes in the local arena
    - HORIZON-CL2-2023-HERITAGE-01-03: Re-visiting the digitisation of cultural heritage: What, how and why?

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