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Digitising from Scratch

An Example from the Practise of a University Collection

Digitisation is on everyone's lips. "This collection must be digitised": this is the work order almost everyone has had to face after taking on a new curatorial position in a museum or collection in recent years. But what does digitisation imply, and what does it actually mean in terms of the practice of university collections? This article describes the current situation in the Collection of Classical Antiquities at Heidelberg University, and aims to show the challenges surrounding the digitisation of heritage in terms of administration, organisation, and workflow.

Generally speaking, university collections face different challenges than public museums: established as 'study collections', they combine academic teaching, research, and public outreach. In all of these matters, they tend to be provided with either very poor financial and human resources, or none at all. Given these constraints, all possible methods of 'digitising' such collections – from background research to actually photographing or scanning documents and objects/artefacts – require an enormous effort from the individuals involved. This article therefore hopes to sensitise its readers regarding the implications of what we call 'digitisation', and to elucidate specific actions that are required on a greater scale from universities and academic funding agencies, and on national and international levels.

What Does 'Digitising' Even Mean?

"Digitisation is the process of converting information into a digital (i.e. computer-readable) format", says Wikipedia,[1] itself an online encyclopedia and an early example of just such a conversion of printed encyclopedias into digital, and dynamic, formats. Transferring this definition to museums and collections, digitisation encompasses the following comprehensive measures.

– **Digital preservation:** the digital recording of the artefacts themselves ('primary objects') using imaging techniques such as photography, film, 3D scanning, or X-ray computer tomography.[2]

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1   https://en.wikipedia.org/wiki/Digitisation (accessed 28/12/2020).
2   For an example of large-scale 3D-scanning and data derivation, see Aaron PATTEE: *Graph Databases for the Organisation and Analysis of Digital Heritage,* pp. 123–138 in this volume.

– **Digital documentation:** the scanning or photographing of all documents ('secondary objects') relating to artefacts and the history of the collection, e.g. index cards, inventory and acquisition books, correspondence, loan agreements, restoration reports, photos of the collection and artefacts, etc.[3]

– **Digital administration**: the digital recording and compilation of information ('metadata'), often requiring research on the artefacts, including material, genre, dating, provenance, restorations, insurance values, etc., either for the collection's own internal documentation or as freely available data.

– **Digital accessibility and transparency**: the feeding of all this data – documents, image formats, and metadata – into a digital storage system such as a database that will make the information retrievable and systematically searchable at any time, whether it is stored offline and locally or online and publicly available.

– **Digital public engagement**: the representation of the collection and the presentation of its objects online through social media, blogs, digital exhibition formats, etc.[4]

Each of these tasks on its own could easily keep a person busy for a long time, and each of them requires different skills, from specialist knowledge in the field to technical knowledge of recording techniques, experiences with databases and authority files, and public relations work.[5] These requirements are rarely thought of, or even named in detail when curators are asked to 'simply' digitise a collection.

Even for larger institutions, this complex set of tasks is challenging. In university collections it can hardly be managed as part of daily routine operations, as typically only one person is responsible for the collection as curator. In addition to teaching, conducting research, organising events, answering photo requests, managing loans and more, there is usually very little time left for actual collection management.[6] The current generation of curators working in (archaeological) university collections is facing the digitisation process alone: they have mostly 'inherited' collections that have been managed completely analogously and are now expected to make the digital transition on their own. The general desire for 'digitisation' – from the universities, institutes, and colleagues – is coupled with a great deal of

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3   For the usage of index cards in the retracing of migrant routes, see Marijke van Faassen and Rik Hoekstra: *Storytelling, Identity, and Digitising Heritage,* pp. 155–174 in this volume.

4   See the examples of exhibitions using means of digitisation: Kimberley Coulter: *Mediating Ecologies,* pp. 91–101 and Paul Longley Arthur and Isabel Smith: *Digital Representations of Slavery in Australia,* pp. 47–62, both contributions to this volume.

5   On this problem, see, in brief, Lang 2016, 51.

6   Very generally on the current situation of German university collections and their digitisation: Stricker/Weber 2016, 23. On the role and use of university collections, see Seidl 2016. More specifically on archaeological (plaster cast) collections, with an overview of collections at German-speaking universities, see Bauer 2002.

ignorance, because the steps involved in this complex process are unknown to or ignored by the upper levels of the hierarchy.[7] Those entrusted with the actual implementation, on the other hand, are confronted with many organisational and practical hurdles.

It is both unfortunate and counterproductive that awareness of the implications of digitisation is so limited, because this ignorance impedes and slows down the actual digitisation process. It is the reason why no additional academic positions are granted for digitisation projects, and scientific funding opportunities for digitising cultural heritage are rare. In Germany, for example, calls for proposals are mostly limited to proposals which apply digital methods; they do not address the large-scale digital recording of objects which forms the necessary basis for any further projects.[8] Their explicit requirement for explanatory statements about the scientific value of the objects to be digitised suggests that not all objects are considered equally relevant and worthy of being studied. Thus, even if these statements serve to create comparability within the project selection procedure, they downgrade the overall value of historical university collections. Picking out artefacts and defining very specific research questions for future studies means limiting ourselves to studying the same best-known or most frequently published artefacts over and over again, because it is easy to justify digitising what has already been considered worth studying once. Unknown artefacts which have never been researched, on the other hand, are less likely to be chosen for a funding application, both because they require more preliminary work from the applicant and because sponsoring organisations are less likely to fund projects on artefacts which seem less attractive to them. A selection of objects, if required, will therefore follow political guidelines with regard to not only a collection itself, but also both general research trends and trends in the relevant field. Furthermore, digitising only a certain portion of

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7 On the high expectations towards museums and their available object data, see HOHMANN 2016, 64.

8 The German Ministry's funding line "e-heritage", for example, states: "No concepts will be funded that serve [...] the generally necessary digitisation of inventories in the context of fulfilling a basic task specific to an institution." The call also claims that a "prerequisite for funding is that the planned digitisation *forms the basis of subject-specific research*" and demands the "submission of a letter of intent from recognised experts in the field, *describing in detail the scientific interest* and, if applicable, the methods with which research questions can be addressed on the basis of these digitised objects" (e-heritage 2016, transl. by author, https://www.bmbf.de/foerderungen/bekanntmachung-1197.html, accessed 20/12/2020). The same funding line in 2019, with modified terms, states that "A prerequisite for funding such digitisation projects is that the resulting digital copies *form the basis for research*", and that "This funding line is aimed at institutions that are planning a digitisation project for a *precisely defined* number and type of cultural heritage objects and on the basis of a *scientific research interest demonstrated by a letter of intent*"(e-heritage 2019, transl. by author, https://www.bundesanzeiger.de/pub/publication/V7AgA8oY66jMjAXDOxd;wwwsid=E01F47520F51E150CEA29990DD4E7D67.web06-pub?0, accessed 20/12/2020).

a collection obviously also limits its accessibility, and therefore the development of potential future research questions. After all, how is one supposed to systematically search for relevant research topics and objects in a collection which has only been digitally recorded in part? Funding that is available for digitising only parts of a collection therefore supports an unwelcome hierarchisation or prioritisation of objects, though at least it is a start. The existing calls are reactions to both growing demand and the efforts of the "Coordination Centre for Scientific University Collections in Germany" to support university collections and make them more resilient (in the long run).[9]

These limited funding options and their prerequisites draw attention to one major problem: that digitising is not treated as real scientific work, but as a subordinate task, despite the various skills it requires. Proper digitisation – i.e. digital preservation, recording, documentation, and administration – cannot happen without qualified people trained in the relevant field to research objects, document data, and control data quality. In contrast to the specific skills required, the term 'digitising' is now a commonplace one which is used casually and without awareness of its implications. Yet behind the act itself there are questions regarding the selection of digitising methods and techniques, the sustainable storage of digital data, and the associated costs. Last but not least, digitisation goes hand in hand with legal problems in dealing with image and usage rights, some of which need individual solutions while others have not yet been sufficiently solved – on either national or international levels. The free access to and sharing of data also meets psychological boundaries in a world in which many historical collections have been well-guarded spaces for a long time, with strict control over who had access to them and who was allowed to publish certain information (STRICKER/WEBER 2016, 24). This mentality still prevails in many institutions.

Why Digitise and How Is it Done?

The Collection of Classical Antiquities at Heidelberg University was officially founded in 1848 as a study collection.[10] It consists of almost 9,000 original ancient Greek, Roman, and Etruscan objects, roughly 1,200 large plaster casts (i.e. copies) of statues, busts, and reliefs, and several thousand small-sized plaster casts of gems, cameos, and coins (Fig. 1a–l). With its long history and widely varied stock, it is one of the most important classical archaeological university collections in Germany. Even today, it offers students of Classical Archaeology the chance to study materials and tool marks, styles and iconographies of originals and copies (casts). The

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9   *"Koordinierungsstelle Wissenschaftliche Universitätssammlungen"*: https://wissenschaft
     liche-sammlungen.de/en/ (accessed 20/12/2020).
10   On the history of the collection, see ZENZEN 2016.

Fig. 1a: Greek vases (lekythoi) in the depository of the collection.
Fig. 1b: Roman oil lamps in the depository of the collection.
Fig. 1c: Ceramic fragments from the Greek island of Thera / Akrotiri.

Fig. 1d: Ancient coloured architectural element.
Fig. 1e: Bronze vessel.
Fig. 1f: Coloured terracotta figurine.

Fig. 1g: Golden palmette ornament, attached to a piece of wood.
Fig. 1h: Greek inscription on a bronze plate.
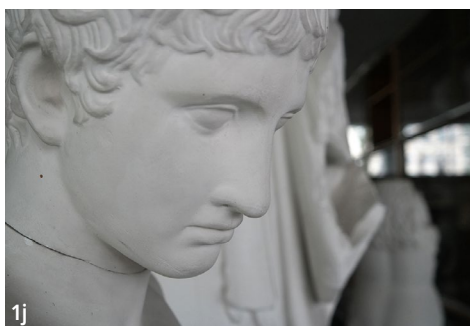**Fig. 1i:** Pieces of ancient floor mosaics.

Fig. 1j: Plastercast of the so-called Doryphoros of Polykleitus.
Fig. 1k: Plaster impressions of ancient gems from the so-called Daktyliotheca of Tommaso Cades.
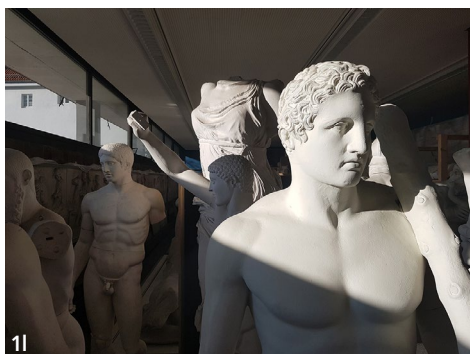**Fig. 1l:** The plaster casts of the collection as currently stored due to the building renovation

collection is also used for practical exercises such as drawing, photographing and 3D-scanning of artefacts, and to design exhibitions together with students. With its broad range, representing 3,000 years of ancient history, it was also open to the public on a regular basis before renovation of the building (which will take several years) began in 2017. Institutionally, the collection is linked to both the Institute of Classical Archaeology and Byzantine Archaeology and to the Heidelberg Center for Cultural Heritage (HCCH).

In the Heidelberg Collection of Classical Antiquities, the digitisation of objects was already considered a necessity from the point of view of everyday work. For a curator starting a new position and needing to get to know a collection from scratch, the analogue system still common in many collections poses a problem.[11] This system usually consists of many drawers full of index cards which contain basic information about the objects (Fig. 2).[12] These cards are invaluable resources, as they often provide the only information available. Ideally, they will have been consistently labelled and updated over decades. In Heidelberg, there are index cards for all large-format plaster casts and for almost half of the original artefacts. For the other half of the original artefacts, however, the index card cabinet provides no information at all. Yet above all – and this is probably the greatest difficulty when making oneself familiar with a collection – the index cards do not contain any information on the storage locations of the objects. How is one supposed to find an object when a colleague asks for photos or details if one does not know its location? This everyday problem has made digital recording of the original objects along with their inventory numbers, basic data and locations indispensable.

Fig. 2: Drawer with index cards of the collection.

11   On the advantages of digital documentation, in contrast to its reputation as a boring task, see HOHMANN 2016, 63.

12   On the 'classic' analogue documentation systems of collections and museums, see HANSEN 2016, 35. On the positive aspects of index cards, and with critical remarks on the requirements of database systems, see LANG 2016.

Digital Administration: Conducting a Collection Inventory with Students

Since it is impossible for a single curator to record about 9,000 objects, a large inventory of the collection took place in March 2018 in which students of the Institute were allowed participate, thus both getting to know the collection and earning credit points. These 18 students helped to record almost 5,000 objects in an Excel spreadsheet over three days, for a total of 216 working hours (Fig. 3a–c).[13] In addition to object type, storage location, material, and place of origin, all (modern) inscriptions and labels on the objects were also documented. In part, these records contain old inventory numbers from the history of the Collection of Classical Antiquities and thus provide information about the historical systematisation or grouping of objects, and possibly also about the time when the objects were acquired

Fig. 3a–c: Inventory of the collection:
the students Katharina Voll and Isabelle Weiser (3a),
Ela Eser (3b), and curator Polly Lohmann (3c).

13 The fact that recording a whole collection of several thousand objects requires a huge amount of time can also be seen in a project of the Museum of the University of Tübingen (MUT). In addition to our digital inventory, the Tübingen project included the scanning and actual numbering of the objects, 1,400 covers of print magazines (cf. BIERENDE 2016, 79).

(Fig. 4a–f). Such numbers and place names on the artefacts may also date from the time when they were excavated or sold for the first time, thus providing valuable clues regarding their origin and object biography. Due to the age of the artefacts, many of the labels are now beginning to peel off, and inscriptions are fading. Documenting this information therefore had a high priority. It is possible that a systematic analysis of the inscriptions and labels, in conjunction with a reading of old

Fig. 4a–f: Artefacts carrying different labels and ink inscriptions with inventory numbers, dates, places of origin, and other indications.

inventory books, may also reveal which objects were acquired in groups; however, this is work for a longer-term project on the provenances of the collection items, which, as in many collections, have been documented only partially or not in detail.

The 4,000 remaining original objects were further recorded after the inventory by the collection's student assistants during 2018 and 2019. The basic data was supplemented with information from the index cards and references to research literature. A number of editorial changes were also necessary to align fields and standardise terms and spellings. The Excel spreadsheet compiled now makes it possible to filter in a simple form, for example for object categories, or to discover the locations of objects. For more complicated questions about correct inventory numbers, both old and current numbers can be searched for. The digital inventory will also be needed to monitor the upcoming relocation of the collection to the newly renovated part of the building, which will take place in 2021 with the help of an art logistics company, and update the storage locations. We are still a long way from having our own internal database for all artefacts of the Collection of Classical Antiquities, but the Excel spreadsheet already makes work much easier. It also forms the preliminary stage of and preparation for the online presentation of the collection items in the Heidelberg University Library's image database heidICON. The metadata from the Excel spreadsheet will be included in the database, together with photographs of the artefacts and scans of the index cards.

Digital Preservation and Accessibility: Reproductions and Databases

Fortunately, by 2017 almost all of the 1,200 large-format plaster casts and several hundred original objects of the formerly permanent exhibition in the Collection of Classical Antiquities had been digitally photographed. The newly systematised and organised images were then to be entered into the image database heidICON and thus made available online; this had been agreed on among the curators of the different collections of ancient cultures belonging to the HCCH. On the one hand, this pursues the collaborative strategy of a uniform presentation of the various collections online; on the other hand, heidICON already provides a platform via the Heidelberg University Library, which thus takes over the secure hosting of the data and its maintenance.

For an automated import, the Excel data needed to be 'matched' with the data fields available in heidICON. First, we had to find equivalents to the digital data collected – i.e. the columns of the Excel table such as "material", "place of origin" etc. – in the online image database. This process took several months, during which the demands of the Collection of Classical Antiquities and the requirements of heidICON were discussed with respective colleagues and adjusted (Table 1). While some of heidICON's data entry fields allow flexible contents ("free text fields"), others

Table 1: Matching of date fields of the Collections Excel spreadsheet and heidICON.

Collection of Classical Antiquities, internal Excel file, columns / categories	Public heidICON data fields	Internal heidICON terms
Inventarnummer	Inv.Nr./Signatur	obj_sig
?	Sachbegriff/Objekttyp	obj_sachbegriff
Objekt (Gattung)	Klassifikation	obj_klassifikationen_gnd[].obj_klassifikation_gnd
Objekt (Gattung)	Klassifikation Typ	obj_klassifikationen_gnd[].obj_klassifikation_gnd_typ#_system_object_id
Material (GND)	Material (GND)	obj_materiale[].obj_material
Technik (GND)	Technik (GND)	obj_techniken[].obj_technik
Material und Technik	Material/Technik	obj_material_technik_alt
Fundort (GND)	Fundort (GND)	obj_fundorte_gnd[].obj_fundort_gnd
Entstehungskontext	Entstehungsort (GND)	obj_herstellungsorte[].obj_herstellungsort_gnd
Datierung (Freitext)	Datierung (Freitext)	obj_datierung_freitext
Datierung absolut	Datierung normiert	obj_datierung_norm#from
Datierung absolut	Datierung normiert	obj_datierung_norm#to
Datierung relativ	Epoche/Periode/Phase	obj_epoche_freitext
Kommentarfeld	Objektbeschreibung -Kommentar	obj_kommentar#de-DE
Ansprache	Titel	obj_titel#de-DE
Kurzbeschreibung	Objektbeschreibung	obj_beschreibung#de-DE

require the use of authority files (standard descriptors/vocabulary).[14] Place and object types, for example, therefore had to be adapted using authority files, which constituted another work step. Only in the final step could the revised Excel spreadsheet finally be imported into heidICON and its metadata linked to the photos of the objects, and the scans of the index cards linked to the data records to make the sources of information more transparent.

The first data import included 1,000 original objects, which have been available online since summer 2020 via heidICON[15] (the COVID-19 pandemic forced us to concentrate on the preparation of the heidICON import). These first objects to be made digitally available were well researched and much-published pieces. Their information and photos had already been available, and only needed to be transferred into the right format. The situation is different with the remaining 8,000 original artefacts, for which there is less information available, or none at all, and which still need to be photographed. In addition to the images, a lot of research will need to be done before their importation to heidICON to generate metadata so that reliable information on the objects can appear online. As this would mean years or decades of delay, however, a more sensible option would be to make photographs of the artefacts available in heidICON even if it must be without much additional information. This would at least allow us to rely on 'swarm intelligence' – or in other words, the idea that what we cannot do ourselves, perhaps others can. In absence of metadata, although the objects could not be systematically searched for

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14 On standardisation and databases, see e.g. the contributions of the Museum of the University of Tübingen: LANG 2016, 53–55; HUGUENIN 2016, 67–68; BIERENDE 2016, 81.

15 https://heidicon.ub.uni-heidelberg.de/search?p=357 (accessed 28/12/2020).

by external users, at least scientists from all over the world could (if interested) gain insight to the collection items and possibly come across pieces that relate to their own research by chance. In the long term, this could generate new research results, which would certainly not be the case if the objects remained unknown, hidden away in storage cabinets and inaccessible to the public. Regarding the prioritisation of certain objects as criticised above, this would at least be a compromise solution.

So far, no imaging technique other than digital photography has been applied. 3D scans exist for only a very few objects; they were produced during a seminar in summer 2019 in collaboration with the Interdisciplinary Center for Scientific Computing (IWR) of the University of Heidelberg.[16] Students of both Classical Archaeology and Computer Science were trained to operate a Hexagon/Breuckmann smart-SCAN-3D-HE scanner. In groups of two, they generated scans of three different types of objects over the course of the semester: a flat impression of an Aegean seal; a three-dimensional ancient Greek terracotta figurine; and a three-dimensional ancient Greek clay vessel. All three object types presented different kinds of technical challenges, and the aim of the seminar was to discuss the costs and benefits of 3D technology. As the students rightly claimed, the effort and time invested is still relatively high compared to the actual output in the case of the Heidelberg Collection of Classical Antiquities. Despite the fact that 3D scans and models generally offer diverse possibilities in the course of studying and presenting objects, they are thus not feasible when work power is limited and more basic tasks have to be prioritised. In the case of the Collection of Classical Antiquities, therefore, comprehensive scanning of all objects does not make sense, at least for now. 3D scans can, however, contribute to archaeological research questions, for example through automated comparison and matching of ancient moulds and their corresponding vessels regarding sizes, shapes and designs, or, in combination with computer tomography, through the analysis of ancient or modern restorations, to name two examples of existing projects.[17] If a similar project requires 3D scans of objects from the Collection of Classical Antiquities in the future, heidICON would allow for storage of this data as well. It is envisaged that the future permanent exhibition will include a small number of 3D scans, allowing detailed views of surfaces, including tool or colour traces.

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16 Seminar "3D-Scanning", taught by Hubert Mara and Polly Lohmann, summer semester 2019.

17 On the application of 3D scanning techniques and computer tomography on ancient Greek vases and vase painting, see the contributions in the 2013 Corpus Vasorum Antiquorum Österreich Beiheft 1, e.g. Mara/Portl 2013 (documentation and roll-outs of the painting); Fürhacker/Karl 2013 (historical restorations of ceramic vessels); Karl/Jungblut/Rosc 2013 (technological and archaeometrical analyses of vases).

Fig. 5a: Old photographs of the former exhibition spaces, "archive" of the Institute of Classical Archaeology and Byzantine Archaeology.
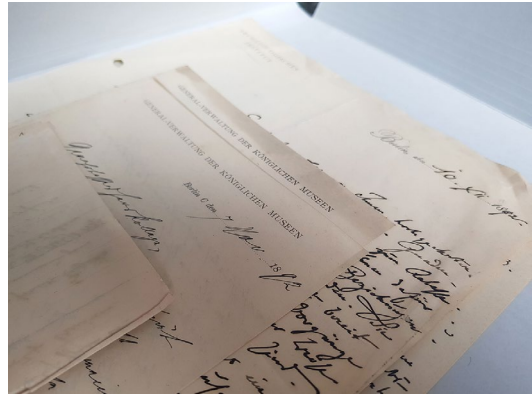

Fig. 5b: 19th century letters, "archive" of the Institute of Classical Archaeology and Byzantine Archaeology.

Digital Documentation of Archival Material and Further Steps

At the same time as they recorded the original objects in Excel, the collection's student assistants also scanned all existing index cards. These were uploaded to heidICON along with the object photographs in order to make all available information transparent. Other documents, such as inventory books, correspondences and old photographs, were viewed, recorded and scanned in 2018 and 2019 for internal use (Fig. 5a–b).

From 2021 onwards, the next steps will be to publish the scanned index cards and photos of the approximately 1,200 large-format plaster casts of the Collection of Classical Antiquities on heidICON. These are already recorded in an internal database, from which the basic data can be exported to Excel, prepared for heidICON with the addition of authority files, and imported into heidICON. However, some strategic decisions will have to be taken first, because here the typical problem regarding copies arises: which information should be provided, that of the copy or that of the original (i.e. the model from which the copy was made)? Should the date of the original (e.g. the Greek classical period) be entered in the main data fields, or the date of the production of the cast (e.g. the 19th century)? Should the material entered be the plaster of the copy or the marble of the original? In other words, should the original or the cast be relevant for future search queries?[18] This raises the question of the value of copies: do we regard them as works in their own right, or as copies whose intrinsic information is unimportant?[19]

18 On the database solution of the plaster cast collection of the Freie Universität Berlin which links the data sets of the copies (plaster casts) to data sets of the respective originals via "ARACHNE", see Remmy/Schröder 2012.

19 On the changing attitudes towards cast collections, see Cain 1995. On the history of plaster casts of ancient statues, see, among others, Borbein 2000; Kammel 2001; Klamm

All these aspects need to be considered and clarified in advance in order to undertake the systematic indexing of any reproductions, e.g. two-dimensional pictorial works such as photographs. They show once again how complex digitisation is as a process, because it is in the first instance a decision process and in the second instance a practical work process. These decisions influence, for example, the accessibility, protection, and sustainability of the data (depending on the host or database system chosen), and the search queries and hit rates (based on the data recorded and criteria chosen for digitisation – aspects which are mostly not 'objective').

In the Collection of Classical Antiquities at Heidelberg University, the digitisation process took two and a half years, from the first digital recording of the original objects to the online presentation of only 1,000 pieces. It can only be guessed how much more time will be needed before another 8,000 original objects and 1,200 large casts can be found via heidICON and thus be accessible to researchers from all over the world.

Digital Public Engagement

While all measures presented in the earlier paragraphs of this article focus on the digital documentation, preservation, and administration of the collection's holdings, additional actions are needed to raise public awareness. In the course of redesigning the future exhibition, a concept for engaging with a broader audience is essential. Although it has a certain core audience, the Collection of Classical Antiquities is not known to the wider local public. As a first step to achieving this audience broadening, social media accounts were created on Instagram (for the collection, in 2019) and Facebook (for the Institute of Classical Archaeology and Byzantine Archaeology, in 2018).[20] For these media, and for specific projects, digital formats other than static images have occasionally been applied. In a practical seminar, for example, students were asked to create short video clips (Erklärvideos) on objects from the collection. They were taught basic video editing and cutting skills using freeware available online.[21] Each of the students was confronted with one or several objects and was free to design the video using techniques such as whiteboard technique, stop motion and animation. The content of each video was also created independently by the students, and focused on either the function of the object, its decoration, or its biography and place of origin. The videos were made available

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2010; STEMMER 1993. With a focus on restauration techniques for plaster casts, see GRAEPLER/RUPPEL 2019.

20   This is possible because there are no legal or ethical boundaries as there would be, for example, for Indigenous artefacts.

21   Seminar "Videos selbstgemacht: Produktion von Erklärvideos zur Antikensammlung", taught by Polly Lohmann, winter semester 2020/2021.

Media 1: Video *Gladiatoren, Götter und andere Lichtbringer: Antike Tonlampen* (Gladiators, Gods and Other Lightbringers: Ancient Clay Lamps), https://www.youtube.com/watch?v=id1WhjF5_no&t=2s (accessed 24/8/2023).

online via YouTube and heidICON and shared via the social media channels of the collection and Institute (Media 1).

Another project, a special exhibition designed together with students, focused on the plaster casts of a Roman victory monument in present-day Romania. The so-called Tropaeum Traiani is today mostly unknown, even though it was of high scholarly interest a hundred years ago for political reasons. In 1918, during the occupation of Romania in the First World War, a large number of plaster casts were made on site and transported to Heidelberg so that copies could be available for research.[22] They raise questions regarding the appropriation of cultural heritage in both ideological and practical terms. The pop-up exhibition "Archaeology and Politics" deals with the prerequisites and history of the casts, their production, and their long journey to Heidelberg.[23] It also highlights the reception history of the Tropaeum Traiani in changing political contexts, both in Romania (for the original monument) and in Heidelberg (for the plaster casts). The exhibition will travel back from Heidelberg to Adamclisi in Romania following the same route by which the casts came, together with the students, and is therefore designed as a small and mobile exhibition consisting of panels ('roll-ups'), touchpads (tablet PCs), and a 3D print of the monument. The students' work for the project included designing a digital program (application) for the tablet PCs. Research information on the original monument, its architecture and excavation history was fed into the application, which was put into practice by Jürgen Süß (Fig. 6). He also created a digital 3D model to be viewed both in the application and as a 3D print. Such projects allow for the use of digital technologies beyond the pure recording of the collection and offer students the opportunity to gain insights into new or alternative forms of exhibition-making.

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22 On the (hi)story of the Heidelberg plaster casts of the *Tropaeum Traiani*, see LOHMANN 2020; LOHMANN 2021.

23 For the exhibition blog, see https://aup.hypotheses.org/.

Fig. 6: Start screen of the digital application on the Tropaeum Traiani at Adamclisi.

In the course of redesigning the collection, students have been invited to design concepts for digital screens or panels, focusing on individual topic areas of the future permanent exhibition. The students gather content and create mock-ups for interactive applications or static screens, and discuss their ideas with all participants in one-day events ('retreats') at the end of each semester. The digital elements are still in progress. They constitute one step in the making of the new exhibition, which is being developed over several years, with students committing themselves for two or three – sometimes even more – semesters to contribute to the future permanent exhibition.

Developing different forms of digital representation of heritage, whether for online or on-site interactions, requires theoretical and practical engagement both with the artefacts themselves and with science communication. During the COVID-19 pandemic, since 2020, such digital representations have turned into a central matter of museum and collection work as a way of virtually keeping in touch with the public. However, the production of digital content requires financial resources, which have to be acquired from third parties because the regular university budget is very limited. Due to COVID, the urgent need for digital accessibility and public engagement with collections and museums has become obvious. University collections, which are especially underequipped in these terms, were forced to take their first steps into digital public engagement. On the other hand, the public awareness of the value of cultural institutions beyond their digital appearance has also increased during the COVID-19 pandemic. Museums and collections have reappeared in people's minds as material places, missed once they had to close for weeks and months. In that sense, digitising cannot replace material objects and places, but it can accompany and support them.

Acknowledgements

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