TIMEO INTERRETEM ET DONA FERENTEM

ON ARACHNE AND THE POTENTIAL AND LIMITS OF PUBLISHING ARCHAEOLOGICAL CATALOGUES ONLINE

GABRIELE SCRIBA German Archaeological Institute, Rome Department, gabriele.scriba@dainst.de
ULRICH STOCKINGER University of Cologne, Cologne Center for eHumanities, stockinu@uni-koeln.de

ABSTRACT Catalogues are one of the most important types or aspects of publications in archaeological research. Although often more sophisticated regarding typology, methodology and contents, most publications of archaeological material still tend to adhere to the technical layout shaped in scientific catalogues of the late 19th and early 20th centuries. This neglects the possibilities provided by technological developments of the last decades, especially by the evolution of online publishing. The object-oriented database ARACHNE shows what is and what might be possible by publishing archaeological catalogues online. There are few restrictions regarding the publication's extent, illustrations, availability or further use – and a variety of possible enhancements such as interactivity, contextualisation and digital methods of analysis.
Publishing archaeological material in web environments clearly offers many advantages over the traditional publication in print. However, the latter is still absolutely predominant in archaeological work – but are there any substantial reasons for that? Showing examples of catalogues published by the Rome department of the DAI, this paper demonstrates that online publications are nothing to be afraid of. In fact, archaeologists should appreciate and make use of the gifts offered by the internet.

KEYWORDS Digital humanities, catalogues, publication, online publishing, methodology

INTRODUCTION

Since several decades, technology has become almost indispensable in archaeology, finally dominating the scientific life from data acquisition (e.g. excavation, survey, archival work) to data evaluation and the preparation for publication. Being beleaguered by technology for several years, most projects seem to consider the further use of IT one of Odysseus' stratagems. This paper cannot give a thorough overview of the future of publications as a whole or online publishing in archaeology in general (for further information on existing platforms see for example Dally *et al.*, 2013; Effinger, 2013; Ray, 2013). Instead, this article will shed some light on the possibilities and limits when supposedly *the* most important type of publication in archaeology meets the internet. This shall be illustrated by examples of recent publications of the German Archaeological Institute's department in Rome.

GENERAL CONSPECTUS

Although often more sophisticated regarding typology, methodology and contents, most publications of archaeological material still tend to adhere to the technical layout shaped in scientific catalogues of the late 19th and early 20th centuries. This neglects the possibilities provided by technological developments of the last decades, especially by the evolution of online publishing. The potential of online catalogues shall be demonstrated quickly in comparison with traditional printed versions regarding selected important aspects of scientific publications.

ACCESS AND CITABILITY

Critics of online catalogues often consider the difficulties in citing them as their main disadvantage compared to traditional catalogues published in print (Vonderstein, 2013, p. 31). This is not too astonishing, since the web certainly does evoke the feeling of *panta rhei* from time to time – and accessibility resp. range of circulation are by far the most important factors for choosing a certain way of publication for scholars as surveys show (Ray, 2013, p. 67). Who has not been confronted with a sad *404 Not Found* error message instead of that specific great report which had been accessible through this link weeks before?
However, stable references via uniform resource identifiers (e.g. UNRs, DOIs) can ensure that the cited link does indeed lead to the same information even years later. The catalogue entries must and may be addressed individually. Regarding the other texts, either a fixed pagination or a reliable way of reproducing the same layout of dynamically presented contents is necessary to make citations of specific sections of the

publication (comparable to nowadays pages) possible. Besides, it is important to make use of professional long-term storage devices which are independent from commercial interests or proprietary applications: Arachne's data are stored on a Tivoli Storage System with multiple redundancies and provided to the public via the Andrew Filesystem to prevent loss of data and to assure a stable and fast access.
Publishing archaeological material online does not necessarily mean open access – although it makes it technically feasible. Open access has been subject to many debates in the past years, especially from the early 2000s onwards, and 2012 has seen the evolvement of several initiatives demanding OA publications for all publicly funded scientific projects (Vonderstein, 2013, p. 27-30). Indispensable for the dissemination is the integration in established repositories (e.g. OPACs) or search engines. Generally, this ensures a wider distribution than the (simultaneous) publication in print and might as well facilitate the traceability of citations (e.g. CrossRef).
A survey conducted by ITHAKA S+R (Ray, 2013, p. 64--67) showed that the percentage of members of colleges and universities in the US who started their research projects in the library diminished continuously and drastically from 2003 to 2012 (ca. 15 vs. 3%).[1] In recent years, more than three out of four interviewees stated to use general search engines or specific electronic resources as stepping stone for their research.

USABILITY

In contrast to printed catalogues, the information provided online can not only be accessed 24/7 from the most remote locations but can also be easily modified – both by the author and by the readers (e.g. rearrangement of the entries and addition of personal notes). This allows an interactive and easier access to the data relevant to the particular researcher, as metacrawlers or faceted browsing provide more possibilities than naturally restricted indices at the end of a volume of more than 500 pages. Furthermore, an interactive table of contents gives a better overview of the information, and the data can be arranged according to each reader's interests – this means displayed in a specific order (for example chronological or geographical) or filtered by specific conditions. Besides, online catalogues make cross-referencing way easier.
A relational database model offers the possibility to contextualise the individual objects, and to facilitate comparisons and comprehensive studies and queries. Following certain web standards such as the CIDOC Conceptual Reference Model allows interoperability between different systems. CIDOC CRM provides an extensible ontology to map data in cultural heritage and museum documentation to a common and extensible semantic framework and thus makes the controlled exchange of this information possible.

1. These numbers don't include the people who started their research in the library's online catalogue (ca. 28% vs. 19% in 2003 resp. 2013).

MEDIA

While the extent of media in printed publications is limited both in quantity and quality, online catalogues are quite flexible in these respects. Images, graphics, maps and statistics can be published in their original quality without restrictions of paper size, printing costs or the publication's weight and thickness. On top, these illustrations can be enhanced by interactive elements such as providing concrete figures and information for each bar in a chart which would just be extremely confusing in the printed version. Instead of deriving static maps from data generated in a GIS, this information can be presented as an interactive WebGIS-interface allowing spatial visualisations, queries and analyses. Moreover, other types of media like 3D-models or videos may be provided online to give a better understanding of the archaeological material presented.
Since media can be reproduced way easier online, this might entail legal implications which have to be addressed and yet to be solved.[2] At least, it is possible to assign certain rights to certain groups of users, providing only information on what kind of media is available to unregistered users, while registered users can view these illustrations in different quality according to their specific rights. The Creative Commons licences provide a variety of restrictions regarding the rights to reproduce and/or edit the data provided by the author to facilitate their further use and make use of synergy effects. Moreover, online publications are not *per se* a space of public domain, and publications may also be only accessible via institutions or for a fee.[3]

EXTENT AND SUSTAINABILITY

Undeniably, researchers can make far more information public on the web and provide both more content and service to the readers. At the same time, the possible audience is incomparably larger. Thanks to the easy and omnipresent access, online catalogues are distributed more diversely and circulated wider. As a result, scientific papers published on the web see a considerable increase in citations by other authors. While a lot of printed catalogues of archaeological material is widely neglected in further research and ends up in the scientific dustbin once and for all, web catalogues offer better possibilities for revision, reuse and recycling. It is or should be common practice that the data obtained in a study leads to new questions and studies which produce more data to be discussed further – and publishing archaeological material online definitely facilitates and encourages this scientific data life circle. Data mining might have significant influences on further research: For instance, it might be possible to generate an unbiased typology of ceramics, based on

2. Putting aside that even printed versions might implicate copyright issues and that scientific catalogues, which are funded by the public, might be *per se* considered non-commercial.
3. Publications can be provided online behind a so-called moving wall (e.g. the publications of a predefined range of years are not (yet) accessible).

form recognition software tools which are applied on digital representations of the finds.[4]

QUALITY

Quantity does not necessarily mean quality – however, the vast extent of data that can be published online should guarantee more transparency how the results were obtained (e.g. information on individual dots of a distribution map or on a single bar in a chart provided as a mouse-over or pop-up). Another powerful tool of web publications is the possibility for adaptions, corrections and additions – an online catalogue can be updated and enhanced much easier than a printed book. In fact, second or third editions of archaeological catalogues are almost unheard of. By versioning, it should be possible to make sure that a specific URL indicates a specific version of the catalogue entry.[5]
Besides this chance for further changes by the author him- or herself, the scientific community may also correct and add information to the existing catalogue. While reviews are completely separated from the contents they refer to in the analogue world, these comments can be displayed together with the original data on the web. This also facilitates the plurality of parallel ideas and interpretations, thus possibly promoting a further democratisation of archaeology.

IMPACT

As online publications are circulated wider, have a more diverse, global readership and can be used more easily as a stepping stone for further research projects, their impact is by far bigger and longer-lasting. Furthermore it is much easier to offer multilingual interfaces on the web. While the automatic translation of free text might remain difficult for another couple of years, a standardised vocabulary comprising specific and specified terms can already be displayed in other languages without many grave mistranslations. The DAI is currently developing a multilingual archaeological dictionary which can be used to exploring these possibilities further.
On top, it is possible to generate more basic versions of digital catalogues for the broader public and possible sponsors – this includes both the abstraction of too detailed information (e.g. a dating to the first half of the 2nd century AD rather than to late trajanic-early hadrianic times) as well as the supply of additional information like a link to georeferenced information to the locations cited in the catalogue.

TIME AND EFFORT

Creating online catalogues generally takes more time than to publish a print version because the data has to be structured and mapped in a reasonable, comprehensible and reusable way. It is necessary to generate machine-readable metadata according to certain standards such as those of the so-called Semantic Web to structure the archaeological material. This universal framework guarantees common data formats and exchange protocols on the web, thus allowing data to be shared and reused across application, institution, and community boundaries. Regarding stress before publication deadlines and distribution costs – especially in relation to the quantity of volumes published – online catalogues are less demanding for the authors. Moreover, they make collaborations of several researchers working in different places far easier, guaranteeing a certain uniformity of data acquisition and compilation and avoiding competing versions of the catalogue. Similar to analogue dangers (e.g. mould, fire, water or human contact), digital publications need constant curation to prevent losses – otherwise, most of the file formats currently in use might not be accessible without loss of data.

EXAMPLES FROM THE DAI ROME

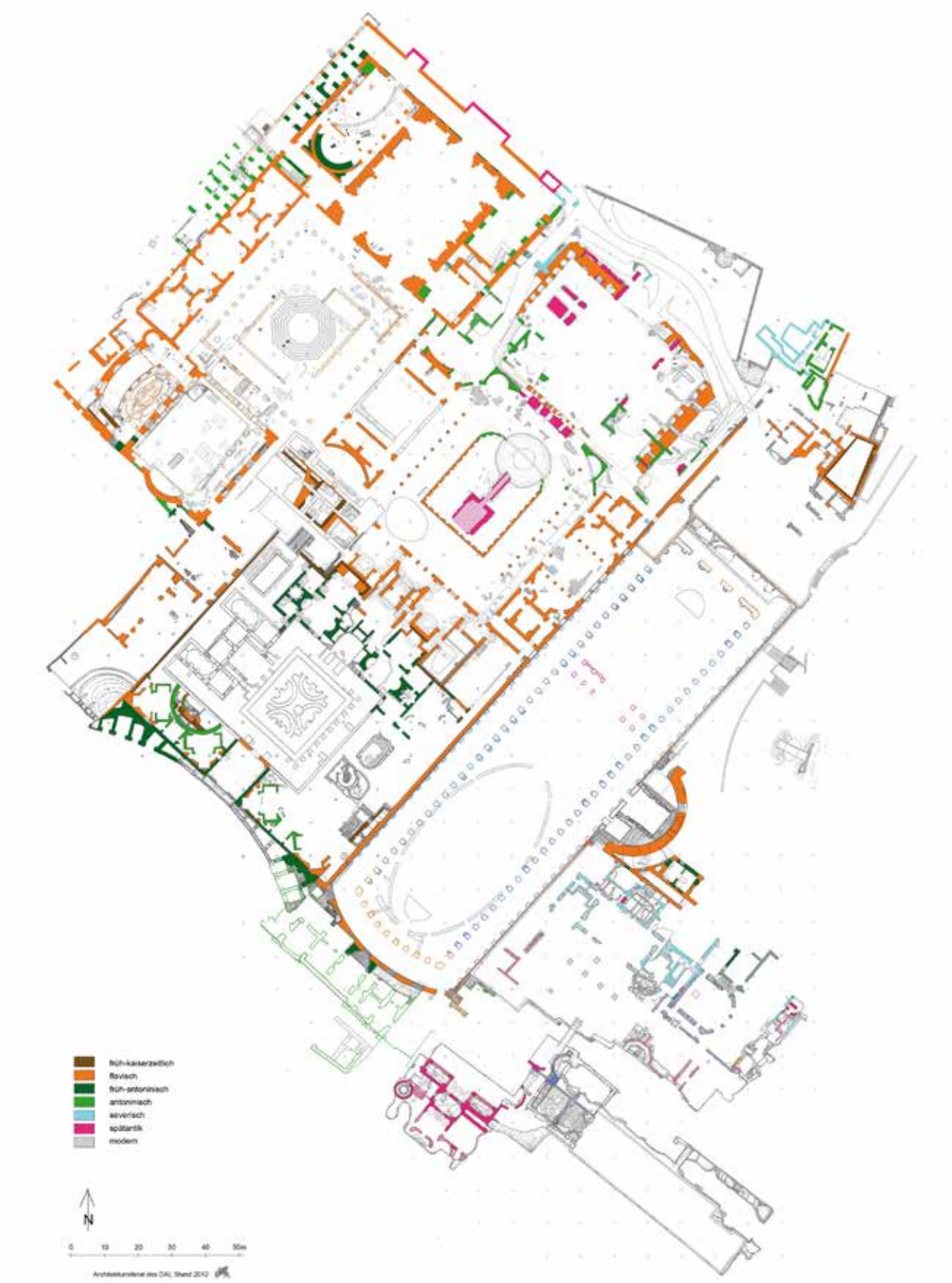
The editorial office of the German Archaeological Institute's Rome Department has been at the vanguard when it comes to publishing online catalogues in collaboration with Arachne. After a more detailed presentation of our most recent project – the first article in our journal *Römische Mitteilungen* to feature an Arachne catalogue –, I will briefly describe some of the publications in our monograph series, *Palilia* and *Sonderschriften*, in order to illustrate the variety of possible online catalogues.

RÖMISCHE MITTEILUNGEN
121, 2015

The 2015 volume of *Römische Mitteilungen*, which has been published in December 2015, features an important article dedicated to the brick stamps from the Imperial residences on the Palatine Hill in Rome (Bukowiecki and Wulf-Rheidt, 2015a). As part of the German Archaeological Institute's Palatine project led by the architect Ulrike Wulf-Rheidt,[6] all the brick stamps from the Domus Severiana, the Stadium, the Domus Augustana and the Domus Flavia known from previous publications and found *in situ* have been compiled and studied by Evelyne Bukowiecki (cf. short project summary: Bukowiecki and Wulf-Rheidt,

4. See the ArchAide project: [http://www.archaide.eu/. Access date: 23/05/2017].
5. Online publishing will definitely increase the number of articles' versions since digital revisions are far easier, faster and cheaper.
6. [https://www.dainst.org/projekt/-/project-display/45489. Access date: 25/03/2016)].

1. View of the Imperial residences on the Palatine from South (R. Wieczorek, BTU Cottbus-Senftenberg, Lehrstuhl für Baugeschichte).



2. Map of the Imperial residences on the Palatine (U. Wulf-Rheidt, DAI Architekturreferat).

2015b) (figures 1-3). This collection of 940 brick stamps has allowed Wulf-Rheidt and Bukowiecki to establish a much more detailed chronology of the construction activities on the Palatine – and moreover, to modify the existing chronology. Therefore, the collection represents an important instrument for further research – not only on the Palatine, but also for the whole city of Rome and its supply chains. But how does one go about publishing such an extensive catalogue of brick stamps? While a print version

3a-c. Brick stamps from the Imperial residences on the Palatine (E. Bukowiecki).

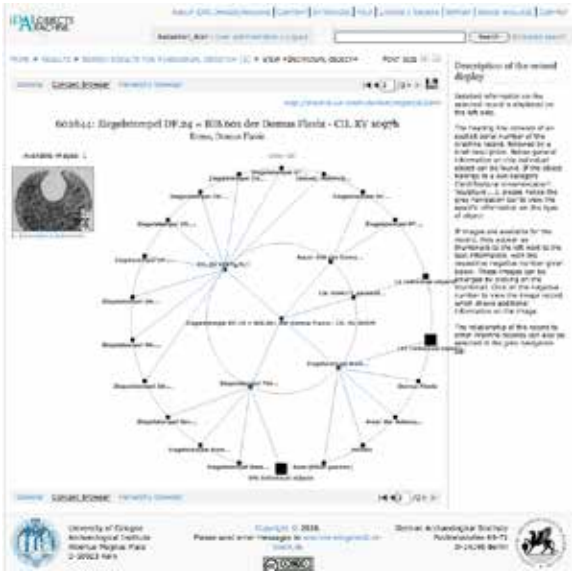
would simply be far too voluminous for the journal, it also would not allow the brick stamps to be classified and tagged according to different categories and research interests. These objections were the primary reason behind our decision to publish the catalogue online using Arachne. Before addressing the advantages offered by this approach, I want to briefly describe the main features of the catalogue structure.

In the print version of the article you will find an introduction on how to use the supplementary Arachne catalogue (Bukowiecki and Wulf-Rheidt, 2015a, p. 319-320), including a link that will direct you to the homepage of the article (figure 4). Here,[7] you can access the catalogue either by chronological or topographical order. The 940 brick stamps can also be searched for individually, by using their specific catalogue number. In addition to this, it is possible to access separately detailed maps of the Imperial residences and the respective locations of the brick stamp findings. The catalogue entries themselves consist of various features (figure 5): the catalogue number, a photo of the brick stamp (if available), the precise provenance within the Imperial residences (room and level), the dating in absolute terms and within the chronology established by the authors (Groups 1-7), bibliographical information, and, finally,

4. Homepage of the article in Arachne (Screenshot: [http://arachne.uni-koeln.de/drupal/?q=en/node/387. Access date: 25/03/2016]).

7. English version: [http://arachne.uni-koeln.de/drupal/?q=en/node/387. Access date: 25/03/2016]; German version: [http://arachne.uni-koeln.de/drupal/?q=en/node/384. Access date: 25/03/2016]; Italian version: [http://arachne.uni-koeln.de/drupal/?q=en/node/388. Access date: 25/03/2016].

5. Catalogue entry (Screenshot: [http://arachne.uni-koeln.de/item/objekt/602844. Access date: 25/03/2016]).



6. Context browser (Screenshot: [http://arachne.uni-koeln.de/item/objekt/602844. Access date: 25/03/2016]).

the number within the Corpus of Latin inscriptions (CIL), plus a transcription of the brick stamp's inscription.

This brief overview now finished, I will go on to highlight some of the advantages – as illustrated in the section above – of using Arachne for the online catalogue of brick stamps from the Palatine.

Access: All you need to access the catalogue is a free Arachne account. Thanks to the stable references and the long-term storage features, the links provided in the article will not change. Thus, the data will be available to a vast scientific community now and into the future.

Usability: One of the main advantages of Arachne is the flexibility it offers when it comes to using the catalogue. Depending on your research interest, you can tailor your access to the material according to different criteria: Chronologically speaking, you may choose to study a single chronological horizon – for example, all the brick stamps from Imperial residences dating from the Severan dynasty. Or instead, you could choose to study the deve-lopment of the brick stamps tracing their history from the early Imperial construction sites under the Flavians in the 1st century AD to the final building project in the age of Theodoric. You could also decide to access the brick stamps from a topographical point of view – for example, to isolate all the brick stamps from the Domus Augustana, or all those from a specific level of the Stadium, to cite only a few of the many possibilities. It is also possible, as mentioned above, to search for single brick stamps, if, for example you need to know the exact dating information for a specific specimen.

Media: Another very interesting feature of Arachne is the possibility to connect the catalogue entries with internal or external sources and information. Right now, it is possible to access directly from the catalogue entries the books in which the brick stamps were published – many of them are already digitized in Arachne. It's also possible to access the German Archaeological Institute's online catalogue, Zenon,[8] which includes the complete bibliographical reference and its collocation in the Institute's libraries. Arachne's context browser (figure 6) may be of additional help for studying the single brick stamps within their larger context: For example, the brick stamp DF.24 from the Domus Flavia can be connected to additional brick stamps with the same inscription, or to the Domus Flavia itself. These are only some of the possible connections. In the future, it will also be possible to access the corresponding inscription in the *Corpus Inscriptionum Latinarum* (CIL), which is available as a digital copy in Arachne.

Quality: This last point illustrates another advantage of Arachne: In contrast to traditional print catalogues, it is possible to modify the entries in retrospect and thus create a subsequent version of the online catalogue, if for instance you discover errors, or the dating of some brick stamps has changed, or you decide to enhance the catalogue by adding further links and information.

Extent and Impact: This leads to my final, and, in my opinion, most important point – the scientific extent and impact of Arachne. Apart from the ability to reach a much vaster scientific community, the online catalogue enables researchers to connect their own project to the online catalogue of brick stamps. New findings from excavations in Rome can be dated easily, simply by using the Arachne catalogue. An international cooperation between the German Archaeological Institute, the École française de Rome, and various *Soprintedenze* of Rome is currently planned, which would allow to connect previous and future research on brick stamps with Arachne, for example from other parts of the Palatine or from the Testaccio quarter. Arachne's multilingual approach – which was very important for us, considering that the article was co-written in Italian

8. [http://zenon.dainst.org/. Access date: 25/03/2016].

by a German building scholar and a French archaeologist – facilitates its adoption by an international scientific community.

FURTHER PUBLICATIONS: PALILIA, *AND* SONDERSCHRIFTEN *SERIES*

Considering that brick stamps are perhaps not the most common topic in archaeology, I will now move on very briefly and illustrate some of our other publications featuring an online catalogue in order to show the range of possibilities Arachne offers.

In 2011, the first book in our monograph series *Palilia* to feature an Arachne catalogue was the PhD thesis by Johannes Lipps dedicated to the Basilica Aemilia on the Forum Romanum (Lipps, 2011). The catalogue detailed the surviving parts of the Imperial architectural decoration. Other publications within the *Palilia* series have featured catalogues on the architectural remains and grave monuments of the military in Rome by Alexandra Busch (Busch, 2012), on the Roman *otium*-villas in Tivoli and its surroundings by Martin Tombrägel (Tombrägel, 2012), and on the decoration and wall paintings from Pompeii and the Campanian countryside by Wolfgang Erhardt (Erhardt, 2012). At the moment, two books with an Arachne catalogue are being prepared for publication. Our very first publication within the *Sonderschriften* series, a work by Klaus Stefan Freyberger serving as the first comprehensive study of the Basilica Aemilia from Republican times up to Late Antiquity (Freyberger and Ertel, 2016), and a work by Daphni Doepner on the votive terracottas from Medma in Calabria for the *Palilia* series (Doepner, in print).

CONCLUSIONS

As the DAI's publications in ARACHNE show, publishing archaeological catalogues online is hardly restricted regarding the publication's extent, illustrations, availability, revision or further use. On top of these advantages compared to the analogue print versions, the material can be enhanced with interactive tools, contextualised and analysed with digital methods if published online. Finally, web interfaces can be easily adapted and developed further in the future to make use of all the data and metadata provided.

While publishing archaeological material in web environments clearly offers many advantages over the traditional publication in print, the infrastructure (e.g. long-term data curation) has yet to be established, and fears regarding copyright and citability issues have yet to be answered. From an editorial point of view, an online publication necessitates a somewhat larger amount of preparation – one must find funding, design the catalogue structure, incorporate the data, and go about grouping and connecting the data according to the different categories. Despite all this, the advantages are quite clear: ARACHNE, with its wide range of possible catalogues, and most especially its flexibility, usability, vast extent and its possible scientific impact, is a powerful tool with manifold possibilities for publishing and enhancing catalogues online.

Adding to the sustainability and usability of catalogues in the scientific world, the digital Trojan horse turns out to be nothing to be afraid of. In fact, archaeologists should appreciate and make use of the gifts offered by the internet.

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