Englische Kurzfassungen der Beiträge
English Abstracts

TOBIAS ARERA-RÜTENIK

Digital Technologies in Building Archaeology and Heritage Conservation Practice
Development, tasks, prospects for the future

Digital processes in building archaeology and practical heritage conservation find application above all in the acquisition of two- and three-dimensional data on architectural geometries. The massive volumes of additional data on the monument that are also collected in the process tend to receive less attention. Yet it is precisely here that digital methods of work can make a decisive contribution to improving efficiency in research and practice; they can also promote collaboration between the participants involved, guarantee long-term monitoring, and open new fields of research.

The current tasks of digital building archaeology and practical heritage conservation must include the networking of existing collections of digital information and the development of digital tools for visualization and analysis; such measures are needed to facilitate the growth of knowledge relevant to the profession, as well as to prevent the progressive loss of information and to minimize the effort and expense of developing digital systems. A necessary precondition of this work is agreement as to standards or norms within the expert community. The corresponding data models should guarantee a precise and flexible degree of detail, in order to allow for meaningful analyses on the one hand, and for user-specific depth of focus on the other. This in turn calls for the development and widespread adoption of controlled vocabularies that will make comparisons among data and significant statistical evaluations possible. Only in this way will we be able to collate and cross-reference data and to add to it without the need to start again from scratch with every new project.

The adoption of standards or norms as well as sanctioned vocabularies will also allow for transfer across projects, and thus the shared use of technological developments.

FRANZISKA BLOCH

Syrian Heritage Archive
A digital register of sites and monuments for Syria and potential applications in times of crisis

Syria counts among the world's outstanding cultural landscapes. Since the outbreak of the current civil war, however, the dense distribution of monuments in Syria and the oftentimes unusually good state of preservation of many ruin sites is acutely threatened, and in many cases there has already been heavy damage. It is against this backdrop that the German Archaeological Institute (DAI), in cooperation with the Museum of Islamic Art in Berlin (SMB-SPK), has been pursuing the "Syrian Heritage Archive Project" (SHAP) since 2013. It is supported by Germany's Federal Foreign Office as part of that agency's cultural preservation programme.

With the creation of a digital register of Syrian cultural assets, the project aims to preserve primary research data on these assets for the long term, and is gradually generating the basis for future work in the area of heritage preservation. Since 2013, extensive archival records and museum holdings have been digitalized and systematically captured in the networked databases of the DAI. More than 120,000 datasets have thus far been integrated into the DAI's digital research environment (iDAI.world) and administered there according to a standardized methodology – and in the process have been sustainably preserved.

It is precisely the information generated by the DAI's longstanding research activity in Syria that is documenting the cultural heritage of the region in a substantial way. The DAI possesses numerous images and plans of historic monuments and archaeo-

logical artefacts from almost all of the key periods of Syrian history. The provision of these data to those working on the urgent problems of preservation in Syria represents an important contribution to international efforts to protect cultural heritage.

JOHANNA BLOKKER

Heritage Conservation and Digitality

The explosive development and spread of digital technologies and media in recent years, including the increasing abundance of opportunities for storing and exchanging information, have changed not only our relationships to each other in society but also our understanding of history and its built artefacts. The consequences of these developments for architectural heritage and conservation are becoming ever more apparent. In a world of proliferating images, heritage is being reduced to a collection of striking outward effects; in the face of infinite reproducibility, the monument's indispensability as a 'substrate' for our perceptions of heritage value is being called into question, and even the core concept of authenticity itself is being destabilized. This raises some urgent questions: What will become of the historic monument in the digital age? And how do we move forward into a future in which digitization is identified as the highest priority, even in the field of cultural heritage?

The essay imagines some possible consequences of the trend toward digitization in heritage conservation. The obvious advantages offered by digital tools and techniques are weighed against the serious conceptual problems with which they confront the discipline. It concludes that if heritage is to have more than a merely compensatory function, if it is to serve society as a resource of genuine alternatives to current reality, then the field of conservation must adopt a self-conscious and fundamentally skeptical attitude toward digitality. Indeed, it may be necessary to invest more energy, not less, in the conservation of analog, material objects – that is, in the care of objects that are resistant to manipulation, that are open to constant and unlimited interrogation, and that are also perishable, and therefore immeasurably more valuable.

BERND EULER-ROLLE

Data Conservation in Place of Heritage Conservation?

The Austrian example offers valuable lessons on the risks and potential side-effects of digitization, as we still find ourselves in the middle of the development process. For us, these side-effects are therefore clearly noticeable. To be sure, the Austrian national conservation authority has had extensive internal information systems at its disposal for some time, including an excellent monuments databank, a find-spot databank and an export databank, as well as quite a number of smaller, specialized databanks. The legal protection status of the listed objects is published on the national authority's website; however, the objects are not yet presented cartographically or linked to additional information. Instead, the different aspects of the 'object biographies' are held at different levels of the documentation system (Object Archive, Photo Archive, Plan Archive) and are catalogued exclusively by object name; thus the biography of a given object must be put together from components at gathered individual levels.

BURKHARD FREITAG UND ALEXANDER STENZER

MonArch – A Digital Archive for Cultural Heritage

(The text was originally written in English.)

Modern technologies not only enable us to create precise digital models of historic monuments, but also allow us to digitize the enormous collections of documents, incunabula, original plans and drawings, photographs, articles, books and other archival materials that are associated with these monuments. In many cases, however, the physical documents are distributed among different locations, are more or less unsystematically filed and are only partially catalogued, and any semantic tagging or keyword indexing that might exist is often insufficient. Unfortunately, this is also frequently the case with the digitized versions of valuable archival materials. The problem lies in part with the large volume of data being generated, but also with the fact that new forms of organization for digital information collections are needed in or-

der to ensure both their broad usability and their preservation.

The MonArch system described in this essay offers support for the sustainable storage and retrieval of digital information and documents on the basis of their relationship to a spatial structure. Examples of structures especially well served by such forms of digital information organization include buildings and urban situations, as well as archaeological sites.

SYBILLE GRAMLICH

Networked Monuments – Cui bono?

In almost all of the states of the Federal Republic of Germany, the state authorities for conservation maintain lists of historic monuments. These authorities are therefore expected to be able to give a comprehensive overview of the monuments in their areas of jurisdiction and thus to describe the essential components of the cultural heritage of their respective states and the different regions within them. A very rough estimate – which is all that is possible in the absence of reliable statistics – puts the combined number of listed monuments in the states of the FRG at 750,000. They include architectural and artistic monuments, historic gardens, and industrial heritage, and encompass individual objects, ensembles and World Heritage sites. Both professionals and the interested general public expect essential data on this collection of monuments, i.e. information on their location, legal status and type, to be made openly available on the internet. Today, all state and local conservation authorities work with databases and geographical information systems. Only a small fraction of this digital information is currently available online, however, due to the high costs involved in preparing it for presentation as well as maintaining and continually updating it. In order to carry out an efficient and successful databank search, the information it contains must be carefully structured and provided with a consistent set of broadly sanctioned search terms. Harmonized catalogues of data field headings and sets of standardized terms are necessary to allow comparisons among databanks, and are the precondition for making them publicly accessible through online cultural portals such as the German Digital Library (DDB).

FRANZISKA HAAS

Past Perfect – Perfect Past: Virtual reconstructions of the city of Dresden

With the introduction of digital technologies, new forms of visualizing and interpreting historic buildings and cities have emerged. A particularly impressive form – and one that is regarded with a certain measure of academic skepticism – is the virtual reconstruction model, i.e. the three-dimensional representation depicting past states of the building that have since disappeared. Heritage conservationists worry that such easily-consumable (digital) reconstructions could gain precedence over the oftentimes aesthetically unassuming originals to which they refer, and these fears are not unfounded. Unlike material reconstructions, digital models do not require the destruction of historical substance such as fragments or traces of subsequent building phases. However, their pictorial fantasies of a virtual past do appear to change people's expectations of authentic built witnesses to history.

Virtually navigable realities do not necessarily offer a basis for reconstructing a particular image of a city, such as that of the Neumarkt in Dresden, but they do provide effective advertising for it. A comparison of digital models and media with analog examples shows how the digital indeed changes our handling of, and our access to, historic monuments. But what distinguishes a digital three-dimensional model from its analog predecessors? And do digital surrogates really offer additional (knowledge) value, as far as heritage conservation is concerned? It is hardly possible to speak of digital models and their applications without also addressing their spread through different media, in museums, exhibitions and on the World Wide Web. In the process questions are raised about the opportunities and risks that a diffusion fully independent of time and space may hold for the historic environment.

ACHIM HUBEL

Thoughts on the Digital Reconstruction of Architectural and Sculptural Polychromy

During the restoration of Regensburg Cathedral from 1986 to 1989, Dr. Friedrich Fuchs took advantage of the scaffolding to perform a close examination of the church's architecture and sculpture and to look above all for traces of earlier polychromy. He recognized that at least three layers of colour covered the stone surfaces: an original layer dating from the Middle Ages, a completely new colour scheme of the 17th century, and another renewal from the years around 1700. Since such results could not however give an impression of the original appearance of the cathedral's interior or its sculptures, a search began for ways of making the finds visually comprehensible.

After a number of attempts with rather disappointing results, it seemed that a two-dimensional reconstruction of the polychromy based on digital photographs and using PhotoShop software might offer the best solution, given that three-dimensional scans were neither available nor affordable. The breakthrough came in the context of a modest research project entitled „Virtual Spaces", which was established by Professor Christoph Schlieder (Chair of Applied Computer Science in the Cultural, Historical and Geographical Sciences) and the author at Bamberg University. Together with ten doctoral students, and with advisory assistance from Dr. Fuchs, a long series of experiments was conducted which finally produced acceptable results.

Thanks to the effort and engagement of this group, it was possible to digitally colourize, nuance and pattern the photographs to produce highly realistic visualizations. At the same time, an analysis of the results revealed that in the Middle Ages the interior surfaces of Regensburg Cathedral had been given a scheme of polychrome decoration that, together with the polychromy of the sculpture and altars, had formed an integrated colour concept; and furthermore, that the new colour schemes of the Renaissance and Baroque were likewise based on unified artistic concepts which fundamentally altered the impression of the interior and reinterpreted it in line with the aesthetics of the day.

SILKE LANGENBERG

Conservation of the Unconservable

The way, how architecture is designed and realised has changed over the last decades. Initially the development of digital design tools (Computer Aided Design / CAD) has influenced the planning process, meanwhile digital production techniques (Computer Aided Manufacturing / CAM) are gaining in importance in architectural construction. Leading research institutes and companies have already integrated successfully computer-controlled machines and robots into their prefabrication processes or are using them directly on the building site to execute specialised or varying tasks.

Ongoing projects and cash flows of research funds in mind, it seems just a matter of time that the new technologies establish in architecture at a larger scale. Thus a critical reflection about aging, durability and reparability of digitally fabricated constructions as well as of the possibilities for an exchange of defective parts is unavoidable.

The methods of historic building research seem to be suited just rudimentary for an integral understanding of the realised objects, due to the facts that the prevenient digital processes are quite complex. Digitally fabricated constructions and buildings will be difficult to repair without specialised knowledge and most likely cause huge material losses. From a conservational point of view the question arises how to preserve 'the original' as well as about the value of buildings and constructions that can be reproduced at will. Presumably the digital architecture will become a problem in the long-term discussion about historic monuments, as – beside all conservational problems – its process-oriented approach contradicts the principles of a material preservation of original substance.

HANS-RUDOLF MEIER

Digitization as the New Heritage Conservation?
A critical commentary on the theme of the conference

Digitization and its consequences can no longer claim any originality as a topic of academic discussion, even in cultural studies and the humanities: the number of events, publications and job advertisements focusing on the 'digital humanities' and in particular on the digitization of cultural heritage has grown exponentially in recent years. This is attributable to the potential and challenges of the technology, to the wishes and expectations associated with them, but perhaps even more to the comparatively generous funding that is currently available in this area.

It should not be surprising, therefore, that new and different participants and actors are appearing who have had little contact with our field and its discourses before now. This will undoubtedly affect our activity and influence our future agenda. It has already led to odd shifts in meaning, which carry the aura of the new and thus appear to offer appropriate solutions for our times. And these are not limited to the popular arena, but also affect the long-established and traditionally-minded institutions of curation and conservation.

NORBERT NUSSBAUM

Maps – Redrawn.
Experiences with Cologne's Atlas of Urban Strata

As an instrument for the basic organization of professional knowledge in art and architectural history, the multi-volume inventory of historic monuments has become overwhelmed in recent decades by the enormous growth in the demands placed on it as a semantically charged form of data storage. Production of the classic 'grand inventory', for example, has nearly dried up completely. The claim to comprehensiveness with which we once consolidated our knowledge of architectural monuments into a canon and compressed it between the covers of a book has long since been undermined by the increasing open-endedness of our definitions, and by the methodological demands of a conservation disci-

pline that is inextricably interwoven with a number of neighbouring fields of spatial research – for the resulting exponential growth in the volume of information now being generated exceeds the capacity and functionality of the book. Indeed, a print medium that is supposed to document, evaluate and interpret the results of years of research conducted using analog and digital methods, and to allow both a receptive and an interactive approach to this material, already seems obsolete at the moment it is sent to press.

The solution seems obvious: we must make the switch to Geographic Information Systems (GIS). They are capable of consolidating numerous and heterogeneous media, of ordering all of the significant thematic aspects of a building in terms of their spatial relationships and of presenting them in all of their topographically, chronologically or scientifically describable correlations. Because such systems are by their nature open and extendable, their 'book-covers' – when correctly conceived and maintained – should in principle never close. Embracing this potential fully in the design of a research initiative can, however, lead to difficulties. This brief report from the field offers an example of this experience.

CHRISTIAN-EMIL SMITH ORE

Digitization and Preservation of Cultural Heritage Information – A Nordic focus

(The text was originally written in English.)

The paper gives an overview of the digitization of cultural heritage and the current status of digital cultural heritage information in the three Nordic countries of Denmark, Norway and Sweden. Cultural heritage is a very broad term which includes libraries and archives. The main focus is on cultural history museums and archaeological sites and monuments.

Physical cultural heritage and the available knowledge about it is under threat from deliberate destruction and general neglect, but above all from the pressure of constant development of lands and cities. Thus it is important to do proper documentation while this is still possible and to ensure that sites, monuments and finds have sufficient legal protection. In Denmark and Sweden, cultural herit-

age legislation has a tradition going back to the 17th century. In Norway the first law protecting tangible cultural heritage was passed by parliament in 1905. The current legislation is quite similar in all three countries.

Denmark and Sweden have a more centralized public sector than does Norway. Denmark has the most centralized information system for dealing with cultural heritage. Its new SARA system could serve as a model for Norway and Sweden, but SARA may not solve the problem of cultural heritage information 'disappearing' in modern administrative archival systems. This is a complex problem that calls for changes in archival procedures. Paradoxically, the increasing decentralization of the administration of cultural heritage requires that information systems be harmonized by some central authority. To achieve a meaningful integration of digital data, it is necessary to make the data linkable by using common ontologies as "semantic glue". Digital data can easily be lost, as the history of digital excavation demonstrates. There is a general problem of making data linkable both within institutions and between institutions, as well as across the countries of Scandinavia.

The history of those countries is a factor. Norway's narrative of nation-building was in part founded on the conception of its union with Denmark as a dark period lasting 400 years. For Norway (as for Iceland), it has been important to recover medieval manuscripts and other historical objects from Denmark and Sweden as a part of the (re)building of the modern nation. After the Prussian-Danish war of 1864 there was a short period of active Scandinavianism, but it did not really take hold. These factors may be the reason why there are, unfortunately, no common websites or linked databases for the intertwined cultural heritage of the Nordic countries. The potential, however, is great.

MAX RAHRIG

What To Do With All These Scans?
Bamberg's "Kaisergrab" and the long-term archiving of 3D data related to significant cultural assets

Over the past few years, the 3D documentation of cultural assets has developed into a widely-used method. The accuracy, quality and value of the da-

tasets produced is also increasing constantly, to the point where the 3D models themselves must now be recognized as independent and preservation-worthy objects of digital cultural heritage in their own right. But what exactly happens to the data after it has been produced and analyzed? How exactly is 3D data related to significant cultural assets to be conserved for future generations? National and international cultural portals are taking on the problem and making their data available to a broader public online. And yet museums, collections and state conservation authorities likewise have an obligation to protect and conserve digital cultural heritage for the long term. In the course of the high-resolution 3D documentation of Bamberg's "Kaisergrab" (imperial tomb), an outstanding example of medieval sculpture by Tilman Riemenschneider, the 3D working group at the Bavarian State Conservation Authority (BLfD) defined a unified set of data formats and a standardized filing structure which will help to archive the 3D data on durable glass DVDs.

In this way, 3D data relating to important cultural assets, such as those already collected on the Bamberg Rider and the tomb of Pope Clement II, as well as other, newly-gathered data, can be archived at the BLfD in the future. These methods will also bring a significant reduction in the cost- and labour-intensive work of data maintenance that is associated with current storage media, with their severely limited operating life.

DANIELA SPIEGEL

Immersed in the Point-Clouds.
Daniela Spiegel in dialogue with Norman Hallermann and Alexander Kulik on practical applications for 3D data technologies in the practice of heritage conservation

In the context of their annual conference in Weimar in 2016, the members of the Working Group on Theory and Education in Heritage Conservation were given a first look at the research projects currently being conducted at the Bauhaus University by the chairs in Modelling and Simulation of Structures (Professor Guido Morgenthal, Faculty of Civil Engineering) and Virtual Reality and Visualization Research (Professor Bernd Fröhlich, Faculty of Media).

These two chairs, along with the Chair in Computer Vision in Engineering (Professor Volker

Rodehorst, Faculty of Media and Faculty of Civil Engineering), work across faculties to develop digital processes and methods for the capture and analysis, evaluation and visualization of data on the condition of existing buildings.

The research interests of civil engineer Norman Hallerman (Modelling and Simulation of Structures) are rooted in the field of structural inspection and include the (automated) use of Unmanned Aircraft Systems (UAS) for the image-based capture and analysis of buildings. Particularly in the case of structures that are difficult to access, such as towers or bridges, UAS can be a useful tool for collecting data efficiently and safely.

The processing of the images gathered by UAS is done by the Chair in Computer Vision in Engineering. Professor Volker Rodehorst, himself a computer scientist, and Dr. Jens Kersten, a geodesist, develop sensor-platforms and algorithms to extract information on the spatial characteristics of the building from the digital images. In addition, they work on the automated evaluation of image-based data, such as the detection of cracks in concrete surfaces. Computer programs analyze pairs of images, and the resulting information, when combined with knowledge about the precise location of the camera during the fly-by, can be used to determine the spatial location of the area or feature depicted, and to generate a three-dimensional point cloud of the object.

Dr. Alexander Kulik is working within the team in Virtual Reality and Visualization Research Group. They are developing interactive processes for visualizing these extremely large 3D models, as well as virtual reality technologies and user interfaces which allow the observation and analysis of photorealistically presented point clouds for up to six local users simultaneously.

Following the presentation of these projects, Dr. Daniela Spiegel (Heritage Conservation and Building Archaeology) spoke with Hallermann and Kulik to discover their opinions on the potential relevance of their colleagues' work for the discipline of heritage conservation.

GERHARD VINKEN

The Digital and Heritage Conservation.
Introduction to a complex relationship

The 'digital revolution' is now in full swing. For heritage conservation, digital tools have opened new perspectives, finding application in the interactive visualization of past situations, the monitoring of threatened sites and artefacts, or the complex cross-referencing of heterogeneous collections of knowledge. At the same time, the limits and unsolved problems associated with using digital technologies are also becoming more apparent, for example with regard to maintaining the rapidly-growing volumes of data being generated.

And yet with digitization, we are not dealing primarily with a 'technical' innovation. Thus the effort to conserve digital heritage, including documenting, researching and publishing cultural assets, will transform more than just the institution of the museum. The new abundance of digitally-generated images can also be seen to be changing the standards of the scientific and academic discipline. A further and as yet underappreciated aspect of the digital revolution is the way it is rearranging the foci of attention in the knowledge 'market'.

Perhaps the most noticeable consequence of digitization's promise of exact and comprehensive reproduction is the knee-jerk insistence, following every instance of the spectacular destruction of a famous monument, on creating a reconstruction. Here it is clear that an affinity for reconstruction is inherent in the digital, to the extent that its primary feature is its capacity to translate all information into binary code, to capture and copy exactly, supposedly without loss of detail. In the digital age, the distinction between original and copy will therefore lose relevance – at the cost of a total manipulability of data, and of reality.

MARTIN VOLLMER-KÖNIG

Digital Processes in the Conservation of Archaeological Heritage

Given the increasing degree to which digital processes determine our lives, it is worthwhile to take a look at the kind of role they are playing in the conservation of archaeological heritage. It soon becomes apparent that those engaged in this work cannot fulfill the demands of rapidly-evolving planning processes without the use of correspondingly sophisticated and cutting-edge technology. The same goes for research taking place in an archaeological context. And beyond this context too, digital processes must be included in archaeologist's inventory of available tools and measures, if the field is not to be held short of its current potential. From the perspective of conservation, three areas must be taken into consideration when thinking about this topic: the role of archaeological heritage conservation in planning and approval processes; the implementation of archaeological measures; and the communication of the results of these measures.

ULRIKE WULF-RHEIDT

Copy and Paste – Can a common historical consciousness be 3D-printed?

If people are to identify with their culture, then conserving the authenticity, local context and uniqueness of heritage – not facilitating its reproducibility – is the only viable approach. It is here that the real cultural-political task of heritage conservation and the value of its activity lies, and not in 'militant reconstructions'. The truly shared and common work of documenting, analyzing and interpreting, of consolidating and conserving, and even – where unavoidable – of reconstructing or replicating cultural heritage that has been lost or requires repair, represents the real cultural-political challenge. Only this work will lead to a better understanding of the value of one's own cultural heritage, and only such an understanding will have lasting success and ensure the truly long-term survival of historic monuments.

The lecture was conceived in the context of the dramatic contemporary events in Syria and delivered at the 49th conference of the Koldewey-Gesellschaft in Innsbruck in May 2016; it is also published in the proceedings of that conference. At the request of the Working Group on Theory and Education in Heritage Conservation, the lecture was presented once again in slightly altered form at the conference "The Digital and Heritage Conservation" in Weimar in 2016, and is here reprinted in nearly identical form.