

# The *Digitale Kunst-Pforte*: an interdisciplinary online platform for art technological source research and experimental reconstruction

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**ABSTRACT** Reconstruction as a means of furthering knowledge, based on the practical application of historical materials, techniques, and tools, has recently gained great importance in a range of subjects. In music, experimental archaeology, and medieval research the relevance of this method has also become apparent to the broader public. Art technological research has been practicing reconstructions based on art technological sources since the 19th century. General ideas on reconstructions, based on philosophy and the philosophy of science, are presented, linked to reconstruction as a significant empirical research method in art technology. A recently established database called the Digitale Kunst-Pforte is described. It brings together art technological sources and delivers information about historical manufacturing processes, predominantly derived from published books and images, as a tool for practical reconstructions. It supports reconstructions within teaching and research, illustrated by the example of students reconstructing “paste paper” after a historical recipe.

## Preliminary considerations: reconstructions in terms of the theory and philosophy of science

The philosophical term “reconstruction” may not be derived from the Latin word *reconstruere* (rebuilding) which is scarcely documented in antique texts and therefore seems to not have been used at that period (Scholtz 1992: 570). Instead, the philosophical notion of “reconstruction” was developed within the framework of German idealistic and romantic philosophers during the 19th century and can be found in texts by Fichte, Schlegel, and Hegel (Scholtz 1992: 570; Mittelstraß 1995: vol. 3, 550–552.) In the case of the philosopher Friedrich Schleiermacher “to re-construct” or “to rebuild” thus means “to emulate”, to think and to participate – in contrast to passive acceptance and re-recording (Scholtz 1992: 571). To understand a phenomenon in material terms means to understand it as the result of a certain way of thinking, whereby a (hermeneutic) reflection on its own genesis is included.

This demanding, poietic<sup>1</sup> connotation of the term “reconstruction” is based on Kant’s epistemological conception of “construction”. Kant, in his *Critique of Pure Reason* (Kant/Müller 1922), defines mathematics as a “synthetic science *a priori*”, i.e. a discipline that does not derive its assumptions from the world of experience, but instead “constructs” them (Kant/Müller 1922: 741). In contrast to this notion of “construction” he defines “comprehension”, as “thinking about (*Nachdenken*)” and “tracking down (*Nachfinden*)” ideas in the sense of a paradigmatic method in philosophy (Mittelstraß 1995: vol. 3, 550). The philosopher and science theorist Jürgen Mittelstraß criticized Kant’s distinction between the synthetic, constructive method of mathematics and the “analytical” approach of philosophy as shortfallen (Mittelstraß 2011: 170). Moreover, he proved that the terms “construction” and “reconstruction” belong to the same conceptual field within Kant’s transcendental philosophy (Kant / Müller 1922: 217) which had such an enormous impact on Western philosophy.

In fact, Kant did not use the term “reconstruction” explicitly. But “construction” and “reconstruction” have subsequently proved to be central concepts for both logic and philosophy of science, for which Kant’s ideas provide elementary foundations. Rudolf Carnap for example tried to give a rational reconstruction (*Nachkonstruktion*) of the way we acquire our concepts about reality. His programme for a revision of imprecise language through exact language constructions (*Trennung zwischen dem reinen Gegebenen und der Verarbeitung*, in Carnap 1961: 139) is considered the paradigm of a logical empirical meaning of reconstruction.

In contrast to “interpretation” and “understanding” as philosophical categories, the method of reconstruction represents a “constructive interpretation” in terms of scientific theory (Scholtz 1992: 570–578) and is defined as follows:

A reconstruction is given or is considered successful, i.e. adequate, if a construction K’ substituting for a given conceptual (theoretical) context K, not only correctly represents K in all parts, but at the same time fulfils those intentions that K seeks to fulfil better, at least not worse, than K. (Mittelstraß 2011: 181 *et seq.* and 207 *et seq.*).

Therefore, the method of reconstruction is characterized by the fact that it eliminates the distance between production and reception and at the same time is based on a “pre-theoretical experiential reason”. Skills are reconstructed that are “factually experienced as mastered as well as failed”, first in everyday life, then also in its continuation in the sciences and in the arts, in order “to achieve both an understanding (of what is self-produced) and an explanation (of what is experienced)” (Mittelstraß 1995: vol. 2, 565).

Reconstruction means a procedure which – within the framework of an elucidation of theories and scientific developments – concerns propositions and conceptual explications. During the 19th century, the use of the term “reconstruction” was extended beyond the specialized circles of philosophy and gained a foothold in art, literature, psychology and politics, whereby restorative connotations can also be observed. At around 1900 the term “reconstruction” appeared in German encyclopedias.

Against the background of the history of the philosophical concepts of “reconstruction”, it would be worthwhile to illuminate the method of reconstruction as an indispensable practice in conservation theory. This could help to question the premises, procedures, and results in the sense of a reflection on methods and at the same time to better understand them from the perspective of the history of reconstruction in conservation studies. Considering the fact that Cennini’s *Il*

*Libro dell’arte* was first translated into Western languages as late as the 19th century and that studies in art technological sources have been gaining importance since the early 19th century, the step towards a practical, “reconstructive” experience is not great. Thinking of Ernst Berger’s systematic experiments based on historical sources at the beginning of the 20th century, or the techniques used by Edward Waldo Forbes and Daniel Varney Thompson in its earlier decades, one can categorise (art technological) reconstructions as a basic method in the historical application of art conservation studies. They are situated at the exciting interface between art technological source criticism, art technology, art history, sciences, and artistic practice. Additionally, reconstruction reflects on these from today’s perspective and today’s scientific knowledge.

### **Art technological reconstruction as an empirical method**

Generally, scientific inquiry can be placed on several hierarchical levels: epistemological questions deal with the possibilities and limits of scientific knowledge; meta-scientific, methodological questions concern the procedures and framework of research; considerations that relate to concrete research topics and questions in specific settings are in turn oriented towards methodological guiding ideas. Finally, technical questions concern the framework and the implementation of concrete experiments in research projects.

The Art Technological Sources Research (ATSR) working group is active in practical conservation procedures as well as in the multidisciplinary field of technical art history. In recent years, targeted research into art technological sources has drawn more and more attention to the reconstruction of artistic and craft techniques as a means of advancing scientific knowledge. Ad Stijnman presented a fundamental framework for reconstruction as an art-technological method (Stijnman 2005). The “historically accurate reconstruction” techniques exemplified in the HART project which ran 2002–2005, had very similar aims (Carlyle and Witlox 2005, Carlyle 2006). This distinguishes art technological reconstructions for example from Lawrence Principe’s experiments in reproducing alchemical recipes, which emphasise “reproducing” and thereby understanding a chemical process and result rather than “reconstructing” the fully correct historical process (Fors *et al.* 2016, 87–89). Recently, an anthology was published in which representatives of various disciplines discuss the topic of reconstruction and related methods in their field of expertise (Dupré *et al.* 2020).

In art technology, reconstructing based on historical sources always makes sense if one can derive from it useful knowledge about the manufacturing process, ageing processes or means or recognising the process when it is encountered. The reconstruction of an artistic technique based on an historic recipe means modelling the components and procedures of this technique in a very real sense. As has been emphasized several times, it is necessary to consider gaps, misunderstandings, and misleading or absent context-bound information in the recipes, in order to arrive at new insights or to recognise obstacles to understanding. Accordingly, it was probably no coincidence that important researchers who used the method of reconstruction in the 19th and early 20th centuries were also trained in art. Making a reconstruction was more difficult than it appeared at first glance. Thus, Berger stated that successful reconstruction required experience as an artist, because without prior knowledge the recipes are often incomprehensible. and without craftsmanship and artistic experience they cannot be executed. The requirement for relevant expertise is basically still valid today, even though one tends to think about the value of an art technological reconstruction for scientific investigations as well as for historical studies, critical reading of texts and scientific methods applied to studying art (Stijnman 2005: 2).

Although the natural sciences have decisively shaped the self-image of conservation studies in recent decades, humanities-based methods are once again increasingly finding their way into the context of conservation studies, for example within the framework of technical art history. However, it is not so much classical art history that serves as a source of ideas, but rather an anthropological and sociological research approach that increasingly lends to a further examination of reconstruction as a process-oriented method. This might in the future modify frameworks for conservation studies.

The questions to be answered by reconstruction as a methodology thereby seem to be increasingly less object-oriented, especially in the humanities. They are more actor- and process-oriented and seek to illuminate more and more actions and processes in art and craftsmanship as material and poetical aspects. However, the perspective of the philosophy of science has not to date been introduced in the methodological discourse for art technological reconstruction.

### Reconstructions as a promising method in research and teaching

Spanning the wide arc between epistemological, methodological considerations and practical experiments



**Fig. 1** Materials for the module in traditional painting techniques at the HKB. (Photo Ueli Fritz)

is an exciting goal. However, students are even more thrilled by the practical and hands-on aspects of reconstruction. At the Bern University of the Arts, reconstructions of practical techniques based on historical recipes are regularly carried out. For instance, the students tested the production of a material made from carrageen as part of the manufacturing process of marble papers. Also, historical painting supports are produced, and practical exercises are carried out with a focus on classical tempera and book illustration (Fig. 1). Particularly popular among the students is the course during which a plastered wall is built outdoors for the application of paint or *sgrafitto* (Fig. 2). Sometimes, reconstructions are also carried out as part of studio work or for masters theses. Students hope that practical experience with reconstructed historical recipes will provide them with (tacit) knowledge and that the hands-on experience will also make them better professional conservators. Not to be underestimated is the joy of the activity, which the students experience and internalize.

Nowadays, the education of students at the University is based on the guidelines set up by the European Confederation of Conservator-Restorers' Organisations (ECCO 2011). The study programme is student- and competence-oriented.<sup>2</sup> Therefore, conservation inter-



Fig. 2 Student working during the wallpainting module at the HKB. (Photo Ueli Fritz)

ventions for objects of cultural significance should be a well-founded and balanced mixture of “holistic practical teaching” to enable students to exercise “critical awareness of knowledge issues”. The ability to continuously analyse and evaluate situations and processes as a foundation for the competence “to adjust where needed” is part of the concept of lifelong learning (ECCO 2011: 16). Reconstructions are obviously not to be underestimated here.

### Establishing a new tool

The modern triad of conservation/restoration/reconstruction, as has just been shown, is taught through the examination of the historical source. But how can these art-technologically relevant sources be obtained today in a timely and systematic manner? Before the digital era, it was necessary to conduct one’s own laborious research in appropriate libraries, partly based on bibliographies such as – in the German-speaking areas – that of Ulrich Schiessl (1989) or the compilation of art technological sources by Christoph Zindel (2010).

In the digital age, tracking by using printed indices is more and more often replaced by using standard search engines or a specialized database.

During the rapidly increasing digitisation and to avoid the so-called “Cennini syndrome”<sup>3</sup>, the need for (publicly accessible) databases on art technological sources, has increased in recent years (Clarke and Carlyle 2005). An early example of digital accessibility is the exemplary Cologne database, the first of its kind in the German-speaking world (Oltrogge 2005)<sup>4</sup>, which is included in the *Artechne* database<sup>5</sup> and the *Colour Context* database<sup>6</sup>. These databases mainly ensure accessibility to individual recipes that are difficult to locate in their original format, and are therefore primarily helpful for a highly specialised audience. In contrast to them, we would now like to introduce the *Digitale Kunst-Pforte*, a database on numerous craft and artistic materials and techniques, which is suitable both for specific research questions, but also for conservation training purposes, or even the wider interested public such as artists or craftspeople.



### **The *Digitale Kunst-Pforte*: a database for art technological sources**

In the research project *The Exploitation of Art Technological Resources (Text and Image)*<sup>7</sup> funded by the Swiss National Science Foundation (SNSF), a publicly accessible online platform was created. The aim of the project was to supplement and to expand the important compilation of art technological source texts by Zindel (2010) with further, newly discovered materials of art technological relevance, to develop it in terms of content and method and to make it accessible digitally. Initially, the database was conceived as a working tool for the project team. However, it proved to be a valuable working instrument for conservators and art historians in both research and teaching, and was thus made publicly accessible under the name *Digitale Kunst-Pforte* as a contribution to current knowledge.<sup>8</sup> It is intended to contribute to a conscious dialogue between the technical, production-related side of works of art and their positioning in the historical context. The aim was to create the opportunity to update, supplement and refine existing methods in parallel with the latest developments in international research on materiality in art and culture.

In the next section, it will be shown how the translation of a book into a digital format took place, how the *Digitale Kunst-Pforte* became an online platform and what functions it has that not only support other researchers but also provide a framework for presenting research results.

### ***Digitale Kunst-Pforte*: a work in progress**

The core is a relational database based on the book *Die Güldene Kunstpforte* by Zindel (2010), who is part of the project team. It contains mainly texts, but also images (not publicly accessible), which provide insights into the conditions under which works of art were created, which materials were used and how craftsmanship has been practiced. In the beginning there were three main questions which guided data modelling. One of the aims of the research project was to search for then-unknown art technological sources in Swiss libraries. They were added to the already existing collection by Zindel. For this reason, it was decided to maintain the basic structure of the book and to find a way to transfer it into a digital format.

Furthermore, it was observed that art technologically relevant images were seldomly researched thoroughly (Stijnman 2009, Koller 2013). The second aim was therefore to investigate whether and which illustrations can be found in (and beyond) art technological sources, to ask what functions they have, and above all what art

technological content they convey. To explore these questions as well as to make the images accessible and searchable for the future user, images also became part of the data. As has been repeatedly observed, it is not unusual for important art technological sources to have been re-published in different places and in different years with slightly different content, illustrations, and commentaries. For this reason, as a third question, it was desirable to record how and whether information changed from one publication to another or whether it remained the same (Oltrogge 2005). This was an attempt to contribute to understanding of the publishing network of art technological sources.

By using these three research questions as guiding tasks for the data model, the following functions for the platform emerged: entries for the source texts and illustrations are each provided with bibliographical information and a brief description of their art technological content, which was already known, and proven from over 800 entries in the already-published *Güldene Kunst-Pforte*. In addition, the entries, if possible, should link to an external digital resource or at least are provided with an indication of the location of the physical original source of the text or image. Information about editions or connections to further sources are visibly highlighted and linking makes it easy to compare and cross-link related or affiliated sources. Searching the database is possible *via* bibliographic entries, such as author, artist, title, or year of origin (of course, all of them can be combined for searching) as well as *via* a specifically developed thesaurus.

This thesaurus is based on Zindel's *Sachregister*, a catalogue of art technological categories and specialist topics (such as materials or techniques, sometimes with historical names) that are divided into 27 categories each with up to six levels of subcategories. Zindel understood this to be an attempt to classify art technological sources, as discussed in *Versuch einer Klassifizierung kunsttechnologischer Quellenschriften* (Zindel 2010: 5). The hierarchal arrangement enabled him to distinguish between the same or similar terms and to place them in context. For example, the term "*Metallauflage* (metal covering)" occurred 26 times in different contexts. Zindel distinguished between metal coverings in panel painting and metal coverings in mural painting. The two fundamentally different techniques are of course also discussed in other sources. It must therefore be possible to distinguish among the 26 different metal coverings in the digital version.

To adapt the structure for an online solution whilst considering such problems, the tree of categories and subcategories was transformed into a less hierarchical subject index with only two levels. Additionally, a network of synonyms and related terms was developed,



**Fig. 3** Production of the film on the reconstruction of paste paper by students of the HKB. (Photo: Franca Mader)

which enables the user to get the same search results by entering different (partly historical) terms. For example, the keyword *Kreuzdorn* (buckthorn) is linked to the related terms *Wegdorn (Farbmittel)*, *giallo santo*, *Kreuzbeeren (Farbmittel)*, *Saftgelb*, *Rhamnus Frangula L. (Farbmittel)*, *Rhamnus cathartica L. (Farbmittel)* and *Jaune d'Avignon*. Although the terms are clearly different, they are nevertheless closely related and will guide the user to the same set of historical sources which mention this group of colorants. This feature in combination with the flat hierarchy of the subject index makes it possible to differentiate such term clouds at a later point or to add new terms at any time. It will also make it easier to translate the database or the thesaurus into other languages in a future development step and it is possible to add new terms at any time. Since one of



**Fig. 4** Production of wheat paste (Film Still © HKB).



**Fig. 5** Execution of a suspension technique with a specially made toothed wooden tool ("comb") (Film Still © HKB).

our partners is the *Materialarchiv*<sup>9</sup> the keywords in the thesaurus were provided with a link to its archive which is also publicly accessible, so that the user can easily learn more about individual materials or techniques.

Currently more than 1000 entries for more than 500 authors of art technological sources are listed in the database. Compared to the publication of the *Guldene Kunst-Pforte* from 2010, 120 new source texts, some of them never described before, have been added. At present, there are more than 2000 keywords, most of them in German, but the structure to integrate other languages has already been created. And there will be more terms added during forthcoming research projects which will additionally the *Digitale Kunst-Pforte* and generate new content. This database must therefore always be understood as a work in progress. To emphasise this fact and to use one of the advantages of the digital form of publication, a feedback form is attached to every single entry (text, image, or term in the thesaurus) in which each user can directly comment and send criticism or additions to us.<sup>10</sup>

How can reconstructions be integrated into this listing of mostly textual and pictorial primary sources? A

case study will show how the *Digitale Kunst-Pforte* can be used actively in teaching, and also how it can be supplemented, so that future research projects can also be incorporated into this platform.

### Reconstructing “paste paper”

Charlotte Maier, a former student of conservation and restoration at the Hochschule der Künste Bern (HKB), wrote her masters thesis about “paste paper”. She examined historical sources which gave information about the production of paste paper, looked for existing and if possible datable original historical papers, and tried to reconstruct some of the historical recipes to gain more knowledge about the technique, its historical development and application.<sup>11</sup> In the thesaurus of the *Digitale Kunst-Pforte*, until then only the keyword *Buntpapiere* (Coloured Paper) had existed. After Maier’s masters thesis, a specific keyword “paste paper (*Kleisterpapier*)” could be introduced.<sup>12</sup> On this basis, further ideas concerning paste paper could be developed (Krauter 2020).

In the spring semester 2019, the reconstruction of paste paper was taken up again as part of a teaching module at the HKB. With the help of Charlotte Maier, the students worked over one week on the reconstruction of further paste paper recipes. The results were also recorded on film (Fig. 3), to show how the students extracted starch from wheat grains and cooked it until it was gelatinous (Fig. 4). Next, they produced Berlin blue, which was then used to dye the previously produced paste, followed by the preparation of the paper and the application of the coloured paste. Finally, as described in a recipe by C. F. G. Thon of 1826, which was used as a template, a suspension technique was applied (*Verdrängungstechnik*) (Fig. 5). The full-length film is integrated into the database to supplement the entry in Thon’s manual.<sup>13</sup> It is planned to add more practical examples like this and to develop the cooperation with other disciplines.

### Conclusions

The structural database presents countless opportunities to extract, combine, link and revise information; it also offers new ways to store and impart knowledge. In the classical format of print publication for research results, the presentation of data must be selected, and fixed in advance. With a structured collection of digital data, further aggregations and views not yet foreseen can be generated from the existing data at any time.<sup>14</sup> The advantages of an online publication are not only

the multitude of possible outputs, but also that the results are posted for immediate discussion, changes and additions, which can be made and viewed instantaneously. In printed books it is necessary to wait for a new edition. In the database, amendments can be tracked via a history/change log function and thus be reconstructed at any time. This provides direct interaction and discussion for every user as well as the integration of students’ unpublished academic outputs (such as theses) or teaching modules and it also hosts developing research questions on the reconstruction of historical techniques or recipes, or further desiderata. The integration of the database into teaching at the Bern University of the Arts was not only a basic prerequisite for its conception, but it also ensures the continuation of this form of publication.

### Notes

1. Poiesis, in the context of hermeneutics, means creating a reality through engagement with an object. In this way, understanding and problem-solving is seen as a communicative and creative action that is in constant flux and does not depend on individual subjects.
2. Competence is defined as “... manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches. Take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams” (ECCO 2011: 16).
3. The “Cennini syndrome” is an umbrella term for the fact that “everyone uses the same few recipe texts for all possible applications, even when the artists under examination were far from the original time and place of compilation”. One of the possible reasons is that many art technological sources have not been published and hence are not easily accessed (Clarke and Carlyle 2005).
4. <http://db.cics.th-koeln.de/start.fau?&>
5. <https://artechne.wp.hum.uu.nl/artechne-database>.
6. <http://www.colourcontext.be/en/>.
7. <http://p3.snf.ch/Project-156050>.
8. <http://digitale-kunst-pforte.ch/>
9. <https://materialarchiv.ch/>.
10. <https://www.digitale-kunst-pforte.ch/anleitung.html>.
11. The results of the master project can be seen in a shortened form on the blog of our project website: <http://www.digitale-kunst-pforte.ch/blog.html>.
12. The introduction of related keywords such as “marble paper” (*Marmorpapier*) or “Turkish paper” (*Türkische Papiere*) is still a *desideratum*.



13. <https://digitale-kunst-pforte.ch/datenbank/source/show/der-fabrikant-bunter-papiere>.
14. Aggregations are defined as “the process by which raw data are gathered, reformatted, and presented in a summary form for subsequent data sharing and further analyses” (Wen 2020).

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