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Glaziers' Tables, Cartoons, and Preparatory Tracings (Underdrawings). Observations from Berne Minster and Reflections on the Creation of Stained Glass in the Late Middle Ages and the Early Modern Period

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Tables de verriers, tracés préparatoires, cartons. Observations et réflexions sur la genèse de vitraux médiévaux et du début de l'époque moderne dans le contexte de démarches créatrices et techniques – Résumé

Les tables de verriers conservées à Gérone et à Brandebourg d'une part et les premiers dessins sur papier de vitraux de la fin du XV^e siècle d'autre part sont considérés comme les témoins matériels principaux de l'évolution des méthodes de préparation de vitraux durant le Moyen Âge tardif, et ainsi également des démarches créatrices et techniques impliquées dans ces processus. À ces objets s'ajoutent les tracés préparatoires sur le revers des vitraux. Il s'agit de dessins auxiliaires qui servaient à la mise en œuvre de la peinture sur la face avant des verres tracés à la grisaille et effacés avant la cuisson. A la suite de leur découverte au début des années 1990, de nombreuses observations laissaient supposer que cette méthode de travail était largement répandue notamment au XV^e siècle. Les travaux de restauration récents du chœur de l'ancienne collégiale de Berne ont permis pour la première fois de relever systématiquement et d'étudier les traces de ce procédé sur un ensemble important de vitraux. Le constat indique que les quatre verrières monumentales datées de 1441 à 1455 environ étaient

presque entièrement réalisées de cette façon, avec des différences entre les ateliers d'Ulm et de Berne. Les tracés semblent présenter une phase intermédiaire entre une première étape de préparation sur papier, pour laquelle il existe une source écrite à Berne, et la mise en œuvre définitive en verre. Les caractéristiques des dessins effacés révèlent une fonction combinant transmission et support à la création. Nous avons pu étudier des aspects techniques du procédé et formuler des hypothèses au sujet de questions restées ouvertes jusqu'à présent. Les tracés permettent de se faire une idée des cartons perdus et il existe sans doute des liens avec les dessins sous-jacents de peintures réalisées sur des supports opaques. Une fois de plus, il paraît évident que les vitraux n'étaient pas un média artistique à part. Les questions de leur genèse, dans un contexte de symbiose entre compétences « créatrices » et « exécutrices/techniques », se réfèrent aux mêmes conditions cadre et aux mêmes réflexions que pour d'autres domaines d'art. En marge, nous souhaitons mentionner que des peintures à froid largement appliquées sur les vitraux de Berne peuvent être considérées dans ce même contexte. Elles aussi indiquent que des démarches créatrices intervenaient dans l'ensemble du processus de réalisation des vitraux, des travaux préparatoires jusqu'à l'œuvre mise en place dans l'édifice.

Glasmalertafeln, Vorzeichnungen, Scheibenrisse. Beobachtungen und Überlegungen zur Entstehung mittelalterlicher und frühneuzeitlicher Glasmalereien im Spannungsfeld von gestalterischen und technischen Prozessen – Zusammenfassung

Die Glasmalertafeln in Gerona und Brandenburg und die ersten Entwürfe auf Papier aus dem späten 15. Jh. sind die wichtigsten materiell erhaltenen Zeugnisse zur Entwicklung des Entwurfsprozesses von Glasgemälden im Lauf des späteren Mittelalters, und damit auch für die an ihrer Entstehung beteiligten gestaltenden und ausführenden Kompetenzen. Im selben Kontext stehen die Vorzeichnungen auf der Rückseite von Glasmalereien. Es handelt sich um Hilfszeichnungen für die Motivgestaltung auf der Vorderseite der Gläser, die mit Schwarzlot ausgeführt und vor dem Einbrennen der Glasbemalung wieder ausgewischt wurden. Seit ihrer Entdeckung gegen 1990 mehren sich die Hinweise darauf, dass dieses Vorbereitungsverfahren vor allem im 15. Jh. weit verbreitet war. In den letzten Jahren konnten dessen Spuren erstmals auf einem grösseren Ensemble, den Chorfenstern des Berner Münsters (1441 – ca. 1455), systematisch untersucht werden. Die Befunde lassen darauf schliessen, dass die Gemälde nahezu vollumfänglich auf diese Weise entstanden, mit Unterschieden in Bezug auf die beteiligten Werkstätten in Ulm und

Bern. Es ist nachweisbar, dass die Vorzeichnungen einen Zwischenschritt zwischen den für Bern ebenfalls aus Quellen belegten Vorarbeiten auf Papier und der definitiven Ausführung auf Glas darstellen. Ihre Eigenheiten lassen eine Mischfunktion zwischen Übertragungsmittel und Gestaltungshilfe erkennen. Technische Aspekte des Verfahrens wurden untersucht und es werden Hypothesen zu bisher offenen Fragen vorgestellt. Die Vorzeichnungen geben Hinweise auf die Art der verlorenen Vorarbeiten auf Papier, und Verbindungen zu den Unterzeichnungen von Malereien auf opaken Bildträgern sind offensichtlich. Es zeigt sich einmal mehr, dass auch in Bezug auf die Gestaltungsprozesse die Glasmalerei als Kunstzweig keineswegs im Abseits stand und dass Fragen zur vielfältigen Verbindung gestalterischer und ausführender Vorgänge von denselben Voraussetzungen ausgehen und nach denselben Gesichtspunkten erwogen werden müssen wie für andere Bildgattungen. Nur am Rande sei erwähnt, dass in Bern auch umfangreiche Kaltmalereien auf den Glasgemälden, die ebenfalls untersucht wurden, in denselben Fragenkreis hineinspielen. Auch sie deuten auf eine vom Entwurf bis zum ausgeführten Bildfenster durchgehende und prägende gestalterische Einwirkung auf den Entstehungsprozess von Glasgemälden hin.



Fig. 1. Examples of preparatory tracings found in Switzerland. Although the procedure is the same as that observed in stained glass from Berne Minster, it has been applied differently: rough guidelines (inverted reproduction, with the painting on the front shining through) from the parish church of Stauffberg, unknown artists, c.1440, and very detailed, freely traced brush drawings from the chapel of Pérolles, Fribourg, unknown artist connected to Hans Baldung Grien, c.1520 (tracings inverted and reconstructed by the author). © Stefan Trümpler.

Observations of tracings on the reverse of stained glass were first presented thirty years ago at a colloquium of the Corpus Vitrearum.¹ Since then, the phenomenon has been widely identified, but the general picture remains one of isolated, fragmentary findings that are not substantial enough to be approached seriously or to suggest significant working procedures (fig. 1). In most cases, the traces represent unintentionally preserved remains of deleted paintwork and are very difficult to discern. It has become clear, however, that the tracings should not be confused with other types of paint applications on the reverse and that they served as guidelines for the principal design structures on the front (interior) of the glass. A late 15th century treatise from the monastery of Zagan describes such a method of using preparatory drawings.²

Tracings on the reverse of the choir windows of Berne Minster

Over the last decade, it has been possible to undertake a systematic case study of an important stained-glass ensemble, and thereby to add a new, coherent body of evidence that contributes to addressing this question. A substantial restoration and research project of the choir of Berne Minster included maintenance work on the exterior protective glazing system dating from 1947 and conservation monitoring of the 15th century stained-glass windows. The project also allowed us to analyse technical issues on all four dismantled windows. The

¹ Observations on stained glass in St Mary's Church, Fairford, and in the chapel of Pérolles, Fribourg; simultaneous presentations by Keith Barley and by the author (1989). Stefan TRÜMPLER, "Nouvelles observations sur le procédé de fabrication des vitraux : des dessins préparatoires sur le côté extérieur du vitrail", in Roger VAN SCHOUTE, Hélène VERGOUSTRATE-MARCO, *Le dessin sous-jacent dans la peinture*, Collège Erasme, Louvain-la-Neuve, 1993, p. 179-182; Stefan TRÜMPLER, "Die Glasgemälde der Kapelle von Pérolles in Freiburg zwischen 1517-1523. Neue Erkenntnisse", in *Bericht über die Tätigkeit der Eidgenössischen Kommission der Gottfried Keller Stiftung 1989 bis 1992*, Atlantis-Verlag, Winterthur 1993, p. 50-52; Stefan TRÜMPLER, "Rückseitige Vorzeichnungen auf Glasgemälden", *Corpus Vitrearum Newsletter* 45, 1994, p. 36-39; Stefan TRÜMPLER, Fritz DOLD, Urs WOHLGEMUTH, "Zur Glasmalerei und ihrer Technik", in Jürg A. BOSSARDT, Astrid KAISER, Stefan TRÜMPLER, *Glasmalerei im Kanton Aargau. Einführung zur Jubiläumspublikation 200 Jahre Kanton Aargau*, Lehrmittelverlag des Kantons Aargau, Aarau, 2002, p. 34-59. Other findings and discussions: Sarah BROWN, "The stained glass artists and their craft", in Sarah BROWN, Lindsay MACDONALD, *Life, death and art. The medieval stained glass of Fairford parish church*, Sutton Publishing Ltd, Stroud 1997 (paperback 2007), p. 108-109; Peter VAN TREECK, "On the artistic technique of glass painting in the Age of Dürer and Holbein and its conservation problems", in Barbara BUTTS, Lee HENDRIX (ed.), *Painting on Light, Drawings and stained glass at the age of Dürer and Holbein*, The J. Paul Getty Trust, Los Angeles, 2000, p. 61.

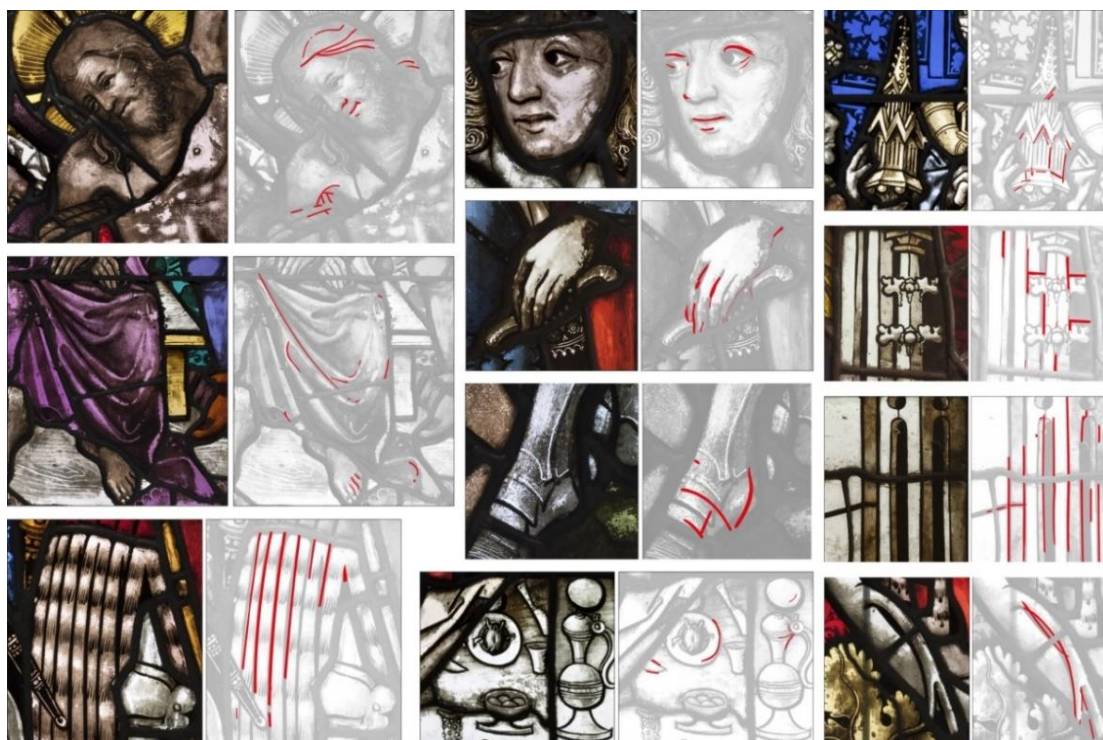
² TRÜMPLER 1993a; Karine BOULANGER, Dany SANDRON, "Traité du moine de l'abbaye de Zagan (Silésie)", in Claudine LAUTIER, Dany SANDRON (ed.), *Antoine de Pise. L'art du vitrail vers 1400*, Corpus Vitrearum France, Études VIII, CTHS, Paris 2008, p. 327-330; Brigitte KURMANN-SCHWARZ, "De Théophile à Cennino Cennini: pratique du vitrail et statut du peintre verrier à travers les textes", in Michel HÉROLD, Véronique DAVID (ed.), *Vitrail. V^e-XXI^e siècle*, Éditions du Patrimoine, Paris, 2014, p. 33-45.

study focused on observations regarding the extensive use of cold paint and what could be termed “underdrawings”.³

The stained glass of five windows in Berne Minster, two of them combined as fragments in the axial window after a hailstorm in 1522, originates from the construction period of the choir, which was roofed in 1438.⁴ The Passion window (I) was made in 1441 by master Hans from Ulm in South Germany, whereas the Legend of the Ten Thousand Knights (I, formerly sII), the Tree of Jesse (nII), the Legend of the Three Kings (nIII) and the Mystical Mill (nIV) were created between 1448 and around 1455, probably by artists in a Bernese workshop that engaged external collaborators in order to cope with the challenging task of rapidly creating the huge and spectacular paintings on light.

Over 200 medieval stained-glass panels and tracery lights were scrutinized during the study, and a database detailing more than 500 glass pieces bearing traces was set up and analysed. The findings can be summarized as follows.

- All five windows exhibit preparatory trace lines over the entire surface.
- There are significant differences regarding the quantity and quality of these tracings. The window made in Ulm features at least twice as many glass pieces with tracings as any other window. These tracings are also much more often preserved as intact paint lines, while generally only sparse remnants of tracings have been preserved on the “Bernese” windows.



« Fig.2. Berne Minster, choir windows, preparatory drawings (inverted reproduction) of various motifs.
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³ Stefan TRÜMLER, Sophie WOLF, “Rückseitige Vorzeichnungen und Kaltbemalungen. Untersuchungen an den Chorfenstern des 15. Jh. im Berner Münster”, in Bernd NICOLAI, Jürg SCHWEIZER (ed.), *Das Berner Münster. Das erste Jahrhundert: Von der Grundsteinlegung bis zur Chorvollendung und Reformation (1421-1517/1528)*, Schnell & Steiner, Regensburg, 2019, p. 404-431.

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⁴ Brigitte KURMANN-SCHWARZ, *Die Glasmalerei des 15. bis 18. Jahrhunderts im Berner Münster*, Corpus Vitrearum Medii Aevi Schweiz IV, Benteli Verlag, Bern, 1998. Recently by the same author: “Rahmen, Bilder, Ornamente. Die Glasmalereien des Berner Münsterchors (1441-ca. 1455)”, in Bernd NICOLAI, Jürg SCHWEIZER, *Das Berner Münster* (see note 3), p. 373-403; Alexandra DRUZYSKI v. BOETTICHER, “Die Mittelalterlichen Bauphasen des Berner Münsters”, in Bernd NICOLAI, Jürg SCHWEIZER, *ibid.*, p. 92-106.

– These lines can be found on glass of all colours. There are nevertheless obvious variations, for example, pieces of white/clear glass with traces outnumber all other colours.

– For all types of motifs, though rarely with inscriptions, we find corresponding tracings on the reverse of the glass (fig. 2). Tracings related to architecture are more common than those associated with other themes such as clothing, parts of the body, objects, nature and ornaments.

It can be deduced from the general overview that the aforementioned technique was employed in the creation of the choir windows by artists from both Berne and Ulm. Certain features indicate that the method was applied in slightly, but significantly, different ways in the Swiss and German workshops. The fact that all motif types – with the possible exception of inscriptions – and hundreds of pieces of glass of all colours located throughout the windows bear traces of such underdrawings makes it highly unlikely that only certain parts were treated in this way. It does not seem possible to deduce from the findings significant criteria for a selective process. It is reasonable to presume that the technique of preparatory tracings on the reverse of stained glass was a standard element of the working process used in the creation of all medieval windows in the choir of Berne Minster.

Several observations enable us to draw conclusions about features and functions of these tracings.

1. The fragmentary nature of the remaining tracings is particularly noticeable on panels of the Passion window: some are preserved as entire brushstrokes, though usually only two fine, parallel outlines of the brushstrokes remain (fig. 3). It is well known to glass painters that if you wipe away unfired glass paint (a mixture of finely ground glass, metal oxides, gum and a painting medium) from the surface of a piece of glass, the borders of the lines, which dry first, tend to resist cleaning. The tracings often survive along borders of glass pieces, but also in border areas of entire windows. Sometimes they are preserved in areas where they were hidden behind dark paint on the front side. Presumably this reflects the way the tracings were cleaned away after they had served their purpose. This must have been done in order to eliminate what had become redundant elements of the image, but the task was sometimes not carried out thoroughly in areas considered less important or accessible, or where the lines on the reverse did not disturb the completed work. The highly fragmentary evidence therefore seems to be explained by the fact that what remains is not the result of a partial application of these underdrawings, but of their unfinished or selective removal. The frequency of tracings on both clear glass and the usually “white” architectural elements could also be linked to this phenomenon. Architectural motifs are mostly framing and structural elements within the monumental images and may have been treated in a labour-saving way. At the same time, these motifs mainly consist of opaque lines which can cover tracings on the reverse of the glass.

2. The overall aspect of the reverse tracings is remarkably uniform (fig. 3). Most were originally rendered neatly and precisely as 1–3mm-wide paintbrush lines, and the paint was diluted in order to allow the lines to be just visible during the painting process on the front side. The tracings are quite elaborate and considered drawings rather than sketchy drafts.



Fig. 3. Berne Minster, preparatory tracings on the reverse of the Passion (I, 5c) and the Ten Thousand Knights window (I, 4c, see also fig. 2). Some of the tracings are preserved as entire brushstrokes, while from others only parallel outlines remain, and even these are often confined to marginal areas. © Stefan Trümpler.

3. The tracings serve as a guide to the main lines of the paintings; they define objects and their positions, without providing exhaustive detail. This is especially evident in the case of repetitive forms, patterns and architectural details, where often only the main compositional lines are predefined. Even the modelling can be prepared in this way, and the tracings sometimes indicate elements such as drapery that the painter did not render using contour lines, but with shadowing.

4. It is essential to understand that the execution of the painting on the front side of the glass often does *not* strictly follow the preparatory tracings. The definitive paintwork evolves as an independent creation in a process that is nuanced, selective and reflective. The designs suggested by the tracings are sometimes clearly modified and the final form develops its own distinct character.

5. Another interesting question is of course whether the tracings reveal information on the cut-lines separating glass pieces of different colours, and thus on the prominent opaque “drawing” of the later lead came structure. In a few places, it is clear that lead lines were taken into account: Ornamental backgrounds are usually composed of individual elements – for example ornamental tiles – cut out as separate pieces of glass and surrounded by lead comes. However, in certain areas, several motifs were combined onto one large glass piece. In these cases, black paint lines replaced parts of the leading, and these “false leads” were also indicated by reverse tracings (fig. 4). This proves that the drafting process, including the preparatory tracings, already combined both artistic considerations and technical issues related to the composition of a glass mosaic supported by its metal structure.

To recapitulate, the tracings found in the choir of Berne Minster testify to a method applied by two geographically distant workshops.⁵ The procedure was executed on a large scale and with remarkable care, which means – with regard to cost and technical considerations – that it must have accounted for a significant proportion of the overall work. The underdrawings on glass appear to represent a specific stage in the drafting and creation process, which must have involved a first approach on a different support and which was brought to completion on the glass itself.

This evidence of a systematic use of exterior tracings, together with several other isolated observations, especially on late medieval and early modern stained glass, allows us to hypothesize that the procedure was far more than an occasional device used by certain painters. It should therefore be considered in the wider context of the art and technique of stained glass in this period, with a focus on preparatory work and in relation to particular stylistic and technical features of these works of art.

However, before we address these questions, we should bear in mind another important finding: Written sources tell us that paper was donated to the Bernese “glazier” Niklaus Glaser for the draft design (“*zu entwaerffen*”) of one of the windows, and that red paint was mentioned at the same place in an account book.⁶ This raises the question of whether, and if so how, the two pieces of information – on underdrawings and preparatory work on paper – are linked.

Preparatory stages on the work’s own support and on other media

We have to be aware that for larger paintings on other supports – such as walls or wood – it was still usual at that time for full-scale preparatory work to be developed directly on the painting support itself. The drafts remain more or less visible as underdrawings, sometimes to the naked eye⁷ but often only with the help of special optical and analytic tools. Extensive research has been dedicated to a wide range of material and artistic aspects of these drafting techniques.⁸ Despite variation in individual or workshop practices, certain methods seem to have been widely adopted. For example, the drafts are generally rendered in black and white but bear indications regarding colour and formatting elements. Another

⁵ Stained-glass windows in the Besserer Chapel of Ulm Minster that are closely related to the window in Berne show similar tracings, as stated at a technical meeting of the Corpus Vitrearum in 2017.

⁶ KURMANN-SCHWARZ 1998, p. 506 (1448).

⁷ On Martin Schongauer’s altarpiece of the Dominicans (ca. 1480) in the Musée Unterlinden in Colmar, for example, the underdrawings are clearly visible on certain panels of poorer condition. They are particularly close to the preparatory painting work on the Bernese windows, regarding their ductus as well as frequent slight differences between the draft and the final form.

⁸ For an overview: Andreas SIEJEK, Kathrin KIRSCH, Ingo SANDER (ed.), *Die Unterzeichnung auf dem Malgrund. Graphische Mittel und Übertragungsverfahren im 15.-17. Jahrhundert*, Siegls Fachbuchhandlung, Kölner Beiträge zur Restaurierung und Konservierung von Kunst- und Kulturgut 11, Munich 2004.

characteristic feature of underdrawings is that the final stage of the artwork evolves directly from the draft, by modifying, interpreting, confirming or reproducing the results of the earlier stages of the process of defining the image. Also suggested by the underdrawings are clues as to the “authorship” (“masters” and collaborators) of the various procedures, and the creative and executive skills involved. Studying the underdrawings often reveals that a single artist made a decisive impact on the entire working process.

For stained glass, the glazier’s tables (and their description by Theophilus) bear witness to the same concept.⁹ Although the support is not the same, there is much evidence for a close link between the preparatory process on the whitewashed board and the final elaboration of the image in glass, paint and lead. Pictorial elements are prepared with indications similar to those found on underdrawings, although much of the information provided on this support is concerned with the composition of the glass mosaic, which was drawn, cut and leaded directly on the same board.

Paper for cartoons generally became affordable during the 15th century. At the beginning of that century, the painter Cennino Cennini describes its use for stained-glass designs.¹⁰ It is often presumed that with the introduction of cartoons in stained-glass production, the art form started to drift away from a coherent creative process as adopted by other pictorial arts, and towards a separation of concept and execution. However, it was probably not this aspect of the working process that led to a particular interest in the new material, because draft designs for stained-glass windows had always been prepared on separate supports. A major issue for this kind of artwork was very often the size of the images. Glaziers’ tables were well suited to the production of images based on partial modules, or panels, which were related to the window openings and their subdivisions by *ferramenta*. Coherent compositions involving larger parts of windows, which became increasingly frequent towards the Late Middle Ages, also needed larger draft media. For the production of stained glass, this did not necessarily change things much, as a cartoon on paper (or an alternative material such as cloth) fixed to a work table, unrolled or even cut into pieces corresponding to one or more panels, could probably be used for most steps of the work in the same way as a draft on the chalked table.

The other use of the cartoon as a mobile support that allowed certain elements of the draft to be made by an external specialized designer, as Cennini points out, is a specificity which may have evolved with the wider spread of this medium and preparatory technique. However, as we have seen, it is not necessarily the driving force behind this innovation. In the case of Berne Minster, paper was offered to a “glazier”, or stained-glass artist, for the purpose of creating a draft of the painting on light. This may mean that he, or someone in his workshop, completed this task, though it cannot be excluded that he outsourced this part of the commission.

The oldest surviving stained-glass designs on paper only date back to the late 15th and early 16th century. However, many of these early examples of designs for stained glass were obviously not used as preparatory aids directly, as suggested above, but were made and kept either as models created by specialized artists for stained-glass workshops, or as designs for commissions of higher prestige. The use of yet another medium – a kind of “working cartoon” – has therefore been postulated.¹¹

Paper drafts and reverse tracings

Returning to Berne Minster, let us now try to shed further light on possible connections between draft designs on paper and underdrawings on glass.

⁹ Joan VILA GRAU, “La table de peintre-verrier de Gérone”, *Revue de l’art* 72, 1986, p. 32-34; Anna SANTOLARIA TURA, *Glazing on white-washed tables*, Institut Català de Recerca del Patrimoni Cultural, Girona 2014; Karl-Joachim MAERCKER, “Überlegungen zu drei Scheibenrissen auf dem Böhmischem Altar im Dom zu Brandenburg”, in *Österreichische Zeitschrift für Kunst und Denkmalpflege* 40, 1986, p. 183-189; Sebastian STROBL, *Glastechnik des Mittelalters*, Gentner, Stuttgart, 1990, p. 78-80.

⁹ VAN TREECK 2000, p. 57-62. THEOPHILUS, *De diversis artibus* II 17. Charles Reginald DODWELL, *Theophilus, De diversis artibus; Theophilus, the various arts, translated from the Latin with introduction and notes*, Thomas Nelson and sons, London/Edinburg etc. 1961, p. 47.

¹⁰ Fernando TEMPESTI, *Il libro dell’arte o trattato della pittura di Cennino Cennini*, Longanesi and C., Milan 1975, p. 134-135 (chapter 171).

¹¹ Hartmut SCHOLZ, *Entwurf und Ausführung. Werkstattpraxis in der Nürnberger Glasmalerei der Dürerzeit*, Corpus Vitrearum Medii Aevi Deutschland, Studien, Band I, Berlin 1991, p. 14; Michel HÉROLD, “Au XVI^e siècle, les peintres verriers à l’œuvre”, in Michel HÉROLD, Véronique DAVID 2014 (see note 2), p. 124, 308; STROBL 1990, p. 80-84.

1. By looking at the underdrawings and taking into account later cartoons, one can draw conclusions as to what drafts on paper may have looked like (fig. 4).¹² Black-and-white drawings executed, as described by Cennini, with pencils and carbon modelling, focused on the main lines and combining figural elements of the stained glass with the requirements of their material construction. Traces in red may have indicated cut-lines and lead came structures – a possible use for the red paint that was mentioned together with paper offered to Niklaus Glaser.

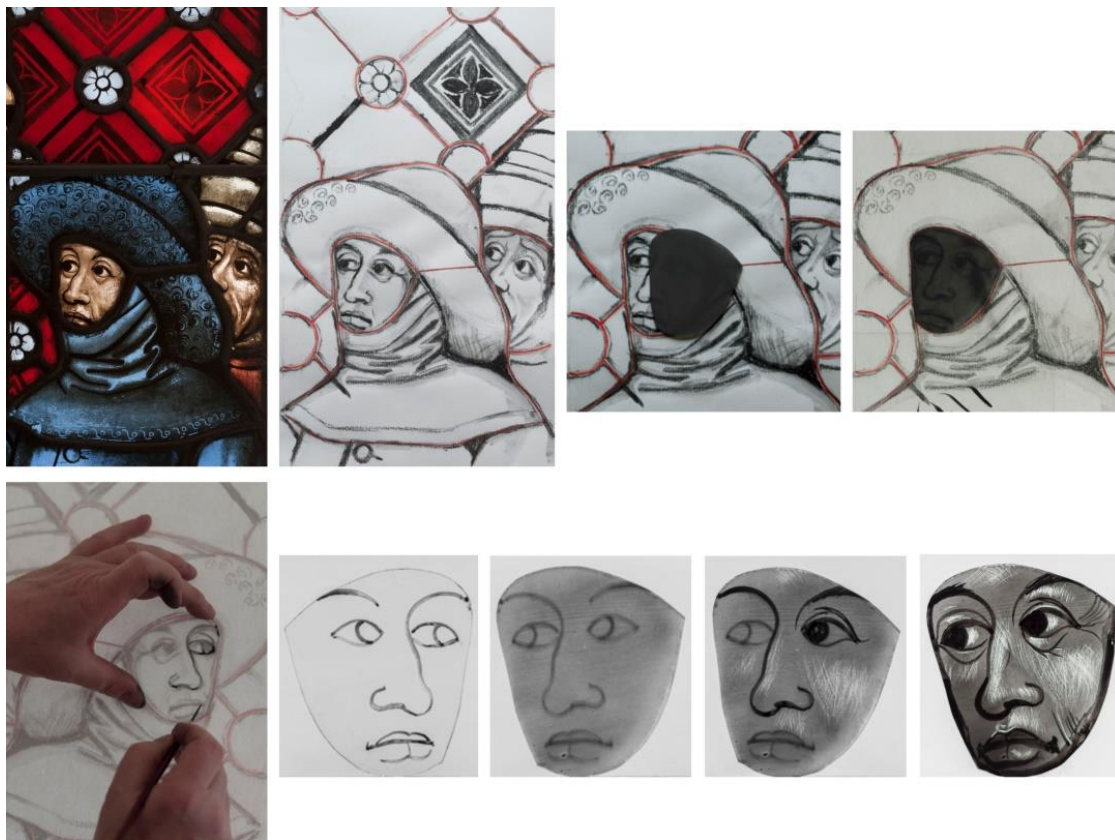


Fig. 4. From paper draft to stained glass. Above: fictive working cartoon for a part of the Legend of the Three Kings window (nIII, 8d) in Berne Minster, rendered in pencil and washed charcoal, limited to the main features of the image, as well as cut and leading lines in red. Through an unfired “badgered” matt, which serves as a base for the painting work, the draft underneath is invisible unless held against a bright background. Below: the main linear structure of the draft is first transferred from the reversed draft on paper to the back of the unpainted piece of glass against a bright background.

The tracings, which are clearly visible through the unfired matt if placed in front of a bright background, outline the main structure of the painting on the front side. Experiments by Daniel Stettler (drawing and painting) and the author.

Photos © Philippe Joner / backsquare, Romont.

The surprisingly detailed nature of the underdrawings suggests that at a certain point in the work process they possibly supplanted and carried on the role of the preparatory work on paper. This, in turn, could indicate that the draft on paper served as an ephemeral tool, with little intrinsic value as an art object. We can also hypothesize tentatively from this that early cartoons often functioned similarly, which would go some way to explaining why, apparently, nothing has survived, and even why the period from which most preparatory tracings have been found so far roughly coincides with the gap in material evidence between the three glazier’s tables in Girona and Brandenburg from the late 14th century and the earliest preserved cartoons for stained glass, which only date back to the late 15th and early 16th century.

¹² Especially designs for Swiss stained glass or the Gouda and Brussels cartoons: Zsuzsanna VAN RUYVEN-ZEMAN, *Stained glass in the Netherlands before 1795*, Corpus Vitrearum the Netherlands vol. IV, part II, Amsterdam University Press, Amsterdam 2011; Zsuzsanna VAN RUYVEN-ZEMAN, Arjan R. DE KOOMEN, Antonie L.H. HAGE, Jan Piet FILEDT KOK, *The cartoons of the Sint-Janskerk in Gouda*, Eburon Academic Publishers, Delft 2012. Yvette VANDEN BEMDEN, Chantal FONTAINE-HODIAMONT, Arnout BALIS, *Cartons de vitraux du XVII^e siècle. La cathédrale Saint-Michel, Bruxelles*, Corpus Vitrearum Belgique, Série études 1, Union Académique Internationale, Brussels 1994.

3. The reasons why the tracings seem to resume and pursue the role of the previous draft on paper may be connected with the nature of the painting technique. One has to remember that paintings on glass need to be executed with light as a background – the required quality of the work can only be ensured if it is carried out under these conditions, under which the completed windows will later be appreciated.¹³ This is especially the case with late medieval and early modern stained glass, which is noted for its subtle pictorial effects based on nuances of translucency, matts, washes, differentiated tracing, modelling and etching. The painters must have been extremely skilled in such techniques, in a way that presumably made highly elaborate preparatory designs superfluous, especially as the effects achieved on the paper support could not match those obtained by painting on light. The opaque cartoon could hardly be used as a source from which the painting on glass was copied in detail (see also below). The draft must have served as a foundation, a kind of reference for the final elaboration of the painting with light as a background, created with the help of the guidelines on the reverse of the glass. This is exactly what we see in Jost Amman's well-known woodcut of a glass artist: he is painting on an easel in front of a large window, with the draft on paper in the background, fixed to the window frame.

A second reason could be connected to the stylistic and technical characteristics of late medieval and early modern stained-glass windows: The elaborate and delicate *chiaroscuro* painting technique was based on an initial semi-translucent matt covering the entire piece of glass (fig. 4). Its middle value of grey allowed the development of both dark areas, with opaque tracing work and shadowing, and bright details, by etching and removing the basic glaze with various tools. This procedure involving a first matt has disadvantages: it is very difficult to modify trace lines applied on the unfired paint layer¹⁴, and – again before firing – the vitreous matt is translucent, but its transparency is very limited. This makes it virtually impossible to see and reproduce an underlying opaque draft (fig. 4). However, the purpose of tracings applied directly to the glass becomes evident: With a bright background, the tracings are perfectly discernible even through unfired matt and therefore serve as a guiding structure for the painting on the front side of the glass.

4. The use of paper drafts may also have been a convenient way of dealing with a particular aspect of this underdrawing technique, namely that the tracings on the reverse of the glass have to be inverted, a point that has already been raised within the context of draft procedures for stained glass.¹⁵ Several techniques are known to be used for this purpose. Experiments established that it is easy to see, and to transfer to the glass, the main features of an image on a paper draft when it is turned over and held against the light (fig. 4).

In conclusion, the tracings found on all four monumental medieval windows of the choir of Berne Minster suggest that we should be aware of a widely – sometimes even systematically – applied working method related to preparatory and final stages in the process of creating stained glass. The tracings reflect the principal features of a previous drafting process. Some technical aspects suggest that they refer particularly to preparatory works on paper. They allow the final outcome of the artwork to be freely developed under the visual conditions required for the appreciation of the completed work. The nature of the tracings could suggest that the drafts were deliberately limited in scope and consisted – apart from essential technical indications regarding the glass and lead composition as well as data on the windows – mainly of outlines of the principal linear structure of the painted elements. The paper drafts could therefore be compared to underdrawings for other types of painting, in that they form a corpus of work intimately related to the *œuvre* but destined to disappear after it has been completed. They would have served primarily as a guide to the *composition* of the work, whereas the preparatory tracings can be regarded as a link and as an initial step towards the *realization* of the final artwork. The reverse side tracings could therefore be considered as evidence for the intrinsic interconnection and continuity of inventive and executive processes in the creation of stained glass, in a way that is familiar from other artistic disciplines.¹⁶



¹³ VAN TREECK 2000, p. 57-62.

¹⁴ See also VAN TREECK 2000, p. 59.

¹⁵ Eva FRODL-KRAFT, "Ein Scheibenriss aus der Mitte des 14. Jahrhunderts", in Ellen J. BEER, Paul HOFER, LUC MOJON (ed.), *Festschrift Hans Hahnloser zum 60. Geburtstag 1959*, Basel and Stuttgart 1961, p. 307-316.

¹⁶ Peter VAN TREECK 2000, p. 61; concerning the well-documented exchange between various artistic disciplines in this period recently KURMANN-SCHWARZ 2014, p. 43-45 (see note 2).