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Austrian Stained Glass in the Interplay of Research and Conservation: Reflections on How to Preserve an Endangered Art Genre

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Abstract: In 2021, two projects for the protection and preservation of Austrian stained glass were performed in close cooperation between the Federal Monuments Authority Austria and active members of the Corpus Vitrearum Austria. Both projects are dedicated to difficult topics that will increasingly challenge how we tackle the preservation of monuments in the coming decades. There are questions regarding the correct conservation and restoration treatment of stained glass from the late 19th and early 20th century (stained glass from the so-called art period of *Historicism*), which, despite all the *Guidelines for the Conservation and Restoration* of this endangered genre of art, is still far from being treated with the necessary care throughout the country. The protection and preservation of the original substance—the glass, the leading and the painting—are the primary focus of interest here. Using the example of the restoration campaign currently being conducted on the windows of St. Mary's Cathedral, Linz, a cultural monument of particular importance for Austria, work is being undertaken to elaborate the feasibility of a concept that can be easily implemented in the future at other construction sites and by all the stakeholders involved. The second monitoring project presented concerns the equally important area of "preventive conservation" of medieval and modern stained glass. The focus of the work that took place here was on checking the condition of stained glass from the Middle Ages to the 20th century (with and without exterior protective glazing) and the general identification of damage and determination of the urgency of measures for conservation (using a "traffic light system" developed for this purpose).

Keywords: stained glass; Middle Ages; art period of *Historicism*; conservation; restoration; concept of measures; monitoring; pilot project

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Citation: Wais-Wolf, C.; Weiss, P.; Tinzl, C. Austrian Stained Glass in the Interplay of Research and Conservation: Reflections on How to Preserve an Endangered Art Genre. *Heritage* **2022**, *5*, 509–525. https://doi.org/10.3390/heritage5010029

Academic Editors: Marcia Vilarigues, Sophie Wolf and Teresa Palomar

Received: 27 December 2021
Accepted: 1 March 2022
Published: 10 March 2022

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1. Stained Glass in the Interplay of Research and Conservation

The study and preservation of medieval stained glass have always been closely linked in Austria. The basis for this is historically anchored. Until very recently, those art historians who were active in the field of stained glass research were also employed at the Federal Monuments Authority Austria (short: FMA). Among them was Eva Frodl-Kraft (†), one of the important founding members of the international research project Corpus Vitrearum (Medii Aevi). Through her, the Austrian Corpus Vitrearum (short: CV) was anchored at the Institute for Austrian Art Research at the FMA as early as 1952. In 1962, she published the first volume (*Die mittelalterlichen Glasgemälde in Wien* [1]), and in 1972 the second volume of the Austrian Corpus Vitrearum Medii Aevi (CVMA) (*Die mittelalterlichen Glasgemälde in Niederösterreich, Teil 1* [2]). Both volumes were printed in cooperation with the International Committee of Art Historians under the patronage of the Union Académique Internationale

and with the support of UNESCO. From the 1970s onwards, Ernst Bacher (†) joined the CV project as the second member of the Austrian National Committee. In 1979 he published the third Austrian CVMA volume (*Die mittelalterlichen Glasgemälde der Steiermark, Teil 1* [3]). In addition to their professional commitments (Eva Frodl-Kraft was director of the Institute for Austrian Art Research at the FMA from 1970 to 1979 and Ernst Bacher was general conservator of the FMA from 1982 to 2000), both always played an extremely active role in the International CV Research Association; Eva Frodl-Kraft as president of the International CV (1983 to 1987) and Ernst Bacher in his function as director of the Technical Committee of the International CV (1981 to 1989) and vice president of the overall organisation (1989 to 1998). Finally, Elisabeth Oberhaidacher-Herzig, employee and later deputy head of the Department of Inventory and Monument Research of the FMA, also became involved in the stained glass project in 1980. Shortly after her admission to the National Committee, Austria organised the 12th International Colloquium of the CV in Vienna in 1983. In parallel to the colloquium, the exhibition *Stained Glass of the Middle Ages* was held at the *Österreichische Galerie Belvedere* in Vienna.

The project's connection with the FMA brought with it a very significant advantage for the researchers. Since World War II, all restoration programs for medieval stained glass have been carried out under the expert supervision of the FMA. Free access to the restoration workshops of the FMA, located in the Arsenal in Vienna since 1955 [4], has offered the CV researchers ideal conditions for studying and documenting the objects in their dismantled state. In this way, they have been able to examine a large number of glass paintings over the decades, both from the front and the back, as well as in different lighting conditions, and to document them scientifically, also with the help of the Authority's own photographers. Through direct contact with restorers and the associated natural science laboratory [5], there was a constant exchange of expertise. This made it possible to gain further important insights into questions related to the material and condition over a long period of time. Today the researchers at the CV—Günther Buchinger and Christina Wais-Wolf [6–8]—benefit from the existing conservation schemes, as well as written notes and historical photographs from these earlier, continuous restoration campaigns.

2. Application-Oriented Basic Research and "Study on the Object"

The focus of the study is on the art form of stained glass; together with wall painting, this is one of the most important branches of monumental painting. Because of its material connection with the built architecture, it has been one of the most important media for images in sacred and secular buildings since the Middle Ages. Within this timespan, it has served almost all social groups as an attractive instrument for conveying religious, socially relevant, or representative image messages in a decorative manner. In Austria, stained glass research had its origins as early as the first half of the 20th century. In 1928, the art historian Franz Kieslinger published the first fundamental publication *Gothic Stained Glass in Austria until to 1450* [9], which summarised the results of his field research in this area. In 1950, Walter Frodl published his catalogue inventory of the stained glass of the province of Carinthia, entitled *Glasmalerei in Kärnten, 1150–1500* [10]. The edition scheme later laid down in the Guidelines of the CV project was already anticipated here. When the Austrian CV was founded in 1952, it was able to build on a solid scientific foundation in Austria. In addition, the inventories and lists of monuments published at regular intervals by the FMA (*Österreichische Kunsttopographie*, *Dehio-Handbuch zu den österreichischen Kunstdenkmälern*) enriched our knowledge of the nature and extent of the Austrian stock of medieval stained glass from the very beginning.

At the same time, stained glass is one of the most endangered genres in art history. Due to harm by natural or mechanical influences (cracks caused by hail or stone chipping, or corrosion caused by acid rain and weathering), almost all of the colourful stained glasses or windows that exist today have been subjected to successive interventions by restorers. In the process, the original glass was replaced with new glass and/or the paintings were painted over with retouching. The ability to recognise the original substance—in terms of the glass, the leading and the drawing—requires years of methodical "study on the object" and experience.

The strong interaction with the FMA opened the possibility of application-oriented basic research for the CV project in Austria at a very early stage. The knowledge gained by the researchers on questions of the conservation, materiality and technique of the documented artefacts of art made an important contribution to the practice of restoration and thus to Austrian monument conservation. While the art historical research of the CV was able to contribute insights into historical manipulations through the processing of the archival records and through the analysis of the detailed artistic forms as well as the glass substance, the restorers provided important findings on the original or altered materiality of the work of art, most of which were also verified through the application of the natural sciences. Through this cooperation, insights into retouching, artificial patination, chemical or mechanical cleaning, etc., could—and still can—be gained today. Basic research has thus entered and continues to enter the applied field and supports decision making in the field of monument conservation. In meetings between monument conservators, restorers and CV staff, the extent of authenticity and previous manipulation, as well as the restoration goal (conservation of the as–is state or the degree of a restorative intervention) can be defined. In this way, the work of the CV achieves direct added value for work in the field of Austrian monument conservation.

3. Exterior Protective Glazing for Medieval Stained Glass Windows

The Austrian position in the field of medieval stained glass has always been a conservative one; however, from today's perspective it is perhaps also thoroughly modern—namely focused on conservation rather than restoration and presentation. In 1970, under the guidance of Eva Frodl-Kraft and Ernst Bacher, the installation of exterior protective glazing was started in Austria (Leoben, Waasenkirche, in the province of Styria) to protect the medieval picture windows that were endangered by the polluted atmosphere of the time (acid rain). The internationally anchored *Guidelines for the Conservation and Restoration of Stained Glass* [11], which were formulated in 1989 under the leadership of Ernst Bacher in his role as vice president of the International CV, finally provided a further, extremely important impetus for the sensitive handling of this material, which is most definitely worth protecting.

The positive effects of these protective measures, which have been consistently implemented over the decades, primarily in connection with medieval stained glass, can still be felt in Austria today. Only a few of the approximately 4000 surviving individual medieval panels in Austria are not yet protected by external protective glazing. Efforts are currently underway to conserve these last remaining stocks; one example is the high-quality Gothic glass stock of the Filial Church Innerochsenbach in Lower Austria [2], where external glazing now also protects the restored stock in the long term. The programme for the nationwide protection of medieval stained glass, which began in Austria in the 1970s, will soon come to a temporary pause. On the other hand, this will also be the start of the evaluation of the respective measures, the central aim of which is to assess the actual protective function and effect.

Consequently, in the early decades of the 21st century that are now dawning the focus in Austria will be directed towards two completely new subject areas, as be presented and discussed in the following sections.

4. Reflections on How to Preserve an Endangered Art Genre

Against the background outlined here, two pilot projects took place in 2021, both of which were performed and implemented with the close cooperation between members of CV Austria (Christina Wais-Wolf) and representatives of active monument conservation (Petra Weiss and Christoph Tinzl), which has always been customary for Austria. In their own way, both projects could point the way for future conservation/restoration campaigns in Austria.

4.1. Project (1): Stained Glass of the Second Half of the 19th and Early 20th Century—Research and Conservation

An important topic currently relating to the preservation of historical monuments is that of the preservation of the numerically extensive stocks of stained glass from the second

half of the 19th and the beginning of the 20th century. Stained glass from this period in particular—which, in art history, is called the period of *Historicism* or *Historismus*—which, in contrast to medieval stained glass has until recently been the focus of little general interest, is now at a critical stage in terms of conservation. Moreover, many of these holdings have been subjected to at least one "restorative" (manipulation) intervention over the course of time, usually without a documentation report. Furthermore, the lack of scientific assessment of the artistic value of these glass paintings has increasingly led to serious and eventually irreversible harm and damage to the objects, for example through the replacement of glass. However, due to the natural ageing process, a large wave of restorations of these holdings is imminent in Austria in the coming decades.

In the future, the CV Austria will be able to provide important input on questions concerning determination of the age and classification of the qualitative artistic significance of these stained glass holdings within monumental painting of the art period of *Historicism*. Since 2015, the CV Austria has expanded its processing period in terms of content in the direction of 19th- and 20th-century stained glass inventories. The impetus for this was a 5-year project at the Austrian Academy of Sciences entitled *Corpus Vitrearum—Medieval and Modern Stained Glass in Austria* [12,13]. Two follow-up projects at the Austrian Academy of Sciences and at the Institute of Art History at the University of Innsbruck in 2020 and 2021 [14,15] were able to advance research in this area. These current developments in Austria correlate with the direction set within the international research project, which, in 2016, established another important milestone with regard to the processing of country-specific stained glass holdings with the adoption of the *International Guidelines for the Edition of Stained Glass Paintings after 1800* [16]. Knowledge of stained glass from this period, which has received little attention to date, is the basic prerequisite for preserving these important cultural assets for posterity. Only by uncovering artistic connections—for example between Austrian and international workshops—by reconstructing artistic concepts for spatial designs, and by revealing socio-historical (donors) or cultural–scientific connections (production and performative processes) will it be possible to perceive the art and (cultural) historical significance and quality of stained glass from the second half of 19th and early 20th century. Presumably, this is also the key to a more careful approach to this extremely sensitive subject on the part of the general public.

In the future, the FMA and CV-Austria will have to work on concepts for the implementation of such restoration campaigns that are easy to implement in practice. It is already known that restoration of 19th and 20th century holdings involves an often above-average number of individual objects—in contrast to common restorations of medieval holdings—and this is combined with enormous pressure in terms of time and financial implementation. Faced with a restoration campaign lasting many months or even years, which is associated with high costs, there is usually a lack of financial resources on the part of the owners and donors, as well as a lack of understanding and fundamental willingness. Regrettably, all too often these components constitute a barrier to approaching the restoration support required by heritage conservation in an unbiased way. The key to solving this dilemma lies in actively demonstrating feasibility concepts that, on the one hand, create the necessary awareness of the matter and, on the other hand, are (or can be) ideally fully supported by all those involved in the project. A project conducted in 2021 was able to provide important input in this regard.

Start of a 10-Year Restoration Campaign of the Windows of St. Mary's Cathedral, Linz

In December 2020, a 10-year restoration campaign of the windows of the high choir and the west side of St. Mary's Cathedral, Linz, was launched. In the course of this campaign, three of the cathedral's windows are to be removed in each calendar year and subsequently restored in the *Schlierbach stained glass workshop* [17] (province of Upper Austria). In the first stage (December 2020 to May 2021), the "Wilhering Abbey Window", the "Holy Spirit Window" and the "St. Florian Abbey Window" (Figure 1) were restored.



Figure 1. Linz, St. Mary's Cathedral, *St. Florian's Abbey window* (clerestory window, transept in the west), created in the second decade of the 20th century by the Tyrolean Stained Glass Company in Innsbruck. © Mariendom Linz/Franz Wurm.

The artistic and (cultural) historical significance of these windows is related to the origin of this sacred building from the period of Historicism, which is extremely important for Austria; it is the largest church building in the country. St. Mary's Cathedral in Linz was built in connection with the proclamation of the dogma of the "*Immaculate Conception of Mary*" in 1854, which is why the then Bishop of Linz, Franz Joseph Rudigiers (1811–1884), expressed a wish for a new church building in Linz, the capital of Upper Austria, which would make direct reference to it. Almost simultaneously with the construction of the building in 1862, the first monumental glass paintings for the windows of the votive chapel were commissioned from the *Tyrolean Stained Glass Company in Innsbruck*/Tyrol [18], which had only been founded in 1861 (the windows were commissioned in 1868). Further windows for the chapel crown and the high choir were delivered in the 1880s. In the course of a third commissioning period in the second decade of the 20th century, the 42 high windows of the nave and transept were finally created, constituting the largest group of windows (in terms of numbers) within the cathedral [19–21].

While the iconography of the windows from the second half of the 19th century still makes direct reference to the "*Patrocinium of Our Lady*", the content of the depictions of the windows in the nave and transept follow the wish expressed by Bishop Rudolph Hittmair (1909–1915) that they should present striking events, personalities and landscapes from Upper Austria. The figural scenes were intended to show that history, including salvation events, and the present are not only closely connected, but are also capable of merging with the immediate present, so to speak. The creation of photorealistic portraits and the depictions of contemporary personalities (Figure 2a,b) underline this intention. This recent group of windows in St. Mary's Cathedral, which was created at a time of great historical upheaval at the end of the Austro–Hungarian Monarchy, has become an extremely important national history cycle for Austria, the cultural historical significance of which is still evident in its identity-forming effect for the entire country today.



(**a**) (**b**)

Figure 2. (**a**) Portrayal of the cathedral master builder Vinzenz Statz from the Foundation stone laying window (west wall of the nave), portrait-like reproduction of the face after a contemporary photography. © Austrian Academy of Sciences/Project Corpus Vitrearum, Daniel Podosek; (**b**) Photography of Vinzenz Statz (1819–1898) in the possession of St. Mary's Cathedral, Linz. © Mariendom Linz/Christina Wais-Wolf.

The current restoration campaign made it possible to document three windows in direct close-up for the first time. In this way, exciting insights could be gained both for the art historical assessment of these panels and with regard to the further conservation–restoration procedures.

The greatest damage—as shown by the analysis of the condition of the panels and their condition—was caused by inappropriate intervention, presumably in the late 1940s. In contrast to the stained glass holdings of the Middle Ages, which had been removed for protection and stored elsewhere, the large number, in terms of scope and size, of windows of the 19th and 20th centuries in Austria were generally not removed. Just these remained in use in the church buildings during World War II. Numerous extremely valuable stained glass windows from the art period of Historicism were destroyed or at least severely damaged in the course of the turmoil of war in the mid-20th century—for example, the Historicist glazing of St. Stephen's Cathedral in Vienna. Linz's St. Mary's Cathedral was also not spared during this time. In November/December 1944 and January 1945, for example, numerous windows in the cathedral were shattered by the blast wave of a bomb that had struck near the church building. In the chapel ring, most of the windows were completely destroyed, including the *Archduke Window* or *Habsburg Window*, which was replaced by today's *Christ the King Window* in 1950. The windows designed by the artist Karl Martin Hartmann in 1992/94 also replace windows from around 1885 that were destroyed during wartime [20].

Broken glass and flaws in these windows were—as has been shown recently—usually repaired in an extremely improper manner, i.e., more "provisionally" than "professionally" in terms of restoration. Moreover, most of this work was probably performed in situ; consequently, defects were sometimes provisionally sealed on both the inside and the outside by means of wide lead plates, coarse cement adhesives or small glass particles placed in cement beds (Figure 3a,b).



(**a**) (**b**)

Figure 3. (**a**) Cracked glass and defects were provisionally closed on both the inside and outside in the course of a "restoration" intervention, presumably in the late 1940s, with broad sheet metal plates on the inside of the glass. © Christina Wais-Wolf; (**b**) Broken parts were filled with coarse cement adhesives or small glass particles placed in cement beds on the outside of the glasses. © Christina Wais-Wolf.

One focus of the current restoration was to remedy these improper manipulations. The discussion in the course of the campaign about "closing such defects", often caused by the chipping of cracked glass, immediately raised the question of the "correct handling of the original substance". Despite all the *Guidelines for the Conservation and Restoration of Stained Glass*, replacement of the damaged original substance with new pieces has unfortunately been the current practice of many glass workshops in this country. At this point, it should be emphasised once again that this improper handling of original substance in Austria refers only to the stained glass of the 19th and 20th centuries and not to the medieval holdings, which are always supervised by academic conservators/restorers in our country. The reasons for this are complex and currently understandable, but in the future, they will have to be strictly banished from the collective understanding of society by the active preservationists. Preservation of the original substance must also be a top priority for the Historicist holdings from the second half of the 19th and early 20th centuries. Without the professional support of the Federal Monuments Authority and the Corpus Vitrearum Austria, original glass substance would probably have been completely replaced by supplemented new glass pieces, a procedure that is currently widespread among glass workshops in the country in cases where there is no professional supervision from the side of monument preservation. It will be necessary to treat stained glass windows of the 19th and 20th centuries with the same conservational–restorative prudence as is completely natural for the field of restoration of medieval stained glass paintings (Figure 4a,b). In addition to the preservation of the glass substance, this topic also includes the lead netting, which in current the "restoration" practice of stained glass of this modern period is often replaced far too readily with newly drawn leading. The project involving the windows of Linz's St. Mary's Cathedral has opened, for the first time, a complex pool of issues that Austrian heritage conservation will have to address more extensively in the future.



(**a**) (**b**)

Figure 4. (**a**) In the case of this splinter crack—a piece of glass from the early 20th century—an attempt was made to preserve as much of the original substance as possible (instead of a complete replacement, as often happens in the practice of glass workshops); (**b**) The entire right half of the glass piece, which was cracked, but had no loss of glass substance, could be saved. Only the left half, which showed loss of substance, had to be supplemented with a new piece. In this way, as much of the original substance as possible could be preserved. © (**a**,**b**): Schlierbach stained glass workshop.

The close-up view of the objects was made possible for the first time during the campaign—in the case of St. Mary's Cathedral, Linz, almost 60 individual panels (!) per window—and helped the art historical research of the CV to gain significant insights. The precision of the drawing of some faces and figures is impressive and can be explained by the fact that these faces were for the most part photographs that the glass painters of the Tyrolean Stained Glass Company in Innsbruck transferred to the medium of glass at the beginning of the 20th century (Figure 5). This type of transposition is not unique for

Historicist stained glass, but it is extremely rare. The historical buildings depicted on the windows were also largely based on contemporary prints or picture postcards. Through this form of artistic integration of the people and buildings of the time into a large collection of over 40 windows, the images created here on glass were given a topicality that still leaves an impression on the viewer today. The art historical analysis of the composition and iconography also influenced the decision-making process with regard to conservation and restoration issues. Thus, in the case of a few pieces of glass that were considered "compositionally inappropriate" (Figure 6a,b, Figure 7) in the course of an older restoration, it was decided to replace them with newly created additions. Analogous to the practice known from the restoration of medieval stained glass, these few pieces were marked on the outside with a delicate hatching and the date "*2021*" (Figure 8). However, it is important to say that this exchange only happened in the case of a few individual glasses and was preceded by a lengthy discussion process. The right way to deal with so-called "Fehlstellen" or "Neutralergänzungen" is extremely important and must never be determined hastily. Aesthetic and iconographic considerations must always be balanced with conservation and restoration considerations [22,23].

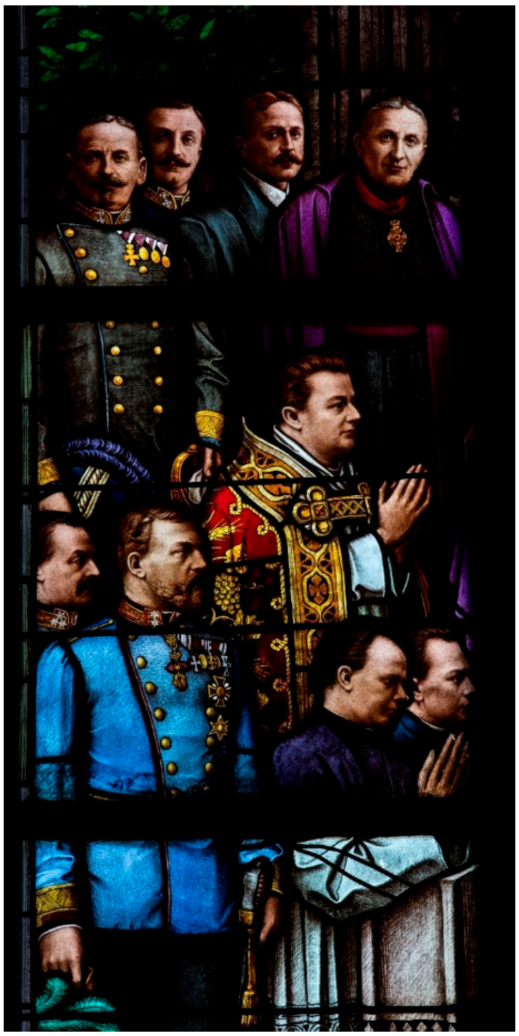


Figure 5. Linz, St. Mary's Cathedral; detail from the *Bishop's Consecration Window* (east wall of the nave) with the depiction of prominent personalities who were actually present in St. Mary's Cathedral in Linz on the occasion of Rudolf Hittmair's consecration as bishop on 1 May 1909. The window itself was created in the second decade of the 20th century by the Tyrolean Stained Glass Company. © Austrian Academy of Sciences/Project Corpus Vitrearum, Daniel Podosek.

A conscious decision was made not to draw or graphically implement an excessive mapping of the inventory, the condition or the restoration measures implemented for each individual panel, each of which is known to require a considerable amount of time. Instead, the most important phenomena of the inventory (primarily supplementary glass, differentiated according to the individual, ascertainable manipulation phases of different times) and condition (primarily defects) were summarised on a single drawing that collectively shows all the individual panels of the window. Based on the assessment performed by the staff of the Schlierbach stained glass workshop in close cooperation with the CV Austria, the most significant damage was recorded and suggestions for restoration were written down in a standardised *concept of measures* prepared for this purpose. This was intended (a) to be easily comprehensible in terms of content by all those involved in the project, including the owners and sponsors who bear the financial burden of the restoration, and (b) to form the basis for the definition of the restoration goal by the representative of the FMA. Currently, a concept is being worked on—together with academic glass restorers—on how employees in a large glass workshop, who do not have academic conservators in the team all the time, can nevertheless create a practicable inventory and condition survey as a basis for determining the restoration goal. The results of this work should be available by 2030 at the latest, when the restoration campaign of St. Mary's Cathedral is completed.



(**a**) (**b**)

Figure 6. (**a**) In the case of the *Wilhering Abbey Window* (clerestory window, transept in the west), the second church tower in the depiction of the abbey building, which is iconographically significant for the entire window, had been added in a compositionally inappropriate manner in the course of an earlier restoration; (**b**) In the case of this supplementary glass, the decision was made in 2021 to replace it with a suitable supplement, performed by Kyra Kleinschmidt/Schlierbach stained glass workshop. © (**a**,**b**): Schlierbach stained glass workshop.

The current restoration campaign at St. Mary's Cathedral, Linz, is intended to have a stimulating effect, especially in the field of practical monument conservation, and to set new standards in dealing with the pictorial glazing of the 19th and 20th centuries. It is intended to (1) make an important contribution to demonstrating to the general public that, in the long term, stained glass from this period must be treated with the same care in terms of conservation and restoration as has been taken completely for granted for stained glass from the Middle Ages for decades, and (2) at the same time, present a model for the more appropriate handling of stained glass from this art historical period that can and should be adopted and implemented, particularly by any glass workshops in Austria in the future.

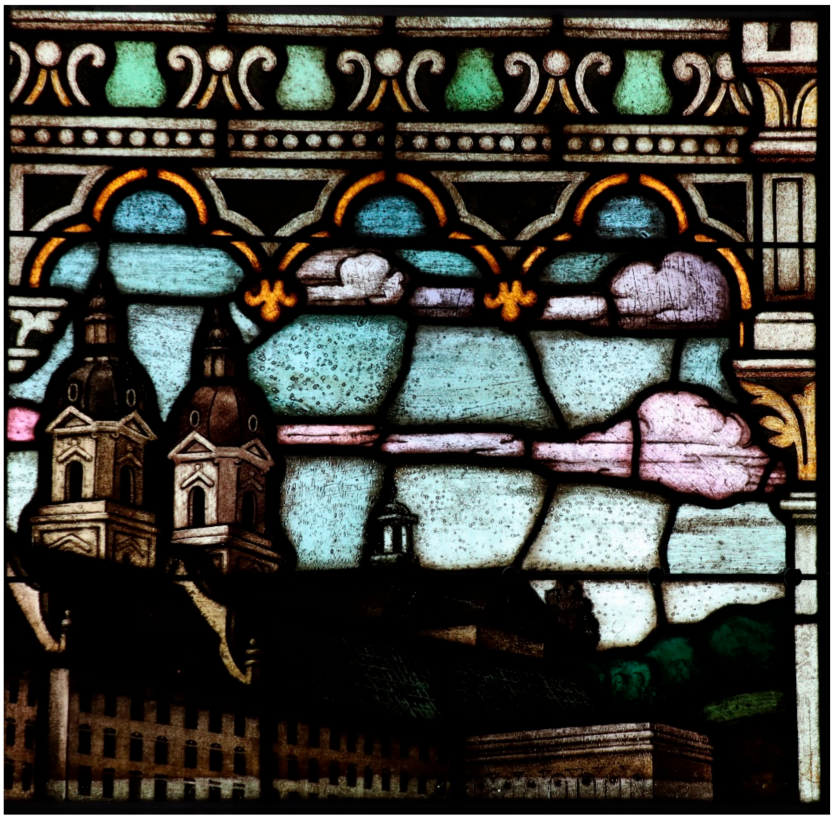


Figure 7. The stained glass panel depicting *Wilhering Abbey* after completion of the work with the supplemented second tower (in the picture on the right); see also Figure 6a,b for before and after comparison. © Schlierbach stained glass workshop.

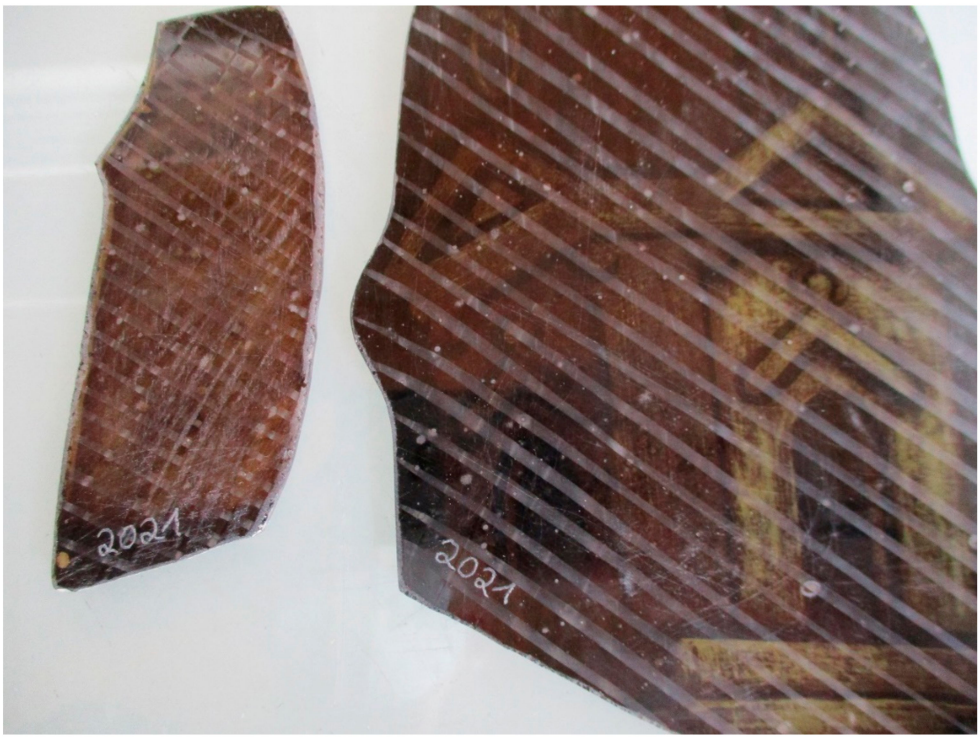


Figure 8. All the new supplementary glass added during the current restoration was given a light hatching on the outside and marked with the date "*2021*". © Schlierbach stained glass workshop.

4.2. Project (2): Monitoring Project as Part of Current Efforts in Heritage Conservation in the Direction of "Corpus New"

A second important pool of topics in Austrian monument conservation currently revolves around the question of implementing so-called *monitoring projects*, especially in the area of wall-bound or difficult-to-move cultural assets. Monument conservation presupposes continuous efforts to preserve the artefacts entrusted to it. Preventive conservation in particular is thus becoming increasingly important. Part of this forward-looking conservation strategy is the cyclical control, appraisal and evaluation of inventory and their condition; these processes define the concept of monitoring. Recorded in standardised report formats, the aim is to create an objective basis for the rapid, sustainable and goal-oriented action in monument conservation and restoration, if necessary.

Against this background, a pilot project initiated by the FMA entitled Monitoring and Condition Survey of the Glass Paintings in Murau and St. Georgen ob Murau took place in 2021. The survey was carried out by the authors, Christina Wais-Wolf and Christoph Tinzl, in cooperation with the academic glass and object restorer Angela Vorhofer. The windows and stained glasses of three churches in Styria were selected as objects for the review, namely the town parish church of St. Matthew (Figure 9), the cemetery church of St. Anna in Murau, and the nearby parish church of St. Georgen ob Murau. An important criterion for the selection of these three locations was the fact that all three buildings are not only spatially close to each other, but, in combination, offer the possibility of examining stained glass from the early 14th to the 20th century. Moreover, some of their holdings are very accessible and others exceedingly difficult to be studied on site. Furthermore, some are already protected by exterior protective glass, while some are still used on site unprotected. In addition to the historic leaded glass from the Middle Ages to the more recent modern period, the focus was also on the condition of the simple bull's-eye or lozenge glazing of these three churches, which are less significant for art history but more so for active monument conservation.

The following aspects were thus the focus of interest in this monitoring project: (1) to check the condition of the historic medieval stained glass windows that are back-ventilated via exterior protective glazing installed in more recent times; (2) to generally identify damage to the historic stained glass windows and windows from the Middle Ages to recent modern times, i.e., also to those stocks that do not have exterior protective glazing; and (3) to determine the urgency of measures to preserve all historic stained glass windows and windows (including simple bull's-eye and bull's-eye windows).

The objects were examined on site with the naked eye and with the aid of magnifying glasses from ladders; sometimes, binoculars were also used. In addition to the prevailing daylight, LED lamps and UV hand lamps were used for illumination. Details of the stained glass at greater heights could also be viewed on a control monitor by using a tall tripod (hmax = 7.3 m) and activating the camera's own live view mode, as well as low-distortion high-resolution photographic documentation (Figures 10 and 11). A Testo 405i anemometer was used for airflow measurements, including temperature recording in the spaces between the historical and front protective glazing; room temperature and relative humidity were recorded by a digital device.

An important prerequisite for the content was the previous research on older restorations and manipulations of the objects, which was primarily extracted from archival sources and documents from the existing archives of the CV Austria (at the FMA). This was supplemented by historical photographic material, which provided important clues for identifying glass that was added later within the original inventory. The distinction between original historical substance and supplemented pieces (as part of the inventory) forms the content-related basis for subsequent conservation and restoration decisions. A graphic drawing can be used to quickly identify glass parts that were added in the course of older restorations (Figure 12).



Figure 9. Exterior view of the parish church of St. Matthew in Murau, Styria. © FMA/Bettina Neubauer-Pregl.

According to the observations made on the object in the course of this investigation, the urgency of measures for the preservation of the individual object groups was determined. The classification was analogous to the procedure that has been tried and tested for some time in the field of wall painting conservation in Austria, including the adoption of a *traffic light system* [24]:

1. "*Red*" for urgent need for action with immediate danger of loss of substance (=unstable state of preservation of the window with damage that goes beyond signs of use and can lead to further damage. The window is at risk of progressive loss of substance and is described as being in very poor condition from a conservation and/or aesthetic point of view. There is an immediate need for conservation and restoration measures, which are to be implemented as soon as possible.)
2. "*Orange*" for urgent need for action (=unstable state of preservation of the window with isolated damage that goes beyond signs of use and may lead to further damage. The window is threatened by progressive loss of substance and is described as being in poor condition from a conservation and/or aesthetic point of view. There is an urgent need for conservation–restoration measures.)
3. "*Yellow*" for moderate need for action on a small scale (=largely stable state of preservation, with traces of use. The window can be described as slightly impaired from

a conservation and aesthetic point of view. In the medium term, however, there is a definite need for conservation and restoration measures to avoid loss of substance.)

4. "*Green*" for no need for action (=stable state of preservation, with traces of use. From a conservation and aesthetic point of view, the window is in a good state of preservation. There is currently no need for conservation measures.) See Figure 13.



Figure 10. Murau, city parish church of St. Matthew; detail of a glass painting in the west window, around 1450, taken on site using a tall tripod. © FMA/Christoph Tinzl.

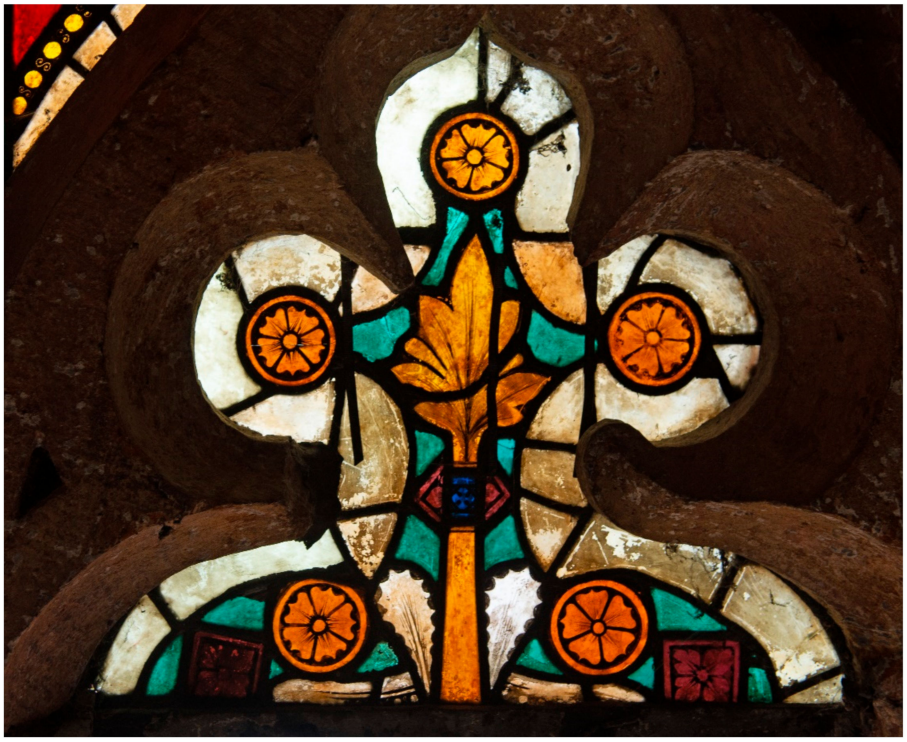


Figure 11. Murau, parish church St. Matthew; detail of a stained glass panel from the Axis Window I, around 1300, taken on site using a tall tripod. © FMA/Christoph Tinzl.



Figure 12. Creation of a conservation scheme using historical photographic material from the photographic holdings of the Federal Monuments Authority Austria, Vienna (Archive of Corpus Vitrearum Austria). The purple dotted lines indicate cracks. The fields marked in purple indicate pieces of glass that were added in the course of older restorations. Accordingly, they are so-called *supplementary pieces* that do not correspond to the original historical stock. © FMA/drawn by Angela Vorhofer and Christina Wais-Wolf.

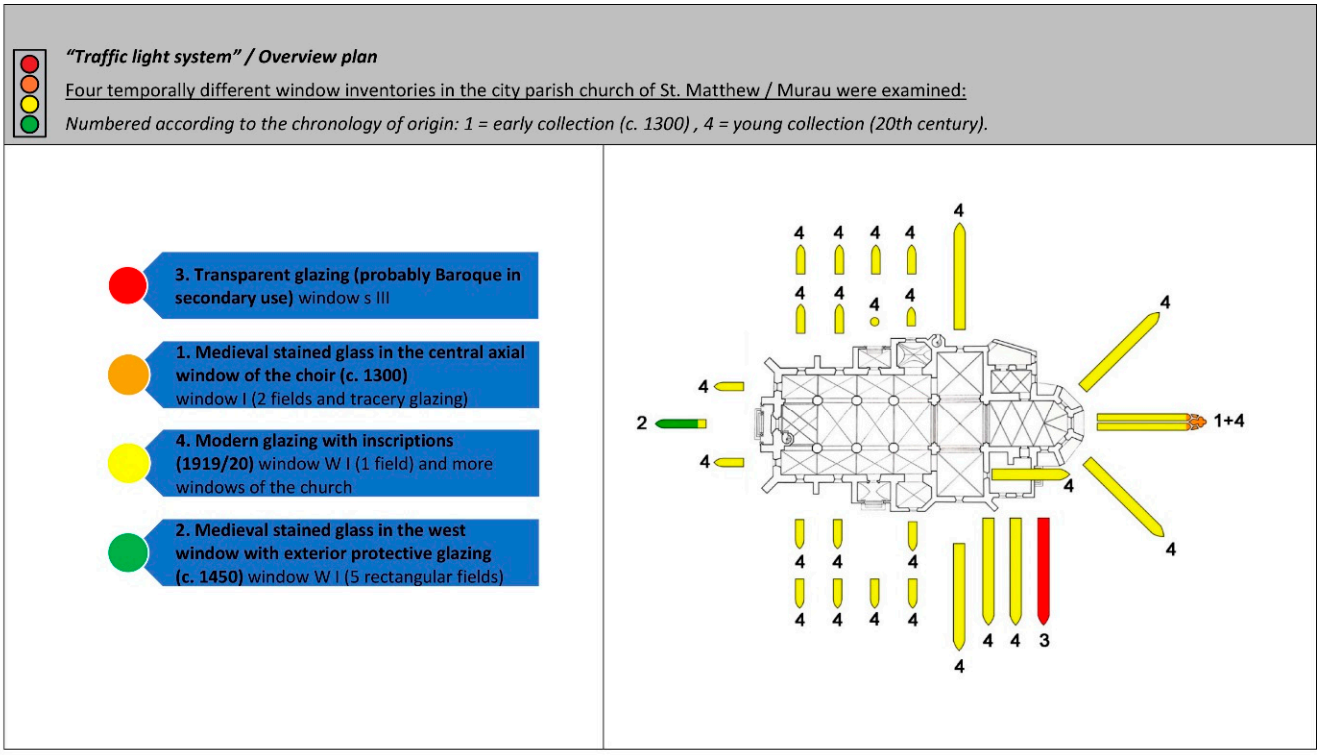


Figure 13. On the overview plan drawn up according to the so-called *traffic light system* (drawn and created by the project team Christoph Tinzl/Angela Vorhofer/Christina Wais-Wolf), the four temporally different stained glass holdings are arranged according to the urgency for conservation-restoration care. The meaning of the four color-differentiated areas is described in detail in the text above ("red" stands for urgent need for action up to "green" for no need for action). © Monitoring Project/FMA: Christoph Tinzl, Angela Vorhofer and Christina Wais-Wolf.

5. Conclusions

The advantage of these projects, which were conducted on a large scale and with the involvement of all the important stakeholders for the preservation of the art genre of stained glass—monument conservators, members of the CV Austria, members of glass workshops and (academic) conservators/restorers—lies in the dynamic and productive interaction of *concentrated expertise*. The insights into Austrian stained glass from the Middle Ages to the present, gained through projects such as these, enrich active monument conservation to the same extent as the research work of the CV project. In the knowledge of this extremely worthwhile output of interdisciplinary cooperation, possibilities for public dissemination should be increasingly explored in the years to come. Apart from publishing the respective individual results in the usual written report form, digital solutions, for example setting up an *online publication and research platform*, could contribute to linking art historical and scientific research on Austrian stained glass in an application-oriented manner and thus make it available to both the active preservation of monuments and the CV research community. Efforts in this direction, which have so far been dubbed "*Corpus New*" by the Austrian heritage conservation community, and include questions of research and conservation on other monumental paintings, i.e., those on walls, are underway on the part of both the Austrian heritage conservation community and members of the CV Austria.

Author Contributions: Conceptualization, Writing and Editing, C.W.-W.; Section 4.1: Writing and Editing, C.W.-W. and P.W.; Section 4.2: Writing and Editing, C.W.-W. and C.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding authors. The data are not publicly available due to legal restrictions.

Acknowledgments: At this point we would also like to thank the Austrian CV member Reinhard Rampold, who has supported the author Christina Wais-Wolf for many years in her research on stained glass in Tyrol from the Middle Ages to the 20th century.

Conflicts of Interest: The authors declare no conflict of interest.

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