

Naumburg Kolleg – Interdisciplinary Research into the West Choir of Naumburg Cathedral

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Abstract

The Cathedral in Naumburg is an outstanding example of ecclesiastical architecture in Germany. In particular this is due to its statues and reliefs in the west choir created in the middle of the 13th century. This paper gives an overview of the “Naumburg Kolleg”, a three year interdisciplinary research programme funded by the Volkswagen Foundation. Within this project, eleven scientists of six different scientific disciplines (art technology and conservation science, natural sciences, building archaeology, history of art, medieval history/regional history, economic geography, and tourism research) deal with open questions concerning the west choir of Naumburg Cathedral.

Working as far as possible on-site provides ideal conditions for research, mutual assistance and exchange of experience among the scientists. This close connection and the resultant interdisciplinary exchange of knowledge render the Naumburg Kolleg an innovative approach to a historic monument. At the same time it offers a unique opportunity to promote junior researchers specialised in the conservation and preservation of cultural assets and cultural development by enabling them to prepare their doctoral theses. The findings and results of the Naumburg Kolleg are not only presented in professional circles and applied in the field of conservation but are also communicated to a wider public. Besides giving an overview of research questions and objectives, this paper particularly mentions results from the research fields of art technology and conservation science, natural sciences, and building archaeology.

Keywords: naumburg cathedral, postgraduate programme, polychromy, analysis, building archaeology

Klíčová slova: katedrála v Naumburgu, doktorský studijní program, polychromie, analýza, archeologie staveb

Introduction

The architecture and the sculptural decoration of the west choir of Naumburg Cathedral, created by the so-called “Naumburg Master” in the middle of the 13th century, lend a unique importance and global renown to the Naumburg Cathedral. The architecture of the choir [Fig. 2], the statues of the founders and the rood screen with its remarkable reliefs [Fig. 1] constitute an outstanding ensemble of the highest quality.

The west choir with its manifold coloured sculptures has been studied from different scientific points of view since the 19th century. About ten years ago, the source material on the Naumburg west choir appeared to be extensive, but incomplete. Nevertheless, several key questions, for example those regarding the creation, significance and function of the west choir, have remained unanswered until today. This led to research deficits in the field of history, building archaeology, and conservation, especially with respect to the polychrome finish of the sculptures. Additionally, several interested parties have expressed the need to assess Naumburg Cathedral’s economic significance for regional tourism as a historic monument and as an important point of interest and likewise the need to develop means of heightening its profile. The initiation for the development of the “Naumburg Kolleg” was laid in 2005, when a preliminary concept for an interdisciplinary research project on the west choir of Naumburg Cathedral was started by experts from the fields of conservation, art history, and building archaeology. Professor Ulrich Schießl, who unexpectedly died in 2011, contributed the main ideas to the concept. Later, representatives in the fields of history, natural science, economic geography and tourism research have become involved.

The overall scientific aims of the Naumburg Kolleg were defined as the comprehensive and systematic assessment, investigation, and evaluation of the construction history and the decoration of the west choir of Naumburg Cathedral. A further aim was to develop a sustainable concept of conservation and publication of the corresponding works of art. Finally, the following six fields became part of the project, and are being undertaken by eleven postgraduates from five universities in Germany:

1. Art Technology and Conservation Science

Head: Prof. Dr. Thomas Danzl, Department of Art Technology and Conservation Science, Restoration of Art and Cultural Assets, Dresden Academy of Fine Arts. Head until 2011 was Prof. Dr. Ulrich Schießl.

2. Natural Science

Head: Prof. Dr. Christoph Herm, Archaeometry and Science in Conservation, Dresden Academy of Fine Arts.

3. Building Archaeology

Head: Prof. Dr. Manfred Schuller, Chair for History of Architecture, Historic Building

Archaeology and Preservation / Institute for History of Architecture, History of Art and Restoration, Munich University of Technology

4. History of Art

Head: Prof. Dr. Joachim Poeschke, retired director of the Institute for History of Art, University of Münster

5. Medieval History / Regional History

Head: Prof. Dr. Enno Bünz, Chair for Saxon History, Department of History, University of Leipzig

6. Economic Geography and Tourism Research

Head: Prof. Dr. Jürgen Schmude, Chair of Economic Geography and Tourism Research, University of Munich

Besides scientific research, the second aim of the project was the promotion of advanced and gifted students. They were to be provided with opportunities for the exchange of knowledge and experience within the framework of central fields of investigation, conservation, and development of cultural assets. Furthermore, their research work should comprise a highly practical component. Generally, it is good practice in scientific research projects to assign doctorate students the task of undertaking research work. Consequently, a doctorate program consisting of a number of doctorate students together with their supervisors seemed adequate for the overall goal. The third aim of Naumburg Kolleg is the dissemination of results not only within scientific circles but also within the wider public. After the objectives and the structure of the project had been defined, an application for support was submitted to the Volkswagen Foundation in 2008. Within its programme “Off the Beaten Track” the Volkswagen Foundation has granted a budget of almost EUR 1.5 million since 2009. Additional resources are provided for a congress and the final publication. The Naumburg Kolleg was originally planned to take three years, ending in summer 2012. However, in order to investigate extended questions, the PhD students have been allowed a further six months for their studies.



Fig. 1 Naumburg Cathedral, west rood screen, view from the east. (Photo Bernadett Freysoldt)

Methodology and Working Process

Implementation

The project started officially in May 2009. By the beginning of 2010, the selection of the group of eleven PhD students was completed. However, a delay in the course of approval affected the time schedule in such a way that both investigation campaigns had to be carried out mainly during the winter season. The first activity in July 2009 was to install an on-site research workshop in the west Choir mainly consisting of an especially stable and large scaffolding. As it was only allowed to occupy one half of the building at any time, the south part of the choir including the rood screen was covered [Fig. 7]. A group of conservation students from Dresden Academy prepared the investigation of the sculptures by dry cleaning them. Subsequently, three-dimensional digital scans of the construction of the west choir as well as of all the sculptures were recorded by the company Linsinger ZT GmbH using both laser beam scanning and structured-light scanning methods. The detailed measurements of selected statues served as the basis for mapping and virtual reconstruction in the sub-projects of art technology and conservation sciences [Fig. 6]. The state exhibition “Der Naumburger Meister” in 2011 set a time for the investigation on site. Thus, the scaffolding was moved to the north part in spring 2010 and had to be removed in February 2011. The portal of the rood screen could be investigated only from mobile scaffolding and only during night time, because the entrance had to be kept clear for visitors during daytime. For a project the size of Naumburg Kolleg, a personnel position dedicated to the management of scientific and technical issues is essential. Therefore it is worth mentioning that it was very beneficial to employ a graduate conservator with skills in organisation, publicity (including the internet), and print layout throughout the whole period of the project.

Research programme

Details of the research programmes of the several sub-projects are given in the following section with focus on the research fields (1) art technology and conservation science, (2) natural sciences, and (3) building archaeology. General information on all sub-projects may be obtained from the project’s web-site www.naumburgkolleg.de. The names of the postgraduates are given in Table 1.

1. Art technology and conservation science

This sub-project contains studies in art technology and conservation science of the polychrome finishes of the statues of the founders and the surrounding architecture as well as the passion reliefs and crucifixion scene at the west rood screen. The focus of the investigation is on the structures of the painting layers, including materials and techniques used. Further aims are the documentation of later additions and restorations, the recording of the conservation conditions, and a virtual reconstruction of the original polychrome finish of the 13th century and later over-paintings. The investigation and evaluation of the conservation state of the statues forms the basis for future conservation and preservation of the sculptures. However, conservation is not intended within the scope of the project. The most recent, and last, investigation of the west choir and west rood screen was by conservator Konrad Riemann in the 1960s. He used all the methods and techniques available in his lifetime. Today additional, mostly non-destructive, methods are available. To determine the colour appearance of the first medieval

Tab. 1 Dissertations of the Naumburg Kolleg with expected dates of issue

author	title		expected date of issue
Christina Hans	Der Naumburger Dom als Attraktionspunkt in der regionalen Tourismuswirtschaft: Image, ökonomische Effekte und Netzwerke	6	March 2013
Jacqueline Menzel	Identifikation von Pigmenten an polychromen Skulpturen mit einer mobilen Raman-Mikrosonde und durch ergänzende Laboruntersuchungen (Identification of pigments on polychromed sculptures by the use of a mobile Raman microprobe and supplementary laboratory investigation)	3	July-Sept. 2013
Susanne Frank	Nachhaltige touristische Entwicklung und Nutzung von sakralen Kulturgütern im Spannungsfeld zwischen Gebrauch und Verbrauch: Der Naumburger Dom	6	July - Dec. 2013
Peter Bömer	Der Westlettner des Naumburger Doms und seine Bildwerke. Form- und funktionsgeschichtliche Studien (The west rood screen in Naumburg Cathedral and its Sculptural Works. Studies on the History of Form and Function)	4	January-June 2014
Dominik Jelschewski	Der Naumburger Westchor - Skulptur, Architektur, Bautechnik (The Naumburg west Choir – sculpture, architecture, building technology)	3	January-March 2014
Sabine Treude	Stiftergedenken in Statuen des 12.-14. Jahrhunderts in Frankreich und Deutschland (Commemoration of the founders in 12th to 14th century statues in France and Germany)	4	January-June 2014
Bernadett Freysoldt	Der Naumburger Westlettner - Kunsttechnologische Erfassung seiner Bildwerke	1	April-Sept. 2014
Daniela Karl	Die Polychromie der Naumburger Stifterfiguren. Kunsttechnologische und konservierungstechnische Untersuchungen	1	April-September 2014
Ilona Dudzinski	Der Westlettner des Naumburger Doms - Bauforschung in Architektur und Skulptur (The west rood screen of Naumburg Cathedral - Building Archaeology in architecture and sculpture)	3	July - Dec. 2014
Tim Erthel	Dombau und Kirchenfabrik in Naumburg im späten 15. und 16. Jahrhundert (Construction of the Cathedral and Fabrica Ecclesie at Naumburg in the late 15 th and 16 century)	5	October-December 2014
Alexander Sembdner	Das Werden einer geistlichen Stadt. Die geistlichen Institutionen Naumburgs von 1028 bis 1400 (The Formation of an ecclesiastic city. The clerical institutions of Naumburg from 1028 to 1400)	5	December 2014
	sub-projects: 1. Art Technology and Conservation Science 2. Natural Science 3. Building Archaeology 4. History of Art 5. Medieval History / Regional History 6. Economic Geography and Tourism Research		

paint layers, the conservators studied the surface of all the sculptures and reliefs with a stereo microscope with up to 50-fold magnification for relevant information. Damage to the paint layer, such as chipped paint flakes or scratches from previous treatment, made the individual layers of paint easy to read. With a digital camera connected to the microscope, the findings were photographed, labelled and located on an information sheet. A detailed description of the appearance of the individual identifiable pigments formed the basis for later evaluation. The mobile Raman spectroscopy – as performed by the natural scientist - allowed non-destructive analyses directly at objects without sampling. Preparation and evaluation of cross sections of layers of paint and chemical analyses allowed the clarification of further issues. In addition to microscopic examination, radiodiagnostic methods were used to gain further information: With the help of UV radiation, later supplements and over-paintings could be made visible. Infrared reflectography provided information about the first painting that is not visible today, especially on the shields of the statues of the founders. Modern documentation methods were used for these investigations. Additionally historical data, especially concerning former conservations of the statues of the founders and the passion reliefs, were collected and evaluated as well. Virtual reconstructions of the original polychrome finishes and different over-paintings, together with mappings of damage, conservation condition and inventory were recorded as digital 3D-models in high resolution. One of the PhD students in this sub-project, Daniela Karl, examined the statues of the founders. The main focus was the investigation of the two polychrome paint layers, the first, original layer from the 13th century, and the entire over-painting of the 16th century. Another PhD student, Bernadett Freysoldt, investigated the different polychrome finish of the reliefs of the west rood screen. At the same time, archive material and documents were analysed in comparison with the observations made on the site.

2. Natural science

This sub-project aimed at the chemical analysis and material scientific characterisation of the polychrome finish of the sculptures and adjacent architectural surfaces and its carriers. The investigation was carried out as far as possible by means of non-destructive Raman spectroscopy. It was possible to acquire a mobile Raman microprobe within the project. Another non-invasive method was the mobile X-ray fluorescence spectroscopy (ARTAX, conducted by Prof. Dr. Simon and Dr. Röhrs, Rathgen Research Laboratory Berlin). These measurements were to be complemented by other non-destructive methods as well as modern analytical methods in the laboratory using selected samples. Particular scientific problems were the limits and scope of in-situ measurements on polychrome sculptures using non-destructive devices, as well as evaluation of those methods as opposed to laboratory methods. Finally, a protocol for non-destructive investigation of polychrome sculptures was to be developed. The investigations were carried out by PhD student Jacqueline Menzel. The dissertation is supervised in cooperation with Eike Brunner, professor for bio-analytical chemistry at Dresden University of Technology.

3. Building Archaeology

The investigations in this field concentrated on the statues of the founders and their adjacent architecture in the west choir and the west rood screen. The focus here is an overview of the interaction between sculpture and architecture. PhD student, Dominik Jelschewski, focused on the key question concerning the point in time at which the sculptures were integrated into the architecture. Moreover, the researcher was interested in the technical process from the selection of the stone to the incorporation of the work piece into the architecture of the west choir. In

order to clarify the technical status and the inner construction of the sculptures and reliefs, close cooperation with the sub-projects of the fields of art technology and conservation sciences and history of art was necessary. Innovative technologies such as digital geometrical 3D-models in high resolution are complemented by traditional and essential manual measurement. This mixture allowed for the production of high-quality results and efficient evaluation. The findings of building archaeology are linked closely to the issues of conservators and art historians.

PhD student, Ilona Dudzinski, investigated questions concerning the history, architectural decoration and construction of the west rood screen. The investigation into the architectural history of the west rood screen focused on clarifying its construction chronology in relation to the Romanesque cathedral and the Gothic west choir, on tracing the technical solutions used for structural details, and on the organisation of the workshop around the Naumburg Master. Moreover, the methods used in building archaeology could also help to answer questions regarding the use of the rood screen in medieval times or the extent of architectural alterations after the fire in 1532. Plans that accurately record the current state (including any alterations or deformations) at a scale of 1:20 provided the foundation for all the work. Over a period of thirteen months every individual stone on the rood screen was measured and drawn. The sculptural program of the crucifixion group and all the reliefs were also examined very closely. Drawings at a scale of 1:5 provided information on the tools used, the setting of the stones, and the integration of the figures into the architecture. The finished plans served as the basis for mapping countless information, such as the varying intensity of traces left from the fire or from the construction changes carried out in the past. Chemical analyses of the building materials such as mortars provide data on their characteristic composition. Details that are hidden from the naked eye, such as lead sealing concealed in the structural system, could be made visible with the help of radiography. Although the building itself remains the most important source of information for the building archaeologist, a visit to the archives is indispensable. There it is possible to learn the reason for many of the alterations, and sometimes also an exact date.

4. History of art

The investigation in this sub-project deals with those art-historical problems surrounding Naumburg Cathedral which have been the subject of controversy in discussions up to the present day. These problems concern the function and the interpretation of the sculptural ensemble as well as its position within the context of Europe's cultural history and the history of art. The sub-project also plans to contribute to the research of the transfer of art and culture from France to Germany in the 13th century. The studies of the polychrome finish of the sculptures and the building archaeological research form a basis for the art-historical investigations. Two PhD projects are carried out within this sub-project (cf. Table 1).

5. Medieval History / Regional History

Two PhD projects are carried out within this sub-project (cf. Table 1). The first project investigates relevant archival sources concerning the history of the construction and the restoration of the west choir and its decoration from medieval and early modern times. The focal point of the second dissertation project is an investigation into the origin and development not only of the cathedral but also of all the other religious institutions of medieval Naumburg, such as monasteries, convents and churches. The enquiry would examine their significance for the history and culture of the city, as well as their relationships to the cathedral and its chapter.

6. Economic Geography and Tourism Research

The aim of this sub-project is to analyze Naumburg Cathedral's potential for local tourism and its consequential integration into relevant forms of cooperation. This could also show possible prospects for sustainable quality management and quality improvement against the background of various fields of conflict in cultural and religious tourism. Two PhD projects are carried out within this sub-project (cf. Table 1).

Doctorate program

It is a particular feature of the concept of Naumburg Kolleg that different fields of research are concentrating rather on one tangible object of investigation than on an abstract scientific problem. The Naumburg cathedral with its unique west Choir provides a vantage point for close connection of the research fields and interdisciplinary knowledge exchange. This renders the Naumburg Kolleg an innovative model. Located in the city of Naumburg, the doctorate program provided ideal external conditions for researching the cathedral's west choir, for studying and using the archive of the cathedral chapter and for mutual assistance and exchange of experience among the scientists. The United Chapter Foundations of Merseburg and Naumburg and of the Kollegiatstift Zeitz generously have provided the premises for the office, rooms for lectures and seminars within the program and also accommodation for the postgraduates. On one hand the individual studies in the works of art and research in archives, libraries, laboratories and study formed a part of the postgraduates' occupation. On the other hand, the common activities formed an essential background for the research. The doctorate program has offered a considerable number of scientific meetings of different importance and range of participants. About ten internal colloquia were held, predominantly in Naumburg. Of high importance for the further education of the postgraduates were eight scientific seminars on special topics of the research project with invited speakers from Germany and from abroad. During the term of the project several excursions were arranged to, among other places, Northern France, Bamberg, and Regensburg. In December 2010 a scientific meeting on „*Naumburg Cathedral and the Naumburg Master*” was held in Naumburg. In October 2011 an international scientific conference on „*Polychrome stone sculpture of the 13th century*” was organised by the Naumburg Kolleg, too. Four of the PhD students of the Naumburg Kolleg presented their intermediate results in exemplary formats. The scientific exchange about details in the materials used and the painting technique suggested continuing current investigation. The proceedings of that conference were published in October 2012.¹

Results and Discussion

Examples of interdisciplinary approach in the care for cultural heritage: Examination and assessment of a historic monument

In the following selected results from the sub-projects of art technology, natural science, and building archaeology are given as examples in order to illustrate the interdisciplinary examination and assessment of a historic monument.

1 Danzl, Thomas; Herm Christoph; Huhn, Annemarie (eds.). *Polychrome Steinskulptur des 13. Jahrhunderts: Beiträge zur Tagung des Naumburg Kollegs vom 13. bis 15. Oktober 2011 in Naumburg/Saale*. Görlitz / Zittau : Verlag Gunter Oettel, 2012. ISBN 978-3938583739.

1. Art technology

Statues of the founders in the west choir²

A unique feature of the sculptures of Naumburg Cathedral is the extraordinarily large existence of polychromy of vivid colours preserved until today. Already at the date of origin of the first layer around 1250, the stone was already covered with a varied polychromy consisting of opaque paint layers and leaf metal. During the centuries the sculptures have undergone numerous changes and damages. As part of a renovation of the west choir in 1518 the sculptures received a polychrome design which is dominating the appearance up to date [Fig. 3]. An important question was the exact dating of the first polychromy. The results from the sub-project building archaeology³ allowed to place the paint layers into a relative chronological order. Hence the sculptures were initially integrated into the masonry and painted afterwards when the choir had been completed. The painting process began with filling irregularities in the stone surface. As a further smoothing the stone surface was covered with two different preparation layers which differ in composition. These layers were applied in a uniform pattern which is only linked to the form and independent from the following colouration [Fig. 4]. A foundation layer containing lead white is restricted to the head, including headpiece, and to hands, belongings and to the inner lining of the coats. The remaining areas of the clothing, except the leggings, were covered with a foundation layer containing calcium carbonate. Before painting, selected areas of the sculptures were accentuated with leaf metal. Predominantly, the gold and silver leaves were applied directly to the oily, lead white foundation layer. The first polychromy from the 13th c. is characterised by bright and not mixed colours. The uniform and undecorated surfaces of garments contrast with finely elaborate details on ribbons, swords, bucklers, and faces [Fig. 5].

West rood screen⁴

The west rood screen of Naumburg Cathedral ranks among the most important rood screens from the 13th c., of which only a small number are preserved [Fig. 1]. It is verified that the sculptures on the screen were painted already at the date of its origin in the middle of the 13th century. After the first painting the portal sculptures received three further polychrome layers and one monochrome gray paint layer. The second over-painting was proven by a bill from 1518. The last complete over-painting was carried out in the year 1747. The stone reliefs depicting the passion of Christ have been painted before they were mounted on the balustrade. After the second polychromy in 1518, and a subsequent partial over-painting, a big fire in 1532 caused severe damage. Only in the middle of the 18th c. were the reliefs completely over-painted with a white-

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- 2 KARL, Daniela. Zur Farbigkeit der Stifterfigur des Grafen Syzzo im Naumburger Westchor. In DANZL, Thomas; HERM Christoph; HUHNS, Annemarie (eds.). *Polychrome Steinskulptur des 13. Jahrhunderts: Beiträge zur Tagung des Naumburg Kollegs vom 13. bis 15. Oktober 2011 in Naumburg/Saale*. Görlitz / Zittau : Verlag Gunter Oettel, 2012. ISBN 978-3938583739, p. 177–192 .
 - 3 JELSCHIEWSKI, Dominik. Zur Bautechnik der Naumburger Stifterfiguren. In: DANZL, Thomas; HERM Christoph; HUHNS, Annemarie (eds.). *Polychrome Steinskulptur des 13. Jahrhunderts: Beiträge zur Tagung des Naumburg Kollegs vom 13. bis 15. Oktober 2011 in Naumburg/Saale*. Görlitz / Zittau : Verlag Gunter Oettel, 2012. ISBN 978-3938583739, p. 165–176.
 - 4 FREYSOLDT, Bernadett. Zur Polychromie des Reliefs Gefangennahme Christi am Naumburger Westlettner. In DANZL, Thomas; HERM Christoph; HUHNS, Annemarie (eds.). *Polychrome Steinskulptur des 13. Jahrhunderts: Beiträge zur Tagung des Naumburg Kollegs vom 13. bis 15. Oktober 2011 in Naumburg/Saale*. Görlitz / Zittau : Verlag Gunter Oettel, 2012. ISBN 978-3938583739, p. 193–204.

grey marbling with golden details. For the first polychromy on the reliefs, as well as on the portal figures isolating layers, filling and various preparation layers were applied. Except one relief on the north side all sculptures carry pigmented preparation layers with differing composition and different sequences of application. In contrast, all the paint layers of the first polychromy on the different sculptures are related in composition and application technique. They were executed in one or multiple layers after application of the leaf metal. Figure 8 shows the reconstructed features of the first polychromy on the reliefs of the south part of the balustrade. The colourful figural scenes stand in front of a blue background and are framed by a coloured architecture. While the southern group of the reliefs possess a strongly coloured architecture with splendid surfaces, the architecture of the two preserved stone reliefs of the north part shows a more simple colouration in white, red, green, and gold. In contrary, the appearance of the figures does not differ from the north to the south side. The garments exhibit a great variety of colours. Besides red, green, and blue shades also violet, brown, and grey-blue hues occur. Large areas of leaf gold on garments are restricted to elevated persons such as Christ, Peter, the High Priest, and Pilatus [Fig. 9]. For some patterns the use of a stencil is proven. A special effect of colouration is achieved by larger areas of red, green, and blue glazes.



Fig. 2 Naumburg Cathedral, west choir, view to the east. (Photo Dominik Jelschewski)

2. Natural Science⁵

In this sub-project the postgraduate accurately identified several pigments of the medieval colour palette (such as cinnabar, minium, lead white, lead-tin yellow and carbon black) at the sculptures of the west choir in Naumburg Cathedral, using a mobile Raman microprobe [Fig. 6]. Some problems appeared when measuring green or blue layers. These obviously absorbed the red laser beam and did not result in distinct Raman spectra. Therefore, microscopic samples and cross sections prepared by the conservators were investigated under the Raman microscope in the laboratory of the Academy of Fine Arts Dresden. Here, azurite, ultramarine, iron oxide, calcite, and Prussian Blue (in an over-painting) could be identified. The mobile X-ray fluorescence spectroscopy allowed to detect gold and silver leafs besides various pigments. In addition, complementary laboratory methods (FTIR, PLM, SEM-EDX, GC-MS) were applied for identifying pigments, lake, leaf metal applications and binders. Investigations at the medieval polychrome sculptures in Cologne Cathedral in July 2011 produced further information about the feasibility of the mobile Raman microprobe. Generally, the development of mobile Raman devices leads us to the expectation that this method may soon count as a routine methods of non-destructive investigation on site. It enables the definite identification of pigments with a comparatively low effort.

3. Building archaeology

*West choir*⁶

Together with the site survey, the analysis of the high-resolution structured light 3D scans enabled new insights into the creative process of sculpture [Fig. 3]. The investigation of the structural engineering solutions at the interface between architecture and sculpture gave a deeper insight into planning and construction of Naumburg west choir. The investigation revealed that the majority of the sculptures were worked from one stone block including a section of the column bundle. This block is tightly cramped with the wall using a special design. The sculptures had to be incorporated in the masonry [Fig. 11]. Thus the sculptures can be dated to the early phase of building activity at the Naumburg west choir. The material used for the sculptures is similar to the shell limestone that was used for the walls. Furthermore, identical working traces prove that the sculptures are directly related to the work of the brigade of the „Naumburg Master“. In addition to the sculptures in the interior of the west choir, a detailed analysis and documentation of pieces by the Naumburg workshop on the exterior was undertaken. Besides the documentation of the unique design of the ashlar, the investigations allowed the reconstruction of the mediaeval design of the cullis. This detail had been lost in the fire in the roof framework in the year 1532, and was repaired in the 19th c. in different shape. Some of the 18 gargoyles date from the 13th century and others were partly repaired or replaced in the 19th and

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- 5 MENZEL, Jacqueline. Naumburger Westchor – Untersuchungen an historischen Skulpturenfassungen mit einer mobilen Raman-Mikrosonde. In DANZL, Thomas; HERM Christoph; HUHNS, Annemarie (eds.). *Polychrome Steinskulptur des 13. Jahrhunderts: Beiträge zur Tagung des Naumburg Kollegs vom 13. bis 15. Oktober 2011 in Naumburg/Saale*. Görlitz / Zittau : Verlag Gunter Oettel, 2012. ISBN 978-3938583739, p. 205–212.
 - 6 JELSCHEWSKI, Dominik. Zur Bautechnik der Naumburger Stifterfiguren. In DANZL, Thomas; HERM Christoph; HUHNS, Annemarie (eds.). *Polychrome Steinskulptur des 13. Jahrhunderts: Beiträge zur Tagung des Naumburg Kollegs vom 13. bis 15. Oktober 2011 in Naumburg/Saale*. Görlitz / Zittau: Verlag Gunter Oettel, 2012. ISBN 978-3938583739, p. 165–176.



Fig. 3 (above left) Figure of *Szezo*, preservation state today. (Photo Daniela Karl)

Fig. 4 Figure of *Szezo*, virtual model of first preparation layers and gilding from the 13th century. White: lead white, grey: calcium carbonate, yellow: goldleaf. (Author Daniela Karl)

Fig. 5 (above right) Figure of *Szezo*, virtual model of first polychromy from the 13th century. (Author Daniela Karl)

Fig. 6 (left) Figure of *Szezo*, detail of 3D scan with finest surface structures in the range of 1/100 mm. (Linsinger ZT GmbH / Dominik Jelschweski)

20th centuries. The investigations showed that not only the central sculpture but also the lateral sculptures had worked as rainwater drain, although they were thought to be without function in the past [Fig. 12]. A complete catalogue of the gothic foliated capitals on both the interior and exterior supplemented the investigation. This documentation facilitates a direct comparison with the capitals on the west rood screen.

*West rood screen*⁷

The Naumburg west choir is a brilliant example which reveals a nearly complete reconstruction of the history of origin and development of a monument. On the plain surface

7 DUDZINSKI, Ilona. Die bautechnische Zusammensetzung der Lettnerreliefs. In *Der Naumburger Meister – Bildhauer und Architekt im Europa der Kathedralen, Exhibition catalogue, 29 June – 2 November, Naumburg, Germany*. Petersberg: Michael Imhof Verlag, 2011, vol. 2, 1314-1316. ISBN 9783865686008.

the wall in the west choir below the sculptures of the founder four engraved drawings are preserved, which recently were published.⁸ These sketches are drafts for details of the west rood screen in a one-to-one scale. They prove that the rood screen has been designed not before the completion of the lower part of the choir polygon. The draft for the eastern central gable of the rood screen is of particular interest for building archaeometry [Fig. 13]. This design drawing is based on a semi-circle with a radius of 168 centimetres and shows the forming construction of both pointed arches, the recessed quatrefoil, the separated outlining profile of the gable, and even the shape of single ashlars. The construction, as executed in reality, differs only minimally from that design. On the gable itself additional engraved sketches were detected. This allows to conclude that the ashlars were assembled repeatedly during the process of working. This detailed realisation of in-situ design by masons leads to the conclusion that the mason's workshop was located in the west choir. The middle gate is appealing not only by the realism of its sculptures but also by the extraordinarily subtle construction of the gable [Fig. 13]. The gable had to be finished not later than the laying of the stone course just below the ornamented frieze. The gable is supported by the sculptures of the crucifix and the both assisting angel sculptures. This group of figures is inseparably connected with the vault above by grouted lead metal [Fig. 14]. Thus a later shift or removal of single stones was impossible. The big ashlar in the middle with a height of 190 centimeters acts like a clamp. The surrounding elements are attached without additional joints such as plugs or metal clamps. Such a self-supporting construction from the 13. c. was discovered here for the first time.

Fig. 7 Scaffolding installed for investigation in the west choir of Naumburg Cathedral. (Photo Dominik Jelschewski)



Ways of communicating science

The findings and results of the Naumburg Kolleg are not only presented in professional circles but also are communicated to a wider public by manifold means:

- From the beginning a website was installed presenting the main topics in German and English (www.naumburgkolleg.de).

8 DONATH, Günter; DONATH, Matthias. Zeugnisse mittelalterlicher Bauplanungen und Bauprozesse an Chorbauten von Naumburg, Schulpforte und Meißen. In *Der Naumburger Meister – Bildbauer und Architekt im Europa der Kathedralen, Exhibition catalogue, 29 June – 2 November, Naumburg, Germany*. Petersberg: Michael Imhof Verlag, 2011, vol. 2. ISBN 9783865686008, p. 1275–1290.

- During investigation in the west choir, posters showed the reliefs and statues of the founders which were partially obstructed by the scaffolds. Additionally, in the sense of an “open workshop”, flat screens presented details of the sculptures in photographic close-ups. Visitors were able to share the view through the microscope on a second monitor. At the end of its holding time in February 2011 the scaffolding in the west choir was opened to the public over a period of one week. This gave visitors the opportunity to be eyeball to eyeball with the sculptures within the framework of a guided tour.
- Innovative forms of dissemination of the project to a general public are short video films of approximately four minutes, so-called „Science Movies“. The postgraduates were invited by the sponsor to produce these films mainly by themselves and were instructed to do so. Ten short films of this kind (in German) are available on the internet (www.sciencemovies.de)
- During the term of the project the huge “Saxony-Anhalt State Exhibition: The Naumburg Master - Sculptor and Architect in the Europe of Cathedrals” took place in Naumburg in 2011. Although simultaneous, both projects were run independently. Nevertheless, both conservators and both building archaeologists contributed to the exhibition, and six postgraduates from the fields of art history, building history, art technology, and natural science published articles in the exhibition catalogue.⁹
- At the international meeting of cathedral master builders on 20 - 24 September 2011 in Naumburg members of the Naumburg Kolleg presented intermediate findings and results.
- The postgraduates from the fields of art technology, natural science, and building history contributed to the scientific meeting on „Polychrome stone sculpture of the 13th century” in October 2011 and published papers in the related proceedings.¹⁰

9 Bömer, Peter. Der Westlettner des Naumburger Doms und die Erschließung seiner Bildwerke. In *Der Naumburger Meister – Bildbauer und Architekt im Europa der Kathedralen, Exhibition catalogue, 29 June – 2 November, Naumburg, Germany*. Petersberg : Michael Imhof Verlag, 2011, vol. 2. ISBN 9783865686008, p. 1317–1319; DUDZINSKI, Ilona. Die bautechnische Zusammensetzung der Lettnerreliefs. In *Der Naumburger Meister – Bildbauer und Architekt im Europa der Kathedralen, Exhibition catalogue, 29 June – 2 November, Naumburg, Germany*. Petersberg : Michael Imhof Verlag, 2011, vol. 2, 1314-1316. ISBN 9783865686008; Freysoldt, Bernadett; Menzel, Jacqueline. Die Polychromie des Lettnerreliefs mit der Gefangennahme Christi. In *Der Naumburger Meister – Bildbauer und Architekt im Europa der Kathedralen, Exhibition catalogue, 29 June – 2 November, Naumburg, Germany*. Petersberg : Michael Imhof Verlag, 2011, vol. 2, 1374-1376. ISBN 9783865686008; JELSCHESKI, Dominik. Die Stifterfigur des Syzzo und ihre Einbindung in die Architektur des Westchors. In *Der Naumburger Meister – Bildbauer und Architekt im Europa der Kathedralen, Exhibition catalogue, 29 June – 2 November, Naumburg, Germany*. Petersberg : Michael Imhof Verlag, 2011, vol. 2, 1317-1319. ISBN 9783865686008; Karl, Daniela; Menzel, Jacqueline. Die Polychromie der Stifterfigur des Syzzo. In *Der Naumburger Meister – Bildbauer und Architekt im Europa der Kathedralen, Exhibition catalogue, 29 June – 2 November, Naumburg, Germany*. Petersberg : Michael Imhof Verlag, 2011, vol. 2, 1314-1316. ISBN 9783865686008, p. 1317–1319.

10 Freysoldt, Bernadett; Menzel, Jacqueline. Die Polychromie des Lettnerreliefs mit der Gefangennahme Christi. In *Der Naumburger Meister – Bildbauer und Architekt im Europa der Kathedralen, Exhibition catalogue, 29 June – 2 November, Naumburg, Germany*. Petersberg : Michael Imhof Verlag, 2011, vol. 2, 1374-1376. ISBN 9783865686008; JELSCHESKI, Dominik. Die Stifterfigur des Syzzo und ihre Einbindung in die Architektur des Westchors. In *Der Naumburger Meister – Bildbauer und Architekt im Europa der Kathedralen, Exhibition catalogue, 29 June – 2 November, Naumburg, Germany*. Petersberg: Michael Imhof Verlag, 2011, vol. 2, 1317-1319. ISBN 9783865686008; Karl, Daniela. Zur Farbigkeit der Stifterfigur des Grafen Syzzo im Naumburger Westchor. In Danzl, Thomas; Herm Christoph;

Fig. 8 Detail of the west rood screen, south part of the balustrade, virtual reconstruction of the first polychromy, foto montage. (Author: Bernadett Freysoldt)

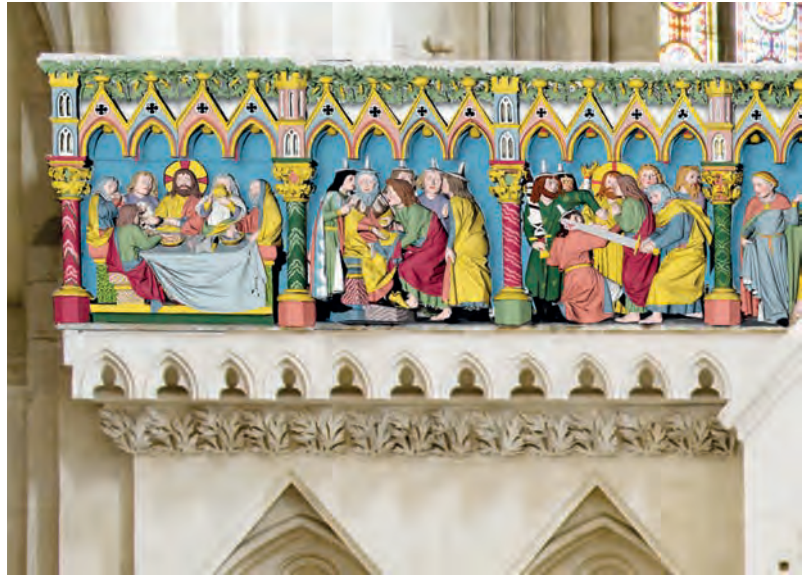


Fig. 9 (left) West rood screen, detail from the relief „Christ in front of Pilatus“, rich gilding and painted ornaments. (Photo Bernadett Freysoldt)

Fig. 10 (right) Measuring head of the mobile Raman microspectrometer in use at the relief of Naumburg west rood screen (Photo Jacqueline Menzgel)



- A final meeting was planned from the beginning of the project. The experience from the project and both scientific meetings made it clear that it would be impossible to present scientific results from such different research fields as present in the Naumburg Kolleg in detail on one occasion. Hence, the project decided to give the general public an insight into the work of the project in an easily understandable manner and to provide a platform for discussion, especially with the citizens of the city of Naumburg and its region. Looking back over more than three years of research, all members of the Naumburg Kolleg presented selected findings and results on a final public meeting in the city of Naumburg on Feb. 1 – 2, 2013. A special topic was presented by Heiner Siedel, professor at the Institute of Geotechnics / TU Dresden, who studied the origin of the natural stones used for the sculptures and architecture of Naumburg west choir. The fact that this event was fully booked proved the high interest both of experts and ordinary persons. At the same time, an extensively illustrated booklet was published presenting the results of the meeting.¹¹
- Scientific results from the several sub-projects presented on different scientific meetings.
- The detailed results of all sub-projects will be found in the eleven PhD dissertations. It is planned to publish them in a uniform scientific series that is additionally funded by the Volkswagen Foundation. [Table 1]

Interdisziplinarität

The following considerations of the general aspects of interdisciplinarity are cited from a public lecture, given by Joachim Poeschke in the framework of the final meeting of the Naumburg Kolleg in February, 2013: Traditionally, interdisciplinary research in a historic monument such as Naumburg Cathedral means simultaneous cooperation and exchange between art historians and historians. As far as it had happened in practice, it worked only partially. However, partial cooperation is not a deficit but an imperative, because each discipline not only has its own questions but also its own methods. These procedures must not be overridden but have to be respected in order not to open the floodgates to dilettantism. On the other hand, there exist transdisciplinary problems, such as interpretation of the meaning of the sculptures in Naumburg Cathedral. As big research deficits are remaining in this field, the exploration of pictorial and written sources on an interdisciplinary level would be very rewarding, where apart from art history and history also in literature, theology, and philosophy were involved. Looking at the title of Naumburg Kolleg one can understand that this project is not merely following a humanistic approach. The abundant occasions for interdisciplinary exchange of the postgraduates in the framework of Naumburg Kolleg were helpful directly for the individual work as well as of indirect benefit. Usually, the benefit from such an interdisciplinary project means not only singular results but also a general eye-opening experience. This experience deliberately

Huhn, Annemarie (eds.). *Polychrome Steinskulptur des 13. Jahrhunderts: Beiträge zur Tagung des Naumburg Kollegs vom 13. bis 15. Oktober 2011 in Naumburg/Saale*. Görlitz / Zittau : Verlag Gunter Oettel, 2012. ISBN 978-3938583739, p. 177–192; Menzel, Jacqueline. Naumburger Westchor – Untersuchungen an historischen Skulpturenfassungen mit einer mobilen Raman-Mikrosonde. In Danzl, Thomas; Herm Christoph; Huhn, Annemarie (eds.). *Polychrome Steinskulptur des 13. Jahrhunderts: Beiträge zur Tagung des Naumburg Kollegs vom 13. bis 15. Oktober 2011 in Naumburg/Saale*. Görlitz / Zittau : Verlag Gunter Oettel, 2012. ISBN 978-3938583739, p. 205–212.

11 Naumburg Kolleg. *Naumburg Kolleg: Interdisziplinäre Forschungen zum Naumburger Dom – Ein Werkstattbericht*, Regensburg : Pustet, 2013. ISBN 978-3791725024.

or unknowingly influences the questions, approach, and methodology of a researcher and is of permanent advantage for his or her personal development. The fruits of such cooperation naturally evolve mainly in the contact of disciplines that are closely related or that involve a big overlap, such as conservation and natural sciences or building archaeology and art history.¹²

In order to evaluate the collaboration in more detail, the author of this report has made a short survey among the postgraduates in the fields of conservation, natural science, and building history addressing the following questions:

- 1) Did you use results from the same field of research within the project?
- 2) Did you provide own results to the postgraduate in same field of research?
- 3) Did you use results from other fields of research within the project?
- 4) Did you provide own results to postgraduates in other fields of research?
- 5) Did you cooperate with researchers from outside of the project?
- 6) Did you use results from those researchers for your own work? (Literature is not covered in this question.)
- 7) Did you provide own results to researchers from outside of the project?
- 8) How do you estimate the possibility of simultaneous research on site and the subsequent evaluation of result within the project?

The answers can be summarised as follows:

Ref. 1 & 2. Both researchers in art technology have harmonised their methodology in the beginning. Later, the chronology of paint layers found was synchronised. Generally, findings of painting technology were exchanged and discussed. All exchange was verbal. Although working almost independently, the two researchers in building history needed reconciliation concerning the interface of both areas of investigation.

Ref. 3 & 4. The scientist relied on the features by the conservators and their documentation as a prerequisite for the analyses, both on-site and in the laboratory. In return, both researchers in art technology could use the analytical results from the natural scientist for the characterisation and interpretation of their findings. The conservators exchanged information on the dating of several paint layers and damages with the researchers from building history as well. From the field of history the conservators and building historians were provided with historic sources. The field of building history also was provided by the art historians with an overview of reference objects and received details on the building stones from the geologist. However, not all findings from the building history were accepted by the art historian. The conservators made available detailed photographs for other fields and passed observations about the behaviour of visitors in the west choir to the field of geography.

Ref 5. The conservators could utilise analytical results from the Rathgen Research Laboratory (Berlin), from the associated geologist and from KIK-IRPA laboratory (Brussels). Furthermore, radiographs and IR reflectographs were provided from external sources. Scientific exchange was possible with other experts in problems of 3D-modelling and mediaeval polychromy. The natural scientist could complement her analytical findings with results produced at the laboratory of Dresden Academy of Fine Arts as well as from Rathgen Research Laboratory. One building

12 POESCHKE, Joachim. *Forschungen zum Naumburger Dom – Der interdisziplinäre Beitrag des Naumburgerkollegs*, public lecture 1.2.2013, Naumburg/Germany.



Fig. 11 Virtual reconstruction of a sculpture during laying of the west choir. Due to a special design of the ashblars the sculpture (Syzzo) is cramped tightly with the wall. (Autor: Dominik Jelschewski)

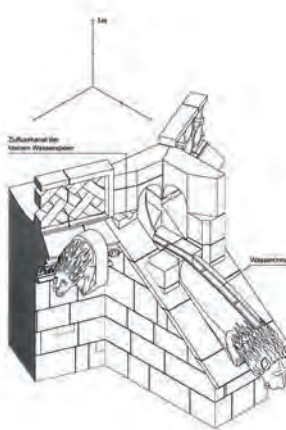


Fig. 12 West choir of Naumburg Cathedral, exterior: incorporation of gargoyles (lions) in a pinnacle (drawing). The bigger gargoyle (right) with open channel on the back, smaller gargoyle (left) with internal channel. (Autor: Dominik Jelschewski)

historian has adopted findings from other postgraduates in her faculty, from geology, the archives and inventory of the United Chapter Foundations, and researchers on other cathedrals (Bamberg, Mainz)

Ref. 6. Preliminarily, the conservators and building archaeologists showed animated 3D-models of construction and polychromy in the State exhibition (2011). On the other hand, one building historian was not willing to share results before the end of the State exhibition. Generally, the scholars from art technology and natural sciences presented their preliminary findings at several national and international conferences.

Ref. 7. Generally, the opportunity of simultaneous working and frequent meetings was acknowledged by all researchers. The postgraduates estimated the series of colloquia with well-prepared presentations by the postgraduates and following discussions as very valuable for the development of their own work. Those who were working together on the scaffolding in the west choir remarked on the efficient arrangement of interrelated investigations. However, a conflict was described between the advantages for the individual researchers on one hand and the needs of the fields of interest on the other hand: If historic research had started earlier, the fields of art technology, natural science, and building history would have benefited more from its findings. Further, if art history had begun later, it would have accessed more broadly the results from the above mentioned fields, especially the findings on the polychromy. Indeed, overall simultaneous working was estimated to be more advantageous. One postgraduate stated that the overlap of the sub-projects with regard to contents was minimal despite the willingness of the participants to communicate on a more general level. Despite some conflicts one of the postgraduates experienced the close living together in the doctorate program as helpful for the personal and professional development of all of the students.

Conclusion

Some of the conclusions concerning implementation, scientific results, and interdisciplinarity from the experiences with the almost finished project “Naumburg Kolleg” are:

- Naumburg cathedral provided a single focus for close connection of research fields and interdisciplinary knowledge exchange. The core of the doctorate program “Naumburg

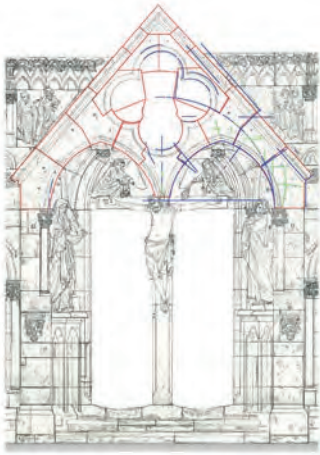
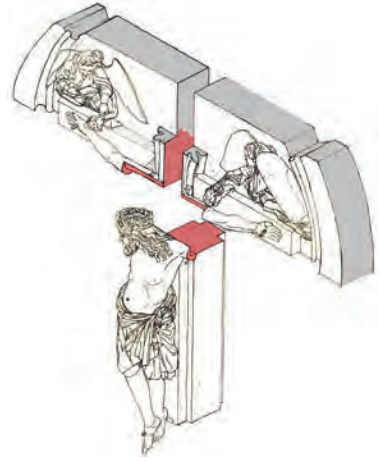


Fig. 13 (left) West rood screen of Naumburg Cathedral, east side, central gable (drawing) with drawn in sketches and joints. Red: jointing arrangement, blue: projected engraved drawings from the west choir, green: engraved drawings on the gable. (Author: Ilona Dudziński)

Fig. 14 (right) West rood screen of Naumburg Cathedral, connection between the crucifix and both assisting angel sculptures. Red: areas grouted with lead. (Author: Ilona Dudziński)



Kolleg” with its premises was located in the city of Naumburg and thus provided ideal external conditions for researching, studying, mutual assistance and exchange of experience. A number of scientific meetings and excursions supported the further education of the postgraduates.

- The installation of an especially stable and large scaffolding on-site was a prerequisite for a thorough investigation of the sculptures and the surrounding architecture by the researchers from art technology, natural sciences, building archaeology, and history of art. Three-dimensional scanning technologies such as Laser and structured light technique facilitated the documentation of results from art technology as well as the production of high-quality virtual models in building archaeology.
- For a project of the size of Naumburg Kolleg it was very beneficial to have a position dedicated to the management of scientific and technical issues throughout the whole period of the project.
- The field of building archaeology were linked closely to issues of conservators and art historians. As an example, these investigations found out that the sculptures of statues in the west choir at first were integrated in the masonry and painted afterwards. In contrary, the reliefs on the west rood screen were painted before being attached to the wall.
- The analysis of the polychromy of the sculptures was carried out as far as possible by means of a mobile, non-destructive Raman microprobe. By this means a number of pigments of the medieval colour palette could be identified definitely on the polychrome stone sculptures.

- The findings and results of the Naumburg Kolleg were not only presented in professional circles but also are communicated to a wider public by manifold means: a website, an “open workshop site” during investigation in the west choir; short video films, and contributions to the Saxony-Anhalt State Exhibition in Naumburg 2011. A final meeting in February 2013 gave the general public an insight into the work of the project in an easily understandable manner.
- The opportunity of simultaneous working and frequent occasions for interdisciplinary exchange was estimated by the postgraduates as very advantageous for their individual work. However, a staggered time schedule of the sub-projects history, art technology, natural science, building history, and art history would have been favourable for profiting from each others’ findings.

Acknowledgement

The following members of Naumburg Kolleg permitted publishing results from their work: Ilona Dudzinski, Bernadett Freysoldt, Dominik Jelschewski, Daniela Karl, Jacqueline Menzel, Joachim Poeschke. The author also wishes to thank Jim Hoblyn for looking through the manuscript.

Resumé

„Naumburské kolegium“ – Interdisciplinární výzkum v západním chóru dómu v Naumburgu

Katedrála v Naumburgu je výjimečným příkladem církevní architektury v Německu, a to především díky svým sochám a reliéfům v západním chóru, vytvořeným v polovině 13. století. Příspěvek představuje tzv. “Naumburg Kolleg”, tříletý interdisciplinární výzkumný program financovaný VolkswagenStiftung. V rámci tohoto projektu se jedenáct badatelů ze šesti různých vědeckých oborů (technologie umění a konzervování, přírodní vědy, archeologie staveb, dějiny umění, středověká a regionální historie, ekonomická geografie a výzkum turismu) zabývalo otevřenými otázkami týkajícími se západního chóru dómu v Naumburgu.

Co největší podíl práce přímo na místě poskytuje ideální podmínky pro výzkum, vzájemnou pomoc a výměnu zkušeností mezi badateli. Tato úzká spolupráce a výsledná interdisciplinární výměna znalostí vykresluje “Naumburg Kolleg” jako inovativní přístup k historické památce. Zároveň nabízí jedinečnou příležitost k zapojení mladých badatelů specializovaných na konzervaci a uchování kulturních statků a kulturního vývoje tím, že jim umožní vypracovat disertační práci na vlastních projektech. Zjištění a výsledky projektu “Naumburg Kolleg” nejsou prezentovány jen v pro-fesních kruzích a uplatňovány na poli konzervování-restaurování, ale jsou zprostředkovány také široké veřejnosti. Kromě toho, že poskytuje přehled badatelských otázek a vědeckovýzkumných cílů, tento příspěvek částečně uvádí zejména výsledky výzkumu z oblasti technologie umění a konzervace, přírodních věd a archeologie staveb.