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The impact of new data for identification and authorship: the case of *The Last Judgement*, triptych from the National Museum in Gdańsk, a Northern Renaissance work, by Rogier van der Weyden and Hans Memling

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Fig. 1. The triptych of the *Last Judgement* attributed to Hans Memling, National Museum in Gdańsk (inventory number MNG/SD/413/M).
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Abstract. *The triptych The Last Judgement from the National Museum in Gdańsk is one of the most mysterious of the Flemish Renaissance works of the 15th century. Since the late 1960s, based on conservation research, art historians have known that another painting lays underneath the work. Until 2012-2014, however, identification and seeing all hidden image in detail has been impossible. There are no known historical sources making specific reference to the origin of this work. Its authorship has often been questioned. Since Hotho's hypothesis of 1843, the painting is regularly attributed to Hans Memling. The earliest and only certain date in the history of the triptych is the 27 April 1473, the date when it was seized by pirates at sea during its transportation from the port of Bruges to Badia Fiesolana near Florence. As a Hanseatic spoil of war, the triptych passed to St. Mary's Basilica in Gdańsk. The artwork was analysed from a number of perspectives, ranging from a humanistic enquiry to its physico-chemical properties. It was found that the triptych was painted with a multilayer tempera-oil technique on oak support.*

Dendrochronological work by Tomasz Ważny showed that the oak support was prepared for painting at the end of 1460. The results of these tests facilitate a fresh approach to the dating of the work and a new interpretation of its origins. A number of scientific examinations were undertaken owing to a grant from the 7th Framework Programme in 2012-2014 in collaboration with an international group of scientists in the project CHARISMA-MOLAB and ARCHLAB. The project offered an access to most advanced EU scientific instrumentations and knowledge to enhance our research, the goal of studies at ARCHLAB in the C2RMF was to confront documents and draw a comparison of the results of The Last Judgement investigations with data of other works of Rogier van der Weyden and Hans Memling. This provided a number of new results based on MNIR results concerning the several stages of the artistic process. New information confirmed the thesis of the dates 1460 – instead of 1466-1467, as expressed previously – as well as three stages in the composition and underdrawing of the work; with the priming

Résumé. *Le triptyque du Jugement dernier conservé au Musée national de Gdansk est l'une des œuvres les plus mystérieuses de la première Renaissance flamande. Vers la fin des années 1960, des examens de laboratoire ont révélé la présence d'une autre peinture sous la surface. Mais il a fallu attendre 2012-2014 pour pouvoir identifier l'image cachée et en distinguer les détails. Aucun document historique connu à ce jour ne fournit d'indication sur l'origine de cette œuvre, dont l'attribution a suscité bien des controverses. L'hypothèse Hans Memling avancée en 1843 par H. G. Hotho resurgit régulièrement. La première et unique date attestée dans l'historique du triptyque est celle du 27 avril 1473, date à laquelle des pirates s'en sont emparés sur le navire qui le transportait de Bruges à Fiesole. Ce butin de guerre hanséatique a été transmis ensuite à la basilique Sainte-Marie de Gdansk. L'œuvre a fait l'objet de toutes sortes d'analyses, depuis l'enquête humaniste jusqu'à la détermination des propriétés physico-chimiques. On a découvert que la surface se composait de plusieurs couches de tempera et peinture à l'huile appliquées sur du chêne. Une étude dendrochronologique conduite par Tomasz Wazny a démontré que la préparation du support en bois remontait à la fin de l'année 1460. Ces données permettent d'envisager la date et l'origine de l'œuvre sur de nouvelles bases. Le septième programme-cadre (7^e PC) de l'Union européenne a financé en 2012-2014 une série d'examen scientifiques effectués en collaboration avec un groupe international de chercheurs travaillant dans le cadre du programme européen CHARISMA MOLAB et ARCHLAB. Grâce à cet accès aux instruments scientifiques et aux savoirs les plus en pointe au niveau européen, les recherches menées au sein d'ARCHLAB au C2RMF visaient à confronter les résultats des différents examens du Jugement dernier avec les documents existants et avec nos informations sur d'autres œuvres de Rogier van der Weyden et de Hans Memling.*

Les résultats obtenus dans le proche et moyen infrarouge (PIR et MIR) concernant les diverses strates du triptyque ont confirmé la thèse des dates 1460-1467 au lieu de 1466-1467, et l'exécution en trois étapes, Rogier van der Weyden ayant sans doute appliqué

layers probably made by Rogier van der Weyden with his collaborators. It was the norm in 15th century painting workshops, while the completion of the painting and final layers were probably the work of Hans Memling (his earliest and most important achievements in his oeuvre). The results shed light on the original proto-Renaissance pedigree of 15th century Flemish painting with its identity born in the north of Europe.

Keywords. Multilayer paintings techniques, Rogier van der Weyden, Hans Memling, Northern Renaissance, visible light photography, IR reflectometry, UV fluorescence photography, X-ray radiography, MNIR, ultraviolet-visible (UV-VIS) reflectance and fluorescence spectroscopy, Measurement of luminescence decay lifetime with time-correlated single-photon counting (TCSPC), Scanning Electron Microscopy (SEM), energy dispersive spectrometry (EDS), Fourier Transform near- and mid-infrared reflectance spectroscopy, X-ray fluorescence (XRF), X-ray diffraction (XRD), Optical Coherent Tomography (OCT).

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Introduction

The multi-criteria research projects devoted to identifying the authors of the altarpiece triptych kept in the National Museum in Gdańsk were conducted by the Faculty of Conservation in Warsaw and CHARISMA-MOLAB, both coordinated by the author in 2010-2014. It included the ARCHLAB project as well. The thesis of the paper is that *The Last Judgement* showed an artistic practice of several authors exploring nature and their intended subjects in a new way of the so-called Early Northern Renaissance¹.

Known early history of the triptych

The earliest historical reference that can be used to date the triptych mentions its capture by Gdańsk pirates in 1473 and the ensuing lawsuit against the Hanseatic League. Authorship of the masterpiece has been reattributed many times. Information on important changes in the composition and divergence from the underdrawings was published by Molly Faries in 1997².

Oak support. The impact of the results of dendrochronological studies

Tomasz Ważny's dendrochronological examination of the support of *The Last Judgement* showed that it was constructed from so-called "Baltic oak" boards. The wood for *The Last Judgement* could have been delivered to the artist's workshop at the end of 1460. Taking the above factors into account, in conjunction with the date of Rogier van der Weyden's death in June 1464, the results of the dendrochronological analysis in conjunction with the earliest possible production date situate the construction of the painting support towards the end of 1460. This then does not preclude Rogier van der Weyden's

les couches d'impression avec ses collaborateurs. C'était la norme dans les ateliers du XV^e siècle. Hans Memling a probablement achevé la composition et appliqué les couches finales (son apport le plus ancien et le plus important à l'histoire de la peinture). Ces résultats éclairent les origines proto-renaissantes de la peinture flamande du XV^e siècle, née dans le nord de l'Europe.

Mots-clés. Superposition de couches, Rogier van der Weyden, Hans Memling, Renaissance septentrionale, photographie en lumière visible, réflectométrie infrarouge, photographie en fluorescence d'ultraviolets, PIR et MIR, spectroscopie ultraviolet-visible, mesure de la durée de vie de luminescence par comptage de photons uniques corrélés en temps (CPUCT), microscopie électronique à balayage (MEB), spectroscopie à dispersion d'énergie (SDE), spectroscopie à transformée de Fourier en proche et moyen infrarouge, fluorescence des rayons X (FRX), diffraction des rayons X (DFR), tomographie par cohérence optique (TCO).

participation in the creation of the masterwork *The Last Judgement*³.

The identification of the materials and art process of *The Last Judgement*

The first studies in 2010 revealed some of the exceptional details used to create the altarpiece and the various phases of execution. The work was examined and documented using visible light photography, IRR, UVF, X-ray radiography. Results received by Warsaw's Conservation Faculty suggest that Rogier van der Weyden could have contributed significantly to the design and execution of the painting, including several stages of underpainting and several final paints, especially concerning the iconography of the most important persons of the paintings. The design was similar to other works by van der Weyden, e.g. the *Triptych Family Braque* at the Louvre in Paris and *The Annunciation* at The Metropolitan Museum in New York and *The Last Judgement* in the Hôtel-Dieu, Beaune, France, painted c. 1443-1452 (fig. 2).

The aim for furthering quality research was to broaden our knowledge of the work and to verify known facts in the best way. The first phase of the CHARISMA diagnostic campaign consisted of an *in situ* analytical survey of the triptych using non-invasive analytical equipment provided by MOLAB. The second phase comprised targeted sampling of representative areas in order to answer specific questions that arose during the non-invasive investigation and related mostly to the preparation of cross-sections of the paint layers. In the third phase, MNIR studies were done. The fourth phase was XRD/XRF studies. The fifth was ARCHLAB research in the C2RMF in Paris. The *in situ* investigations were based on multipoint analyses by Fourier Transform near- and mid-infrared reflectance spectroscopy (using near-IR and mid-IR, respectively), ultraviolet-visible (UV-VIS) reflectance and fluorescence spectroscopy and measurements of luminescence lifetimes

Fig. 2. The comparison of IRR of the central section of the *Last Judgement*: a) polyptych of Rogier van der Weyden in Beune (circa 1443-1452); © C2RMF. b) triptych by Hans Memling, IRR at 1000-1200 nm; c) triptych by Hans Memling (~1460-1471), MNIR at 2265 nm. © Mattia Patti 2013 for CHARISMA-MOLAB project/Archive of Faculty WKiRDS ASP in Warsaw, Poland.

(time-correlated single-photon counting – TCSPC), plus X-ray fluorescence (XRF) and X-ray diffraction (XRD)⁴. Scanning Electron Microscopy (SEM), equipped with an energy dispersive spectrometer (EDS) and reflectance mid-FTIR micro-spectroscopy were both used to study micro-samples and gain information on the stratigraphy of the painting.

Results

In the ground layers, both calcite (CaCO_3) and two types of lead white (basic lead carbonate in the form of cerussite, PbCO_3 , and hydrocerussite, $2\text{PbCO}_3 \cdot \text{Pb}(\text{OH})_2$) were found. This is different from the ground of *Christ with singing and music-making angels*, in Ghent Museum by CHARISMA team which also contained gypsum (CaSO_4). The mineral pigments used for the ground and paint layers were identified using mid-FTIR, XRF, XRD and SEM-EDS, carried out *in situ*. Yellow, red/orange and brown tones correspond to a mixture of ochres, vermilion and lead white. Lead tin yellow was used

in the more brilliant tones of yellow. The colorant present is madder; anthraquinone was identified by its UV-VIS emission and absorption spectra. For the blues, the research indicates that azurite ($\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$) was used predominantly for the blue tones, but in some details, such as the garment of Christ, the natural form of ultramarine, lapis lazuli, was used. Two other blue pigments were identified in the triptych: 1) smalt, found in the sky of the central panel; it was identified by XRF, XRD and SEM-EDS on micro-samples, and 2) Prussian blue, which dates to the early 18th century; it was identified using reflectance mid-FTIR spectroscopy and found in almost all of the blue areas on the front of all three panels. The presence of this pigment is probably due to in-painting during restoration in the 18th, 19th and/or 20th centuries. Greens are detected to be copper based, although an accurate identification of the mineral content was not possible due to the intrinsic difficulty in discriminating between the compounds typically used. Binders were identified in the paint layers, indicating both the use of oils and proteins. In the varnish layers both natural and synthetic resins (probably from recent

Fig. 3. Compositional changes to the right of the figure of Christ: a) VIS image of the composition; © Photo Roman Stasiuk. b) underdrawing with 1st version – the Angels with Arma Christi, MNIR at 2265 nm; c) 2nd composition showing the 1st portraits of Apostles, X-radiography; © Photo Roman Stasiuk. d) 3rd version – portraits of Apostles, MNIR at 2265 nm. © Mattia Patti 2013 for CHARISMA-MOLAB project/Photo Roman Stasiuk and Iwona Szmelter, 2010/Archive of Faculty WKiRDS ASP in Warsaw, Poland.

conservation interventions) were identified by reflectance mid-FTIR spectroscopy.

The secret of the Redeemer's portrait

The unique portrait of the Redeemer, found on the scales of the Archangel Michael in the central panel was added later. The so-called *Portinari head* was painted on a separate tin foil support, which was subsequently glued, as an insert, on to the original painted surface.

Rogier van der Weyden used this same procedure in another work, the *Seven Sacraments*, now kept in the Royal Museum of Fine Arts in Antwerp⁵. The irregular appearance of the surface of the portrait, as it has many holes in it, is visible to the naked eye as well as being confirmed by analytical investigations, including results by XRD and Optical Coherent Tomography (OCT).

The new information of MNIR results

New information provided by scanning with Multispectral Near Infrared Reflectography (MNIR) generally confirmed the hypothesis of three stages of design in the central composition and team or double authorship, and showed them in detail⁶ (fig. 3).

In clarifying previous discoveries in the upper left and upper right sides of the central panel, the first phase of the composition was detected. The drawing initially depicted angels with Arma Christi, part of this design is visible below parts of the Apostles. The oldest underdrawing is composed with delicate brushstrokes in an abundance of detail. The forms of the angels as well as of the Apostles are similar to figures in other paintings by Rogier van der Weyden. The executed lines are as distinct as handwriting. Characteristic “T” lines, hatches and “dots” present at the end of the brushstrokes are consistent throughout the composition.

The next phase of the painting practice was applying hatching for the halftones and light shadows and outlining the contours of the forms. The deeper shadows were more closely hatched, and in places cross-hatched to provide more emphasis and psychological interpretations.

Fig. 4. Catarina Tanagli portrait as wife of donor (Angelo Tani) on reverse side of triptych; results of SMIRR (1000, 1700, 2265 nm) showing *alla prima* proto-Renaissance manner of painting, minimal underdrawing and the VIS image of this figure. © Mattia Patti 2013 for CHARISMA-MOLAB project/Archive of Faculty WKiRDS ASP in Warsaw, Poland.

been designed and painted in several steps: commissioned and begun by Rogier van der Weyden, before his death in 1464; the oak support could have been ready for painting at the end of 1460, and – based on technical evidence – continued by Hans Memling. In a long-term project, such as this one, fruitful collaboration between researchers, conservators and art historians represents the best solution for understanding this fascinating but problematic Flemish triptych and its role in the birth of the Northern Renaissance.

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