

Painting works by Anton Möller
on the background of Gdańsk's painting workshop
of the last quarter of the 16th
and the first half of the 17th century*

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Abstract

This work presents the research on painting technology and techniques of selected panel paintings by Anton Möller (1563/5-1611) and the paintings attributed to his workshop and circle of his artistic influences such as Isaac van den Blocke (before 1589-after 1924) and Hermann Han (1580-1627/8). Gdańsk's painting of the turn of the 16th and 17th centuries was a combination of technology and techniques derived from local traditions influenced by northern trends: German and Dutch, as well as their assimilated Italian art. The results of performed analysis revealed that the works

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by Anton Möller had a great influence on the development of the painting workshop in Pomerania. The white ground and grey imprimatura and colorful ground characteristic for the Gdańsk artist were identified, among others, in the Gronau epitaph and works by Hermann Han and Isaac van den Blocke. Artists working in this area could be influenced by the painting school of Anton Möller, and they could draw technical achievements directly from the Netherlands.

The dominant pigments in Möller's painting palette are lead white, lead-tin yellow, red and yellow iron pigments of natural origin, cinnabar, minium, organic red pigment, smalt, natural azurite, iron umber, charcoal. Anton Möller and Isaac van den Blocke as the only Gdańsk artists used natural ultramarine in their paintings.

Anton Möller's work distinguishes the use of bright colors similar to Italian and Flemish paintings. The artist in some way experimented with color. He used various colors of mortar, imprimatura, and underpainting to achieve the desired effect, including a white imprimatura for illuminating the surface of the painting or a pink ground layer for painting the sky. The composition of the painting was underpainted with brown paint that gave a warm tint. When painting garments, especially red, he used strong contrasts of shimmer, where the vivid red was assembled with a plane painted red with the addition of a large amount of lead white. These treatments were supposed to give the impression of luminosity, which brings even closer the way of color compositions with Italian painting. Anton Möller applied the principles of technology and painting techniques typical of the turn of the 16th and 17th centuries in European art and belongs to a group of outstanding artists active in Gdańsk.

Abstrakt

Anton Möller na tle gdańskiego warsztatu malarskiego ostatniej ćwierci XVI i pierwszej połowy XVII w.

Praca przedstawia badania techniki i technologii wybranych obrazów sztalugowych Antona Möllera (1563/5–1611) i obrazów przypisanych do jego warsztatu i kręgu jego oddziaływania artystycznego, jak dzieła Isaaca van den Blocke (przed 1589–po 1924) i Hermanna Hana (1580–1627/8). Gdańskie malarstwo przełomu XVI i XVII w. było połączeniem technologii i techniki wywodzącej się z tradycji lokalnej pozostającej pod dużym wpływem trendów północnych: niemieckich i niderlandzkich, oraz asymilowanych przez nich osiągnięć włoskiej sztuki malarskiej.

Przeprowadzone badania gdańskiego malarstwa ostatniej ćwierci XVI i pierwszej połowy XVII w. wykazały, że twórczość Antona Möllera miała duży wpływ na kształtowanie się warsztatu malarskiego na terenie Pomorza. Białą zaprawę i szarą imprimaturę oraz barwne zaprawy charakterystyczne dla gdańskiego artysty zidentyfikowano między innymi w epitafium Gronau i obrazach Hermanna Hana oraz Isaaca van den Blocke. Artyści działający na tym terenie mogli być zarówno pod wpływem gdańskiej szkoły malarstwa, Antona Möllera, jak i mogli czerpać techniczne osiągnięcia bezpośrednio z Niderlandów.

Dominujące pigmenty w paletce malarskiej Möllera to biel ołowiowa, żółcień cynowo-ołowiowa, żółte i czerwone pigmenty żelazowe pochodzenia naturalnego,

cynober, minia, czerwony pigment organiczny karmin, smalta, azuryt naturalny, umbra żelazowa, czerń roślinna. Anton Möller i Isaac van den Blocke jako jedyni artyści gdańscy zastosowali w swoich obrazach ultramarynę naturalną.

Twórczość Antona Möllera wyróżnia zastosowanie jasnej kolorystyki zbliżonej do malarstwa włoskiego i flamandzkiego. Artysta w pewien sposób eksperymentował z kolorem. Wykorzystywał różne kolory zaprawy, imprimatury i podmalowania do osiągnięcia zamierzonych efektów, między innymi białą imprimaturę do rozświetlenia powierzchni obrazu, czy różową zaprawę do namalowania nieba. Kompozycję obrazu podmalowywał brązową farbą, o ciepłym odcieniu, która nadawała ciepły koloryt. Malując szaty, szczególnie czerwone, stosował silne kontrasty światłocieniowe, gdzie żywą czerwień zestawiał z płaszczyzną namalowaną przy użyciu czerwieni z dodatkiem dużej ilości bieli ołowiowej. Zabiegi te miały wywołać wrażenie świetlistości, co jeszcze bardziej zbliża sposób kompozycji barwnych z malarstwem włoskim. Antona Möllera stosował zasady technologii i techniki malarskiej typowej dla przełomu XVI i XVII w. w sztuce europejskiej i należy do grona wybitnych artystów działających w Gdańsku.

Anton Möller was born in 1563/1565 in Königsberg and he died in 1611 in Gdańsk. He is one of the leading artists of Pomerania region of the end of the 16th and the first half of the 17th century. He mainly painted works presenting biblical and allegorical scenes on the background of the buildings of Gdańsk. His paintings were primarily intended for exhibiting in public buildings as well as in churches. As a painter, he ran a painting workshop that was significant in Pomerania and which contributed to the formation of one of the most important artistic centres in Gdańsk. Other artists who also had a significant influence on the artistic formation of painting workshops in Pomerania were: a Dutch Hermann Han (1580–1626/1627), born in Gdańsk, who, apart from Gdańsk, also maintained a workshop in Chojnice, as well as two artists from the Netherlands: Hans Vredemann de Vries (1527–1604) – an architect, interior decorator and a painter and Isaac van den Blocke (before 1589–after 1624), a painter and a member of the Flemish family from Mechelen.

At the turn of the 16th and 17th centuries the Gdańsk painting was a combination of techniques derived from the local tradition, which were strongly influenced by northern trends in paintings: German and Dutch, and the assimilated achievements of Italian painting¹.

¹ Willi Drost, *Danziger Malerei vom Mittelalter zum Ende des Barock. Ein Beitrag zur Begründung der Strukturforchung in der Kunstgeschichte* (Berlin, Leipzig: Verlag für Kunstwissenschaft, 1938), 117–121; Jacek Tylicki, "Sztuka Prus Królewskich. Malarstwo i rysunek", in *Prusy Królewskie. Społeczeństwo, kultura, gospodarka 1454–1772*, ed. Edmund Kizik (Gdańsk: Muzeum Narodowe w Gdańsku, 2012), 309–370, fig. 1–35.

Twenty three paintings were selected to determine the essential features of the Gdańsk painting workshop: five paintings by Anton Möller (cat. no. 5, 10, 12, 14, 15), two assigned to his circle of artistic influence (cat. no. 11, 17), one by Isaac van den Blocke (cat. no. 13), seven by Hermann Han (cat. no. 16, 18–23), four paintings with allegorical scenes attributed to Han's workshop (cat. no. 6–9) and four paintings from epitaphs from the St. Mary's Church in Gdańsk (cat. no. 1–4). The selection of works was determined by the choice of representative works but also by their availability and the consent of individual institutions. The most significant works were chosen, allowing for a thorough and precise characterization of painting technology and techniques. The list of works and examination results are included in tables 1. and 2. The order of works in the table was done according to the date of completion. **Table 1.** contains the types of materials used and the technique concerning such issues as the type of support, ground layer, drawing, isolation layer, imprimatura and underpainting layers. **Table 2.** contains the results of examination of pigments and gilding in the analysed paintings².

² The traditional and modern non-invasive and microinvasive methods, physical, chemical and instrumental analysis were used to study the technology and techniques of Gdańsk's paintings. Most of the preliminary tests, including sampling and analysis of the state of preservation in the light of the VIS, infrared IR and UV were carried out by the authors of the article, specialized tests: in colour infrared (false colour IR technique), XRF X-ray fluorescence spectroscopy – dr hab. Jarosław Rogóż, prof. NCU, Adam Cupa, Department of Painting Technology and Techniques of Nicolaus Copernicus University in Toruń; portable XRF research – dr Mirosław Sawczak, Institute of Fluid-flow Machinery Polish Academy of Sciences in Gdańsk; SEM-EDS analyses – prof. dr hab. eng. Maciej Pawlikowski, Department of Mineralogy, Petrography and Geochemistry of the University of Science and Technology in Kraków; M. Wróbel, Laboratory of Electron Microscopy and Microanalysis, Institute of Hydrogeology and Engineering Geology, Faculty of Geology, University of Warsaw; Grzegorz Trykowski, Grażyna Szczepańska, Faculty of Chemistry, Nicolaus Copernicus University in Toruń; x-ray examinations – Roman Stasiuk and Piotr Zambrzycki, Documents Laboratory, Department of Conservation and Restoration of Works of Art at the Academy of Fine Arts in Warsaw; stratigraphy studies of samples, layering, chronology and preliminary estimation of the composition of pigments, dyes and binders were made by means of comparative analysis using standard VIS microscopy and UV fluorescence microscopy – dr Zuzanna Rozłucka, Department of Conservation of Painting and Polychromed Sculpture NCU in Toruń; studies of crystalline pigments on cross-sections of samples using μ -XRPD x-ray microdiffraction – prof. dr hab. Wiesław Łasocho, dr Alicja Rafalska-Łasocho, Department of Crystal Chemistry and Crystalphysics, Faculty of Chemistry, Jagiellonian University in Kraków, and dr Marta Grzesiak-Nowak, Institute of Catalysis and Surface Chemistry, Polish Academy of Sciences in Kraków; Neutron Activation Analysis – mgr inż. Ewa Pańczyk, Institute of Nuclear Chemistry and Technology in Warsaw; testing of adhesives on powdered samples using the FTIR method – dr Adam Balewski, MA Wiesława Topolska, Department of Conservation of Elements and Architectural Details NCU in Toruń; testing of adhesives by gas chromatography

The end of the sixteenth century is associated with progressive changes in the technique of European painting, in which linen canvas and coloured emulsion ground layers were introduced.

Anton Möller painted mainly on wooden supports made of oak boards. His paintings are characterized by different formats and shapes, which depended on the function and purpose of the painted work. The smallest format is represented by the *Portrait of the Bishop Mauritius Ferber* (cat. no. 5) (88.7–89 x 56.5 cm). The paintings of large format are: *Seven Acts of Charity* (cat. no. 12) (291 x 189 cm) and *Crucifixion* (cat. no. 15) (304 x 233 cm). The predella *The Last Supper* (cat. no. 14) coming from the altar of *Crucifixion of the Lord*, has a dimension of 62 x 248 cm. Other paintings at the top, ending with a semi-ellipse and a semi-circle are: the *Tribute Money* (cat. no. 10) and the *Rebuilding of the Temple*. In all the works, the planks of the support were joined together, and in the case of the *Tribute Money* and the *Rebuilding of the Temple*, the wooden reinforcements in the shape of the so-called double dovetail were placed on the joints³. The support of the *Crucifixion* was reinforced with two boards let in from the reverse on the so-called swallow's tail.

Epitaph paintings from St. Mary's Church in Gdańsk were executed on wooden supports made of oak. Isaac van den Blocke preferred support made of oak wood, which served him to paint the *Servilius Appius* (cat. no. 13) and other paintings displayed on the ceiling of the Red Hall of the Main City Hall of the City of Gdańsk.

Besides oak, Hermann Han used also linden-wood supports, which was not so popular in the Gdańsk workshops, where oak wood dominated, as in the case of northern masters,

The paintings in the collection of the National Museum of Gdańsk and Poznań titled *Allegory of Pride*, *Allegory of Wealth* and *Model of the World* (cat. no. 6–9) from around 1600 were painted on oak planks. Dendrochronolog-

– Grzegorz Jaworski, Department of Painting Technology and Techniques NCU in Toruń; research using the micro-Raman spectroscopy method – dr hab. Edyta Proniewicz, prof. AGH (Akademii Górniczo-Hutniczej), dr Ewa Pięta, Laboratory of Laser Raman Spectroscopy, Faculty of Chemistry, Jagiellonian University in Kraków.

³ Due to the large format of the *Tribute Money* and the *Rebuilding of the Temple* and *Seven Acts of Charity* and the technical problems connected with this fact, it was not possible to analyse the supports from the reverse. In addition, the *Rebuildnig of the Temple* has a parquet support mounted from the reverse, which further hindered the analysis of the support. The measurements were made on the surface for these three paintings. The *Portrait of the Bishop Mauritius Ferber*, the *Last Supper* and *Crucifixion* was analyzed from the reverse.

ical studies of two paintings *Allegories of Pride*, one of Gdańsk and the other of Poznań, showed that they were made of oak wood, so-called Baltic type B1 in the case of the painting from Gdańsk, and “NL” type in the case of the painting from Poznań. B1 wood is also found in the Georg Hojer’s epitaph from 1585. Boards from these paintings originate from the areas located East of today’s Polish borders⁴.

Wooden canvas paintings dominated in the Gdańsk painting from the fifteenth to the early seventeenth century⁵. Since about 1500 canvas supports had spread first in Italy, and then among artists of Northern Europe, such as Albrecht Dürer (1471–1528)⁶. Anton Möller was also influenced by new trends in the use of linen canvas in European modern painting. The only known painting by Möller made on canvas support has not preserved, the *Last Judgment* (1602–1603) from the Artus Court in Gdańsk. The painting had the shape of a standing rectangle (780 x 600 cm) closed at the top with ogive. In the works of Hermann Han, similarly to Möller’s, apart from paintings made on wooden supports, there is one known painting on canvas – *Coronation of Mary* (1623) from the cathedral in Pelplin, of the shape of a standing rectangle and dimensions 507 x 303 cm. These two paintings are of the largest format in the *oeuvre* of each artist⁷.

Canvas supports were used by Möller in 1602 and by Han in 1623 and it shows that Gdańsk artists had turned to new trends in the use of this type of painting supports. At the end of the 16th century, one of the few artists in Gdańsk who painted on canvas was Hans Vredemann de Vries, who came

⁴ Dendrochronological research was made by prof. dr hab. Tomasz Ważny. See Kristof Haneca et al., “Provenancing Baltic Timber from Art Historical Objects: Success and Limitations”, *Journal of Archeological Science*, nr 2/32 (2005), pp. 261–271.

⁵ Maria Roznerska, *Techniki malarskie “małych mistrzów holenderskich” XVII w.* (Toruń: Uniwersytet Mikołaja Kopernika, 1991), 149; Max Doerner, *Materiały malarskie i ich zastosowanie* (Warszawa: Arkady, 1975), 304; Bohuslav Slánský, *Technika malarstwa*, vol. 2 (Warszawa: Arkady, 1965), 263.

⁶ Bogumiła J. Roubá, „Płótna jako podobrazia malarskie”, *Ochrona Zabytków* 3–4 (1985): 223.

⁷ In Möller’s and Han’s *oeuvre* there is only one known painting on canvas support besides paintings on wooden ones. The *Last Judgement* by A. Möller was lost in the II World War, Teresa Labuda, „Sqd Ostateczny” Antoniego Möllera z Dworu Artusa w Gdańsku: *problemy ikonografii, Gdańskie Studia Muzealne, Tom 4* (1985), s. 220–221, 69–78, reference 1; and the painting *Coronation of Mary* by H. Han, Barbara Szolginia and Teofil Dąbrowski, *Konserwacja obrazu H. Hana „Koronacja NMP” z Głównego Ołtarza Katedry w Pelplinie*, dokumentacja prac konserwatorskich, Gdańsk 1957, Wojewódzki Urząd Ochrony Zabytków, sygn. ZR/113/1, mps.; compare Bożena Szmelter-Fausek, “Wybrane obrazy ołtarzowe Hermanna Hana (1580–c. 1628) – zagadnienia technologiczne i konserwatorskie”, in *Історія релігій в Україні*, vol. 2 (Львівський музей історії релігії 2012), pp. 609–616.

from the Netherlands. In 1594, he made paintings on linen canvas for the Artus Court, and in 1595 to the Red Hall of the Main Town Hall of the City of Gdańsk⁸. Two other examples of paintings on canvas from the end of the 16th century are displayed in the parish church in Puck. These are two *Portraits of Maria Mortęski and Ernest Wejher*, dated on 1597, and attributed to Herman Han⁹. The paintings from the Christian Henning's family epitaph (Christian Henning died in 1626) from the National Museum in Gdańsk, attributed to Han, were the only paintings made on a copper sheet¹⁰.

In the sixteenth and seventeenth centuries supports and grounds were prepared in accordance with the fifteenth-century tradition, about which Cennino Cennini was writing¹¹.

Before the ground was applied, the surface of the support was glued with glutine glue. Anton Möller, depending on the period of his work, used white and coloured grounds. In the initial period around 1600, white chalk and glue ground and white imprimatura dominated. In later works, ca. 1609, two-coloured or white grounds with a local, mostly brown underlayer can be identified. In white grounds, the filler is chalk (natural calcite CaCO_3), and the binder is a glutine glue. The ground is applied in approx. 2–3 layers with a thickness from ca. 77 μm (cat. no. 10) to 160 μm (cat. no. 12)¹². Lead white is the filler of white oil imprimatura with a thickness of 7–14 μm (cat. no. 10), in the composition of which hydrocerusite was identified (Fig. 1). Brown oil-based underlayer with a thickness of 14–35 μm , composed of: iron yellow, red and brown pigments, lead white (hydrocerusite and cerusite) and finely ground organic black (cat. no. 12).

⁸ Anna Gosieniecka, *Wzory graficzne w malarstwie pomorskim drugiej połowy XVI i początków XVII wieku* („Ze studiów nad sztuką XVI w. na Śląsku i w krajach sąsiednich”, ed. Bożena Steinborn) (Wrocław: Muzeum Śląskie, 1968), 111–132; Juliusz A. Chrościcki, „Orfeusz i Eurydyka’ Hansa Vredemana de Vries na tle tradycji ikonograficznej, in *Dwór Artusa w Gdańsku. Sztuka i sztuka konserwacji*, Dwór Artusa 17–19 października 2002, ed. Teresa Grzybkowska and Joanna Talbierska (Gdańsk: Oficyna Pomorska, 2004), 123–141.

⁹ Janusz Pasierb, *Malarz gdański Herman Han* (Warszawa: Wydawnictwo Naukowe PWN, 1974), 14–15; *Katalog zabytków sztuki w Polsce*, t. 5 *Województwo gdańskie*, z. 2 *Puck, Żarnowiec i okolice*, red. Barbara Rol and Iwona Strzelecka (Warszawa: Wydawnictwo Artystyczne i Filmowe, 1989), 40; Gosieniecka, *Wzory graficzne*, 61–62.

¹⁰ Gosieniecka, *Wzory graficzne*, 68–69.

¹¹ Cennino Cennini, *Rzecz o malarstwie. Teksty źródłowe do dziejów teorii sztuki*, vol. 3, ed. Juliusz Starzyński (Wrocław: Ossolineum, 1955), chapter 113.

¹² The thickness of the ground layer was measured only in these two paintings.

In four epitaphs from St. Mary's Church in Gdańsk (cat. no. 1–4), a white chalk-glue ground was used, and in the Michael Loitz's epitaph (Fig. 2), similarly as in Möller's the *Tribute Money*, a lead white imprimatura was also applied on white chalk-glue ground. The imposition of a white layer of lead white oil imprimatura was characteristic of the 15th-century Flemish paintings by Dirck Bouts (1415–1475) and by Hans Memling (1435–1494)¹³, also in the sixteenth century including Jan van Scorel (1495–1562) and Maarten van Heemskerck (1498–1574)¹⁴. This layer was an insulation as it reduced the absorptivity of the ground, at the same time allowing a stronger reflection of light passing through higher layers¹⁵.

A characteristic feature of Anton Möller's late work was the use of two-coloured grounds: the first yellow and the second pink (cat. no. 15). The pink layer also played the role of an underpainting and was used in some parts of the sky to develop the colour and chiaroscuro. Probably these are the influences of Italian painting, the achievements of which inspired many artists of that time. The Haarlem mannerist painter Jan van Scorel was inspired by the Italian painting. In the painting of the *Lamentation of Utrecht* he underpainted the blue robe with pink colour. He also used the pink colour of the ground to paint the sky in the *Baptism of Christ* from Haarlem¹⁶.

From the sixteenth century the coloured ground and imprimatura became popular in the painting of Pomerania, including Gdańsk. The *Last Judgment* located in the church of Saint James in Toruń and assigned to Anton Möller's circle (dated on 1603) was painted on a three-coloured ground layer. The first layer of the ground is yellow, the second is grey and the third is dark grey. The yellow ground was obtained by mixing iron yellow, chalk, small addition of minium, lead white and charcoal. The grey layer was obtained from lead white and charcoal, and the dark grey by adding more black to the

¹³ Molly Faries, Christa Steinbüchel and Johan R. J. van Asperen de Boer, "Maarten van Heemskerck and Jan van Scorel's Haarlem Workshop", in *Historical Painting Techniques, Materials, and Studio Practice*, Preprints of a Symposium, University of Leiden, the Netherlands, 26–29 June 1995, ed. Arie Wallert, Erma Hermens, and Marja Peek (Marina Del Rey, Calif.: Getty Conservation Institute, 1995), 136–137; Józef Flik and Justyna Olszewska-Świetlik, *Tryptyk „Sąd Ostateczny” Hansa Memlinga z Muzeum Narodowego w Gdańsku. Technologia i technika malarska* (Toruń: Wydawnictwo Naukowe UMK, 2005), 34.

¹⁴ Faries, Steinbüchel and van Asperen de Boer, "Maarten van Heemskerck", 136–137.

¹⁵ Flik and Olszewska-Świetlik, *Tryptyk*, 34.

¹⁶ Jan P. Filedt Kok, Willy Halsema-Kubes and Wouter Th. Kloek, *Kunst voor de beeldenstorm: Noordnederlandse kunst 1525–1580: Catalogus* (Amsterdam: Rijksmuseum, 1986), 106–116, here: 109.

mixture. Grey layers were also used as an underpainting and to develop dark clouds. Emulsion binder was used in all three layers¹⁷.

Isaac van den Blocke used a white chalk-glue ground and a grey oil imprimatura from lead white and charcoal in the painting *Servilius Appius*¹⁸ (cat. no. 13; Fig. 3).

Two-coloured ground layers were also used in the painting from the Hans Gronau's family epitaph (cat. no. 17) from 1612 and assigned to the circle of Anton Möller. The first ground layer is of white chalk-glue, whereas the top layer is brown, in which minium, chalk, charcoal and fat emulsion binder were used (Fig. 5)¹⁹.

Hermann Han, belonging to a generation of younger painters than Möller, used grey grounds consisting of lead white, charcoal (of wood) and sometimes with a small addition of chalk (cat. no. 16, 18–21; Fig. 4). The exception is *St. Elisabeth serving the sick man* (cat. no. 23), where there are two layers of ground: white chalk and grey with an admixture of charcoal.

Allegorical and moralizing paintings from the museum in Gdańsk and Poznań of an unknown provenance and assigned to the Hermann Han's circle (cat. no. 6–9) were painted on a very thin white chalk and glue ground of a thickness of approx. 10–50 µm. Natural calcite CaCO₃ was used as chalk, and in the *Model of the world* – calcite with an addition of quartz SiO₂ (Fig. 5). The ground layer is thin and only fills the pores of the wood, which indicates that it was applied using a putty knife or knife. This method is in accordance with de Mayerne's guidelines for the way of applying perfectly smooth ground layer²⁰. Very thin grounds are typical for Dutch paintings of the 15th

¹⁷ Bożena Szmelter-Fausek and Justyna Olszewska-Świetlik, "The Study on Technology and Technique of the Painting 'Last Judgement' from St. James Church in Toruń", in *Interdisciplinary Research on the Works of Art*, ed. Justyna Olszewska-Świetlik, Joanna A. Arszczyńska, and Bożena Szmelter-Fausek (Toruń: Wydawnictwo Naukowe UMK, 2012), 209–217, here: 212.

¹⁸ Ewa Pięta et al., "Micro-Raman Spectroscopy Analysis of 17th Century Panel Painting 'Servilius Appius' by Isaac van den Blocke", *Journal of Raman Spectroscopy* 45/11 (2014): 1019–1025.

¹⁹ Justyna Olszewska-Świetlik, *Technologia i technika malarska wybranych nowożytnych epitafiów z Bazyliki Mariackiej w Gdańsku* (Toruń: Wydawnictwo Naukowe UMK, 2009), 87, 109–110.

²⁰ Theodore Turque de Mayerne, "Pictoria, Sculptoria, Tinctoria at quae subalternarum atrium, [...]", 1620, in Ernst Berger, *Quellen für Maltechnik während der Renaissance und deren Folgezeit (XVI–XVIII Jahrhundert) in Italien, Spanien, den Niederlanden, Deutschland, Frankreich und England nebst den de Mayerne Manuscript*, 3 Teil (München: Callwey, 1901), 276, in: Roznerska, *Techniki malarskie*, 163.

and 16th centuries, in which the thickness ranged from 12 to approx. 40 μm ²¹. A very thin brown oil or oil-resin imprimatura was placed on the surface of the ground layer, which is about 7 μm thick, consisting of iron brown pigment and organic black. In the paintings depicting the *Allegory of Pride and Wealth* and the *Model of the World*, the imprimatura was supposed to reduce the absorption of the ground.

After applying the ground on the canvas, the artists began to plan the composition of the painting. Anton Möller certainly used preparatory sketches. He is known for his drawing project made in 1595 to the painting of the *Last Judgment to the Artus Court*²². The design of the composition was transferred to the canvas, probably with the help of patterns, using the method of charcoal, then the drawing was reinforced by brush with black water paint.

Drawing made with water paint by brush appears in three epitaphs (cat. no. 1–3) dated to the second half of the 16th century and in Möller's *Portrait of the Bishop Mauritius Ferber* (cat. no. 5; Fig. 6). The author's drawing corrections can be seen in the composition of the so-called *pentimenti*. The same was observed in paintings of the *Servilius Appius* by Isaac van den Blocke (cat. no. 13) and the *Assumption of Mary* by Hermann Han (cat. no. 21). Gdańsk painters searched for the right shape, form and proportion, which proves their creativity and puts them among the creative artists who produced high-quality painting works.

From the fifteenth century drawing patterns have often been used in European painting workshops to prepare the composition²³. At the beginning of the 17th century, engravings by Lucas Cranach the Elder (1472–1553), Jakob de Gheyn II (1565–1629), Aegidius Sadeler (1570–1629) according to Christoph Schwarz (1545–1592), or Zacharia Dolendo (1561–?) according to Karl van Mander, were popular in Poland²⁴. These engravings were repeatedly re-

²¹ Filedt Kok, Halsema-Kubes and Kloek, *Kunst voor*, 107–108.

²² Janusz S. Kęmbowski, „Sąd Ostateczny” Antoniego Möllera na tle tradycji tematu w XV i XVI wieku”, in *Dwór Artusa w Gdańsku*, 143.

²³ Jacek Tylicki, *Rysunek gdański ostatniej ćwierci XVI and pierwszej połowy XVII wieku* (Toruń: Wydawnictwo UMK, 2005), 14; Johannes Voss, „Rysunki warsztatowe późnośredniowiecznych rzeźbiarzy”, in *Od badań do konserwacji. Materiały z konferencji 23–24 października 1998 r.* (Toruń: Wydawnictwo Naukowe UMK, 2002), 123–131; Józef Flik et al., „Rysunek w malarstwie sztalugowym – badania reflektografii w podczerwieni”, in *Księga pamiątkowa ofiarowana profesorowi Wiesławowi Domańskiemu*, ed. Bożena Soldenhoff (Toruń: Wydawnictwo Naukowe UMK, 2002), 47–81.

²⁴ Mieczysław Morka, „Crucifixion Christopha Schwarza – polskie warianty”, *Rocznik Historii Sztuki* 20 (1994): 87–108.

produced by Pomeranian painting workshops, as evidenced by the occurrence of paintings with similar, almost identical compositions, like the engraving by Jan Sadeler according to Christoph Schwarz from around 1590 with the presentation of the vision of the *Last Judgment*. This engraving was copied by the artist at the turn of the 16th and 17th centuries – especially in Pomerania. The most faithful repetition of this composition is the painting from the parish church in Świecie (1590?) and the picture from the parish church in Łęgowo (Warmińsko-Mazurskie Voivodeship). The influence of the engraving is also noticeable in the Gronau's epitaph (1612) from the St. Mary's Church in Gdańsk (cat. no. 17)²⁵.

The palette of Anton Möller's painting consisted of characteristic pigments of the turn of the 16th and 17th centuries, as: lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, lead tin yellow type I and $2\text{PbO} \times \text{SnO}_2$, organic yellow pigment, iron yellow and red of natural origin, minium Pb_3O_4 , vermilion HgS , organic red pigment with an indication for carmine (coshenilla), natural azurite $2\text{CuCO}_3 \times \text{Cu}(\text{OH})_2$, smalt $\text{CoO} \times \text{nK}_2\text{SiO}_3$, natural ultramarine $3\text{Na}_2\text{O} \times 3\text{Al}_2\text{O}_3 \times 6\text{SiO}_2 \times 2\text{Na}_2\text{S}$, copper green with an indication for malachite $2\text{CuCO}_3 \times \text{Cu}(\text{OH})_2$, umber of natural origin, charcoal black.

Comparing the painting palette used in epitaph paintings from the St. Mary's Church in Gdańsk and the work by Isaac van den Blocke, a similar trend in the selection of pigments can be noticed. In all works except the Johann Connert's epitaph (cat. no. 1) lead-tin yellow type I and minimum are present. The other pigments found in the paintings are iron yellow and red, vermilion, organic red – carmine, and in the painting from the Gronau's epitaph (cat. no. 17) also red lake, smalt and natural azurite. Natural ultramarine is also present in the painting of *Servilius Appius* (cat. no. 13). Natural malachite (cat. no. 1 and no. 2) and copper green (cat. no. 2 and 4) were used as green pigments. The painting palette by Hermann Han and three paintings from the cycle *Model of the World* (MNP) and *Allegory of Pride* (MNG) is similar to the palette of other analysed paintings. There is not only natural ultramarine and malachite characteristic of 15th and 16th century paint-

²⁵ The painting was made after 1601, when the parish was founded in Łęgowo. Until 1957 it was placed in the main altar, later on it was probably stored in the parish, "O obrazach w ołtarzu głównym w kościele w czasach powojennych", *Oficjalna Strona Łęgowa* 10 (2007), <http://www.legowo.schoolpage.pl/2007-4.html>, Access 5 June 2017; Gosieniecka, *Wzory graficzne*, 128; Bernhard Schmid, *Die Bau- und Kunstdenkmäler des Kreises Marienburg*, Heft II (Danzig: Verlag des Provinzial-Verbandes von Westpreußen. Kommissionsverlag von A. W. Kafemann G. M. B. H., 1919), 51–53, Fig. 8, 9.

ing – instead there is a copper resinate (cat. no. 19, 21). Hermann Han also obtained green from a mixture of natural azurite and lead white, which he applied to yellow underlayer of lead tin yellow with the addition of iron red (cat. no. 22; Fig. 7). Charcoal black (of wood) is present in all Han's paintings.

Lead white was the pigment most commonly used in painting from antiquity to the mid-nineteenth century²⁶. Studies on the composition of lead white in terms of trace impurities made for Gdańsk paintings showed that both Anton Möller and Hermann Han, as well as the authors of epitaph paintings from the St. Mary's Basilica in Gdańsk used lead white that was popular in the northern European countries²⁷.

In the paintings by Anton Möller, the binder of the painting layer is oil and oil-resin with the composition of linseed oil with an addition of nut oil and natural resin. The paintings of the Gdańsk school were painted with emulsion-binder paint obtained by mixing linseed oil and protein (egg yolk or casein) and / or oil-resin: linseed oil and probably natural resin (cat. no. 1, 3, 4, 6–9, 11–12, 16–23).

The painting style in Möller's paintings and in paintings from the Gdańsk workshops is characterized by multilayeredness. The artists used underpainting layers and lake layers. Paints were usually applied in two to three layers, and in some parts of the paintings up to five.

In Gdańsk painting until the beginning of the 17th century, the painters started painting with an underlayer en grisaille of a mixture of white and black.

Anton Möller began painting a composition with iron brown. He put brown in the darkest parts of the composition. While developing some of the red robes, he initially made a chiaroscuro work with brown in shadows and white in the lights, then applied red lakes of organic red. In the development of red he also used vermilion and iron red (Fig. 8). Hermann Han modelled garments

²⁶ Slánský, *Technika*, 49.

²⁷ Olszewska-Świetlik, *Technologia*, 113–114; Bożena Szmelter-Fausek, "Gdański warsztat malarski ostatniej ćwierci XVI i pierwszej połowy XVII w. na przykładzie twórczości Antona Möllera (1563/5–1611) i Hermanna Hana (1580–1627/8)" (PhD, Nicolaus Copernicus University, Toruń 2013), 286, Annex, tabel 114. The compound of the lead white was estimated, Szmelter-Fausek, "Gdański warsztat", 288, Annex, tabel 115. In the painting *Seven Acts of Charity* two tyoes of whitewas identified: the first compose of the hydrocerusite and ceruzyt, the second of hydrocerusite. Hydrocerusite and cerusite was identified in the painting *Assumption of Mary*, and the white of hydrocerussite was identyfied in the painting of the *Tribute Money* and in *Prussian attack on the monastery in Oliwa*, *Coronation of Mary*, *Allegory of Pride* (National Museum in Gdańsk), *Allegory of Pride* (National Museum in Poznań).

in a similar way. He painted vivid red with vermilion, especially in the parts of red robes and details of ornaments, as well as to underline roses on the cheeks.

Natural azurite and smalt were the dominant blue pigments in the paintings. Ultramarine was also identified in *Seven Acts of Charity*, in the *Last Supper*, in *Crucifixion* by Möller and in *Servilius Appius* by Isaac van den Blocke (Fig. 8). Smalt was a popular pigment often used. Anton Möller used cobalt glass to paint most of the blue garments and in a mixture with carmine to get purple shades²⁸. Azurite was used in a limited amount to paint the details of clothing. Hermann Han used smalt mainly in the parts of the blue sky, where he mixed the pigment with lead white and less often to paint blue robes (*Adoration of the shepherds*, *Assumption of Mary*). He developed robes mainly with azurite, some with smalt. In the *Allegory of Pride* and in the paintings from the cycle *Model of the World*, smalt occurs mainly in the parts of the sky and occasionally in some blue robes.

The purples in Gdańsk painting were obtained by mixing red with blue: organic red - carmine or vermilion with smalt (cat. no. 3, 10; Fig. 3) or with natural azurite (cat. no. 7, 22). Sometimes vermilion was mixed with smalt (cat. no. 3). A dark shade was obtained by adding a little bit of charcoal to a mixture of azurite and organic red (cat. no. 1) and a cool shade of pink by adding lead white to smalt and carmine (cat. no. 2; Fig. 2).

Anton Möller developed the complexion of face and hand in a subtle way using a mixture of vermilion and lead white. He painted the highest lights with lead white. He applied red organic lakes on the cheeks and lips. He marked the shadows on chins with parallel, delicate lines of iron brown (Fig. 9). Isaac van den Blocke painted complexion by mixing lead white with minium and iron brown.

As one of the few Gdańsk artists Anton Möller signed his works, both paintings and drawings. All analysed paintings by Anton Möller, except for those created shortly before the artist's death – *Crucifixion* and *the Last Supper* (cat. no. 15 and 14) – are signed with the AM in ligature next to the date on the surface of the work. The signatures were made very carefully with black-brown paint using a round pointed brush. The earliest painting signed by Möller is the *Portrait of the Bishop Mauritius Ferber* (cat. no. 5) –

²⁸ Bożena Szmelter-Fausek and Justyna Olszewska-Świetlik, *Blue Pigments in Blue and Purple Painting Layers of Gdańsk's Paintings of the Mid-16th to the End of the 18th Century*, "Colour research and application", vol. 41, Issues 3, s. 270–275, June 2016, ISSN 1520-6378, ISSN: 0361-2317, DOI: 10.1002/col.22030.

AM · 1590 . The next can be found in the *Tribute Money* (cat. no. 10) – AM 1601, the *Rebuilding of the Temple* – AM 1602. and *Seven Acts of Charity* (cat. no. 12) – AM 1607. (Fig. 10).

In Gdańsk painting the artists also used gilding techniques, although to a limited extent to make radiant glories or inscriptions. White, yellow and red primer paints with an oil-resin bond and oil and resin mixtion were used. Anton Möller made gilding, among others in the non-existing *Last Judgment* of the Artus Court in Gdańsk, in the *Tribute Money* (cat. no. 10), in the *Last Supper* (cat. no. 14) and in the *Crucifixion* (cat. no. 15). The gilding was also made in the Gronau's epitaph from the St. Mary's Church in Gdańsk (cat. no. 17), in the *Last Judgment* from Toruń, and in the *Concert of Angels* by Hermann Han (cat. no. 16; Fig. 4).

Anton Möller's technology and technique is very similar to the Dutch painting tradition of the end of the 16th and the beginning of the 17th century. The artist was one of the precursors in the use of linen canvas in Gdańsk. Wooden canvas supports made of oak wood should be associated with the Dutch tradition that has been widespread in Gdańsk art since the Middle Ages. The use of coloured grounds and brown underlayer is a part of the new tendency when the white ground was moved away and more inclined towards coloured grounds. The transitional period was the use of white ground and colourful imprimatura, which was rooted in the fifteenth and sixteenth century tradition of painting workshops²⁹. Frans Floris (1516–1570) who worked in Antwerp and Liège and who traveled to Rome during his painting activity, is one of the artists who used white chalk-glue ground and brown imprimatura. *Dieu rassemblant et protegeant son peuple par la grâce du crucifie* and *Sainte Famille* from the Louvre Museum are the examples of paintings with grey imprimatura. The white imprimatura appears in the painting of *Vénus et l'Amor*³⁰. These paintings show a warm colour characteristic of Italian painting.

²⁹ Ella Hendriks, "The Use of the Ground Colour", in *Painting in Haarlem 1500–1850: The collection of the Frans Hals Museum*, ed. Niklaus Kohler (Ludion: Uitgeverij, 2006), 80, in: Abbie Vandivere, "In Search of van Mander's Primuersel: Intermediate Layers in Early Netherlandish Paintings", in *ICOM-CC Working Group Art Technological Source Research*, Vienna, 23–24 September 2010, (Lisbon: Getty Research Institute, 2011), 7, reference 7.

³⁰ Les Archives de la restauration au Centre de recherche et de restauration des musées de France (C2RMF), The report of the analysis of paintings by Frans Floris *Dieu rassemblant et protegeant son peuple par la grâce du crucifie* (1562) (No. INV 20746, ref. no. C2RMF: F2576), *Sainte Famille* (No. INV 2796, ref. no. C2RMF: F2578), *Vénus et l'Amor* (No. INV 28059, ref. no. C2RMF: F2575).

Similarly, warm colouring of Möller's paintings indicates that he could have been inspired by Italian or Flemish painting with Italian influences and at the same time the hypothesis about his journey to the Netherlands can be confirmed. The white imprimatura was also used by Jan van Scorel (1495–1562) at the *Marchiennes Polyptych*, which is exhibited at the Chartreuse Museum in Douai, France. Scorel was famous for the use of colourful imprimatura³¹. Möller's technique approaches to the mannerists of the so-called Haarlem school of the end of the 16th and early 17th century in the use of yellow and pink grounds³².

The research performed in Gdańsk paintings of the last quarter of the 16th and the first half of the 17th century showed that the workshop of Anton Möller had a great impact on the development of the painting workshop in Pomerania. White ground and grey imprimatura as well as colourful grounds characteristic of the Gdańsk artist were identified, among others, in Gronau's epitaph and in the paintings by Hermann Han and by Isaac van den Blocke. Artists working in this area could be influenced by the painting school of Gdańsk and by Anton Möller's works and they could derive technical achievements directly from the Netherlands.

The dominant pigments in the Möller's painting palette are: lead white, lead-tin yellow, iron yellow and red pigments of natural origin, vermilion, minium, red carmine organic pigment, smalt, natural azurite, iron umber and charcoal. Anton Möller and Isaac van den Blocke as the only Gdańsk artists used ultramarine in their paintings.

The works by Anton Möller are distinguished by the use of bright colours similar to Italian and Flemish paintings. The artist experimented with colour. He used different colours of grounds, imprimatura and brown underpainting to achieve the desired effects, including a white imprimatura to illuminate the surface of the painting, or a pink ground to paint the sky. The composition of the painting was painted with a brown paint, and with a warm shade that gave a warm colour. Anton Möller used strong contrasts of chiaroscuro to paint red robes. He juxtaposed red with the lighter parts painted with a mixture of red and the addition of a large amount of lead white. These treatments were supposed to create an impression of luminosity, which brings the colour of composition closer to Italian painting. Anton

³¹ Filedt Kok, Halsema-Kubes and Kloek, *Kunst voor*, 108.

³² Hendriks, "The Use", 7, reference 7.

Möller used the painting techniques characteristic of the turn of the 16th and 17th centuries in the European art and belongs to a group of outstanding artists working in Gdańsk.

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Bibliography

- Cennini, Cennino. *Rzecz o malarstwie. Teksty źródłowe do dziejów teorii sztuki*, vol. 3, ed. Juliusz Starzyński. Wrocław: Ossolineum, 1955.
- Chrościcki, Juliusz A. „Orfeusz i Eurydyka’ Hansa Vredemana de Vries na tle tradycji ikonograficznej”. In *Dwór Artusa w Gdańsku. Sztuka i sztuka konserwacji*, Dwór Artusa 17–19 października 2002, ed. Teresa Grzybkowska, Joanna Talbierska, 123–141. Gdańsk: Oficyna Pomorska, 2004.
- De Mayerne, Theodore Turque. “Pictoria, Sculptoria, Tinctoria at quae subalternarum atrium, [...]”, 1620. In *Quellen für Maltechnik während der Renaissance und deren Folgezeit (XVI–XVIII Jahrhundert) in Italien, Spanien, den Niederlanden, Deutschland, Frankreich und England nebst den de Mayerne Manuscript*, 3 Teil, ed. Ernst Berger, München: Callwey, 1901.
- Doerner, Max. *Materiały malarskie i ich zastosowanie*. Warszawa: Arkady, 1975.
- Drost, Willi. *Danziger Malerei vom Mittelalter zum Ende des Barock. Ein Beitrag zur Begründung der Strukturforschung in der Kunstgeschichte*. Berlin, Leipzig: Verlag für Kunstwissenschaft, 1938.
- Faries, Molly, Christa Steinbüchel, Johan R. J. van Asperen de Boer. “Maarten van Heemskerck and Jan van Scorel’s Haarlem Workshop”. In *Historical Painting Techniques, Materials, and Studio Practice*, ed. Arie Wallert, Erma Hermens, Maria Peek, Marina Del Rey, 135–139. Calif.: Getty Conservation Institute, 1995.
- Filedt Kok, Jan P., Willy Halsema-Kubes, Wouter Th. Kloek, *Kunst voor de beeldenstorm: Noordnederlandse kunst 1525–1580: Catalogus*, 106–116. Amsterdam: Rijksmuseum, 1986.
- Flik, Józef, Justyna Olszewska-Świetlik, Adam Cupa, Anna Wypych. „Rysunek w malarstwie sztalugowym – badania reflektografii w podczerwieni”. In: *Księga pamiątkowa ofiarowana profesorowi Wiesławowi Domastowskiemu*, ed. Bożena Soldenhoff, 47–81. Toruń: Wydawnictwo UMK, 2002.
- Flik, Józef, Justyna Olszewska-Świetlik. *Tryptyk „Sąd Ostateczny” Hansa Memlinga z Muzeum Narodowego w Gdańsku. Technologia i technika malarska*, Toruń: Wydawnictwo UMK, 2005.
- Gosieniecka, Anna. *Wzory graficzne w malarstwie pomorskim drugiej połowy XVI i początków XVII wieku*, „Ze studiów nad sztuką XVI w. na Śląsku i w krajach sąsiednich”, ed. Bożena Steinborn, 111–132. Wrocław: Muzeum Śląskie, 1968.





- Haneca, Kristof, Tomasz Ważny, Hans Beeckman, Joris van Acker, "Provenancing Baltic Timber from Art Historical Objects: Success and Limitations". *Journal of Archeological Science*, 32, no. 2 (2005): 206–271.
- Hendriks, Ella, "The Use of the Ground Colour", in *Painting in Haarlem 1500–1850: The collection of the Frans Hals Museum*, ed. Niklaus Kohler, (Ludion: Ultgeverij, 2006), 80. In: Abbie Vandivere, "In Search of van Mander's Primuersel: Intermediate Layers in Early Netherlandish Paintings". In: *ICOM-CC Working Group Art Technological Source Research*, Vienna, 23–24 September 2010, (Lisbon: Getty Research Institute, 2011), 7, reference 7, access 27.03.2017, <http://www.icom-cc-publications-online.org/PublicationDetail.aspx?cid=05b30243-1d2d-4d09-b8e8-3ef281cb3672>.
- Katalog zabytków sztuki w Polsce*, vol. 5 *Województwo gdańskie*, no. 2 *Puck, Żarnowiec i okolice*, ed. Barbara Rol, Strzelecka, Iwona, Warszawa: Wydawnictwo Artystyczne i Filmowe, 1989.
- Kębłowski, Janusz S., „Sąd Ostateczny’ Antoniego Möllera na tle tradycji tematu w XV i XVI wieku”. In: *Dwór Artusa w Gdańsku. Sztuka i sztuka konserwacji*. Materiały z konferencji naukowej, Gdańsk, Dwór Artusa, 17–19 października 2002, red. T. Grzybkowska, J. Talbierska, Warszawa 2004, 143.
- Labuda, Teresa, „Sąd Ostateczny” Antoniego Möllera z Dworu Artusa w Gdańsku: *problemy ikonografii*, *Gdańskie Studia Muzealne*, Tom 4 (1985): 220–221.
- Morka, Mieczysław, „Ukrzyżowanie Christopa Schwarza – polskie warianty”, *Rocznik Historii Sztuki* 20 (1994): 87–108.
- Olszewska-Świetlik, Justyna, *Technologia i technika malarska wybranych nowożytnych epitafiów z Bazyliki Mariackiej w Gdańsku*. Toruń: Wydawnictwo Naukowe UMK, 2009.
- “O obrazach w ołtarzu głównym w kościele w czasach powojennych”, *Oficjalna Strona Legowa* 10, 2007, Access 5 June 2017 <http://www.legowo.schoolpage.pl/2007-4.html>.
- Pasierb, Janusz, *Malarz gdański Herman Han*. Warszawa: PWN, 1974.
- Pięta, Ewa, Edyta Proniewicz, Bożena Szmelter-Fausek, Justyna Olszewska-Świetlik, Leonard M. Proniewicz, “Micro-Raman Spectroscopy Analysis of 17th Century Panel Painting ‘Servilius Appius’ by Isaac van den Blocke”, *Journal of Raman Spectroscopy* 45, no. 11 (2014): 1019–1025.
- Rouba, Bogumiła J. „Płótna jako podobrazia malarskie”. *Ochrona Zabytków* 3–4 (1985): 37–57.
- Roznerska, Maria. *Techniki malarskie “małych mistrzów holenderskich” XVII w.* Toruń: Wydawnictwo UMK, 1991.
- Schmid, Bernhard. *Die Bau- und Kunstdenkmäler der Provinz Westpreußen*, Bd. IV *Marienburg*, H 14 *Kreis Marienburg*. Danzig: Verlag des Provinzial-Verbandes von Westpreußen. Kommissionsverlag von A. W. Kafemann G. M. B. H., 1919.
- Slánský, Bohuslav. *Technika malarstwa*, vol. 2. trans. Stanisław Gawłowski, Warszawa: Arkady, 1965.

- Szmelter-Fausek, Bożena, *Gdański warsztat malarski ostatniej ćwierci XVI i pierwszej połowy XVII w. na przykładzie twórczości Antona Möllera (1563/5–1611) i Hermana Hana (1580–1627/8)*, PhD, Nicolaus Copernicus University, Toruń 2013.
- Szmelter-Fausek, Bożena, Justyna Olszewska-Świetlik, *Blue Pigments in Blue and Purple Painting Layers of Gdańsk's Paintings of the Mid-16th to the End of the 18th Century*, "Colour research and application", 41, no 3 (2016): 270–275
- Szmelter-Fausek, Bożena, Justyna Olszewska-Świetlik, "The Study on Technology and Technique of the Painting 'Last Judgement' from St. James Church in Toruń". In: *Interdisciplinary Research on the Works of Art*, ed. Olszewska-Świetlik, Justyna, Joanna A. Arszyńska, Bożena Szmelter-Fausek, 209–217. Toruń: Wydawnictwo Naukowe UMK, 2012.
- Szmelter-Fausek, Bożena, "Wybrane obrazy ołtarzowe Hermanna Hana (1580–c. 1628) – zagadnienia technologiczne i konserwatorskie". In *Історія релігій в Україні*, том II, 609–616. Львів: Львівський музей історії релігії 2012.
- Szolginia, Barbara, Teofil Dąbrowski. *Konserwacja obrazu H. Hana „Koronacja NMP” z Głównego Ołtarza Katedry w Pelplinie*, dokumentacja prac konserwatorskich, Gdańsk 1957, Wojewódzki Urząd Ochrony Zabytków, sign. ZR/113/1, typescript.
- The report of the analysis of paintings by Frans Floris *Dieu rassemblant et protegeant son peuple par la grâce du crucifie* (1562) (No. INV 20746, ref. no. C2RMF: F2576), *Sainte Famille* (No. INV 2796, ref. no. C2RMF: F2578), *Vénus et l'Amor* (No. INV 28059, ref. no. C2RMF: F2575).
- Tylicki, Jacek. *Rysunek gdański ostatniej ćwierci XVI and pierwszej połowy XVII wieku*. Toruń: Wydawnictwo UMK, 2005.
- Tylicki, Jacek. "Sztuka Prus Królewskich. Malarstwo i rysunek". In: *Prusy Królewskie. Społeczeństwo, kultura, gospodarka 1454–1772*, ed. Edmund Kizik, 309–370. Gdańsk: Muzeum Narodowe w Gdańsku, 2012.
- Vandivere, Abbie. "In Search of van Mander's Primuersel: Intermediate Layers in Early Netherlandish Paintings". In: *ICOM-CC Working Group Art Technological Source Research*. Lisbon: Getty Research Institute, 2011, access 27.03.2017, <http://www.icom-cc-publications-online.org/PublicationDetail.aspx?cid=05b30243-1d2d-4d09-b8e8-3ef281cb3672>.
- Voss, Johannes. "Rysunki warsztatowe późnośredniowiecznych rzeźbiarzy". In: *Od badań do konserwacji*, 123–131. Toruń: Wydawnictwo UMK, 2002.




Table 1. The type of used materials and the technique

Cat. no.	Title, author, place of exposition		Dating	Support	Ground (colour, filler, binder)	Drawing	Insulation / imprimatura	Underpainting layer
1	2	3	4	5	6	7	8	9
1	Johann Connert's family epitaph, St Mary's Church in Gdańsk		1554–1556	wooden, oak*	white: chalk CaCO_3 , glutine glue	made with a brush, black water paint	glutine glue, oil insulation	grey en grisaille, white under the particular colour (blue, red)
2	Michael Loitz's epitaph, St Mary's Church in Gdańsk		1561–1564	wooden, oak*	white: chalk CaCO_3 , addition of lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, glutine glue	made with a brush, black water paint	white: lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, linen oil	in local colour, grey en grisaille underpainting in semi-shades and in shades: charcoal, lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$
3	Georg Hojer's epitaph, St Mary's Church in Gdańsk		1585	wooden, oak, regions in Eastern Poland, type B1	white: chalk CaCO_3 , lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, glutine glue	made with a brush, black water paint		grey en grisaille, white underpainting in lights



Cont. tab. 1

1	2	3	4	5	6	7	8	9
4	Jacob Schadius' epitaph, St Mary's Church in Gdańsk		1588	wooden, oak*	white: chalk CaCO_3 , lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$ glutine glue			grey en grisaille underpainting: charcoal, lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$ – in shades with dark, in semi-shades and in lights with light grey
5	Portrait Bishop Mauritius Ferber, Anton Möller, National Museum in Gdańsk		1590	wooden, oak*	white: chalk	made with a brush, black water paint		grey en grisaille underpainting
6	<i>Allegory of Pride</i> , Gdańsk artist from Hermann Han's circle (?), National Museum in Gdańsk		c. 1600	wooden, oak, regions in Eastern Poland, type B1	white: chalk CaCO_3 , glutine glue	made with a brush, brown oil paint	oil or oil-resin with addition of organic black and iron brown	
7	<i>Allegory of Pride</i> , Gdańsk artist from Hermann Han's circle (?), National Museum in Poznań		c. 1600		white: chalk CaCO_3 , glutine glue	made with a brush, brown oil paint	oil or oil-resin with addition of organic black and iron brown	




Cont. tab. 1

1	2	3	4	5	6	7	8	9
8	<i>The Model of the World</i> , Gdańsk artist from Hermann Hart's circle (?), National Museum in Poznań		c. 1600		white: chalk CaCO_3 , glutine glue	made with a brush, brown oil paint	oil or oil-resin with addition of organic black and iron brown	
9	<i>Allegory of Wealth</i> , Gdańsk artist from Hermann Hart's circle (?), National Museum in Poznań		c. 1600		white: chalk CaCO_3 , glutine glue	made with a brush, brown oil paint	oil or oil-resin with addition of organic black and iron brown	
10	<i>The Tribute Money</i> , Anton Möller, History Museum of Gdańsk		1601	wooden, oak	white: chalk CaCO_3 , glutine glue	made with a brush, brown oil paint	white: lead white 2PbCO_3 $\times \text{Pb(OH)}_2$	brown underpainting: lead white $2\text{PbCO}_3 \times \text{Pb(OH)}_2$ small $\text{CoO} \times \text{nK}_2\text{SiO}_3$, yellow ochre natural; robes painted with azurite: grey underpainting: lead white $2\text{PbCO}_3 \times \text{Pb(OH)}_2$, charcoal, iron brown, and light blue: natural azurite, lead white $2\text{PbCO}_3 \times \text{Pb(OH)}_2$, small $\text{CoO} \times \text{nK}_2\text{SiO}_3$





Cont. tab. 1

1	2	3	4	5	6	7	8	9
11	<p>Święt Ostateczny, Anton Möller's circle, St James Church in Toruń</p>		1603 (?)	wooden, linden	<p>brown: chalk, CaCO₃, iron yellow and umber; light grey ground: lead white 2PbCO₃ x Pb(OH)₂; charcoal; dark grey ground: charcoal, lead white 2PbCO₃ x Pb(OH)₂; emulsion binder: egg white, oil</p>			<p>grey en grisaille underpainting</p>
12	<p>Seven Acts of Charity, Anton Möller, St Mary's Church in Gdańsk</p>		1607	wooden, oak*	<p>white: chalk CaCO₃, glutine glue</p>	<p>made with a brush, brown oil paint</p>		<p>brown underpainting: iron yellow, red and brown, lead white 2PbCO₃ x Pb(OH)₂; organic black; robes modelled with lapis lazuli: light blue underpainting: fine grinded azurite, lead white 2PbCO₃ x Pb(OH)₂</p>





Cont. tab. 1

1	2	3	4	5	6	7	8	9
13	Servilius Appius, Isaac van den Blocke, History Museum of Gdansk		1608	wooden, oak*	white: chalk CaCO ₃ , small addition of minium Pb ₃ O ₄ , glutine glue	made with a brush, brown oil paint	grey: lead white 2PbCO ₃ x Pb(OH) ₂ , charcoal	minium Pb ₃ O ₄ , lead white 2PbCO ₃ x Pb(OH) ₂ , small CoO x nK ₂ SiO ₃
14	Last Supper, Anton Möller, St. Catherine's Church in Gdansk		1609–1611	wooden, oak*	white: chalk CaCO ₃ , glutine glue	made with a brush, brown oil paint		red underpainting: iron red, vermilion HgS, lead white 2PbCO ₃ x Pb(OH) ₂ , brown underpainting: organic black, iron brown, lead white 2PbCO ₃ x Pb(OH) ₂
15	Crucifixion, Anton Möller, St. Catherine's Church in Gdansk		1609–1611	wooden, oak*	yellow: iron yellow, chalk CaCO ₃ , pink: iron red, lead white 2PbCO ₃ x Pb(OH) ₂ , chalk CaCO ₃ , glutine glue	made with a brush, brown oil paint		pink underpainting: iron red, lead white 2PbCO ₃ x Pb(OH) ₂ , white underpainting: lead white 2PbCO ₃ x Pb(OH) ₂ , brown underpainting: iron brown, lead white 2PbCO ₃ x Pb(OH) ₂ , organic black

Cont. tab. 1

1	2	3	4	5	6	7	8	9
16	Concert of Angels, Hermann Han, Diocese Museum in Pelplin		1611	wooden, linden	grey: lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, chalk CaCO_3 , charcoal oil binder	made with a brush, brown oil paint		brown underpainting: iron brown pigment
17	Hans Gronau's family epitaph, Anton Möller's circle, St Mary's Church in Gdańsk		1612	wooden, oak*	l: white: chalk CaCO_3 addition of lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, glutine glue; li: brown: minium Pb_3O_4 , charcoal, chalk CaCO_3 , emulsion binder: egg white, oil	charcoal		in local colour or grey en grisaille underpainting: lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, charcoal
18	Subislaw's baptism and the foundation of the monastery in Oliwa, Hermann Han, Church of the Holy Trinity in Oliwa (Archcathedral)		1613	wooden, linden	grey: lead white (hydrocerusite) $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, chalk CaCO_3 , charcoal (wood), oil binder (linen oil)	made with a brush, brown oil paint		
19	Prussian attack on the monastery in Oliwa, Hermann Han, Church of the Holy Trinity in Oliwa (Archcathedral)		1613	wooden, linden	grey: lead white (hydrocerusite) $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, chalk (natural calcite CaCO_3 and quartz (SiO_2) , charcoal (wood), oil binder (linen oil)	made with a brush, brown oil paint		

Cont. tab. 1




1	2	3	4	5	6	7	8	9
20	<i>Adoration of the Shepherd</i> , Hermann Han, Assumption of Mary Church in Pelplin (Cathedral)		1618	wooden, oak	grey: lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, charcoal (wood), addition of chalk CaCO_3 and of minium Pb_3O_4 , emulsion binder (linen oil, caseine)	made with a brush, brown oil paint		
21	<i>Assumption of Mary</i> , Hermann Han, Assumption of Mary Church in Pelplin (Cathedral)		1618	wooden, oak	grey: lead white (hydrocerusite $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$ and ceruzyt PbCO_3), charcoal (wood), addition of chalk CaCO_3 and of minium Pb_3O_4 , emulsion binder (linen oil, caseine)	made with a brush, brown oil paint		brown underpainting: iron brown
22	<i>Coronation of Mary</i> , Hermann Han, Church of the Holy Trinity in Oliwa (Archcathedral)		after 1624	wooden, linden	grey: lead white (hydrocerusite $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, charcoal (wood), oil binder (linen oil))	made with a brush, brown oil paint		brown underpainting: iron brown
23	<i>St. Elisabeth serving the sick man</i> , Hermann Han, Assumption of Mary Church in Pelplin (Cathedral)		before 1625	wooden, oak*	white: chalk CaCO_3 ; grey: lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, charcoal (wood), oil binder (linen oil))	made with a brush, brown oil paint		

* Indicates wooden supports where oak wood was used and it was identified by visual analysis. In these paintings was not possible of wood sampling.

Table 2. Painting palette

Cat. no.	Title, author, place of exposition	Dating	Binder	White	Yellow	Red	Red shades and purples	Blue	Green	Brown and black	Gliding
1	Johann Conert's epitaph, St Mary's Church in Gdańsk	1554–1556	emulsion: linen oil, egg white – yolk; oil-resin binder: linen oil, natural resin (?)	lead white – $2PbCO_3 \times Pb(OH)_2$	iron yellow	vermilion HgS, organic red – carmine	dark purple: natural azurite $2CuCO_3 \times Cu(OH)_2$, organic red, charcoal	natural azurite $2CuCO_3 \times Cu(OH)_2$, small $CoO \times nK_2SiO_3$	natural malachite	charcoal	13
2	Michael Loitz's epitaph, St Mary's Church in Gdańsk	1561–1564	oil: linen oil; oil-resin binder: linen oil, natural resin (?)	lead white $2PbCO_3 \times Pb(OH)_2$	lead-tin yellow $2PbO \times SnO_2$, iron yellow	vermilion HgS, minium Pb_3O_4 , organic red – carmine, iron red	purple I: small $CoO \times nK_2SiO_3$, organic red – carmine; purple II (cold pink): small $CoO \times nK_2SiO_3$, lead white $2PbCO_3 \times Pb(OH)_2$, organic red – carmine	natural azurite $2CuCO_3 \times Cu(OH)_2$, small $CoO \times nK_2SiO_3$	natural malachite copper green	iron brown, charcoal	


Cont. tab. 2

1	2	3	4	5	6	7	8	9	10	11	12	13
3	Georg Heger's epitaph, St Mary's Church in Gdańsk		1585	emulsion: linen oil, egg white – caseine; oil-resin binder: linen oil, natural resin (?)	lead white $2PbCO_3 \times$ $Pb(OH)_2$	lead-tin yellow $2PbOxSnO_2$ iron yellow, organic yellow	vermilion HgS, minium Pb_3O_4 , organic red – carmine, iron red	purple: small CoO $x nK_2SiO_3$, vermilion HgS	small CoO $x nK_2SiO_3$, natural azurite $2CuCO_3 \times$ $Cu(OH)_2$		charcoal	
4	Jacob Schadius' epitaph, St Mary's Church in Gdańsk		1588	emulsion: linen oil, egg white – caseine; oil-resin binder: linen oil, natural resin (?)	lead white $2PbCO_3 \times$ $Pb(OH)_2$	lead-tin yellow $2PbOxSnO_2$ iron yellow	vermilion HgS, minium Pb_3O_4 , organic red – carmine, iron red	warm red: minium Pb_3O_4 , iron red, charcoal, small CoO x nK_2SiO_3	small CoO x nK_2SiO_3	copper green	charcoal	
5	<i>Portrait of the Bishop Mauritius Ferber</i> , Anton Möller, National Museum in Gdańsk		1590	not identified	lead white $2PbCO_3 \times$ $Pb(OH)_2$ (?)	lead-tin yellow $2PbOxSnO_2$ (?) iron yellow (?)	vermilion HgS (?), minium Pb_3O_4 (?)			copper green	organic black	


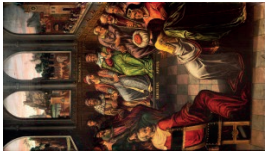
Cont. tab. 2

1	2	3	4	5	6	7	8	9	10	11	12	13
6	<p><i>Allegory of Pride</i>, Gdańsk artist from Hermann Hen's circle (?), National Museum in Gdańsk</p>		c. 1600	oil-resin	lead white (hydrocerusite $2\text{PbCO}_3 \cdot x$ Pb(OH)_2)	lead-tin yellow 2PbOxSnO_2 iron yellow	vermilion HgS, iron red, organic red		smalt CoO $x \text{ nK}_2\text{SiO}_3$ natural azurite $2\text{CuCO}_3 \cdot x$ Cu(OH)_2	copper green	natural umber, organic black	
7	<p><i>Allegory of Pride</i>, Gdańsk artist from Hermann Hen's circle (?), National Museum in Poznań</p>		c. 1600	oil-resin	lead white (hydrocerusite $2\text{PbCO}_3 \cdot x$ Pb(OH)_2)	lead-tin yellow 2PbOxSnO_2 iron yellow	vermilion HgS, iron red, organic red		smalt CoO $x \text{ nK}_2\text{SiO}_3$ natural azurite $2\text{CuCO}_3 \cdot x$ Cu(OH)_2	copper green	natural umber, organic black	
8	<p><i>The Model of the World</i>, Gdańsk artist from Hermann Hen's circle (?), National Museum in Poznań</p>		c. 1600	oil-resin	lead white (hydrocerusite $2\text{PbCO}_3 \cdot x$ Pb(OH)_2)	lead-tin yellow 2PbOxSnO_2 iron yellow	vermilion HgS, iron red, organic red		smalt CoO $x \text{ nK}_2\text{SiO}_3$ natural azurite $2\text{CuCO}_3 \cdot x$ Cu(OH)_2	copper green	natural umber, organic black	

Cont. tab. 2

1	2	3	4	5	6	7	8	9	10	11	12	13
9	<i>Allegory of Wealth</i> , Gdańsk artist from Hermann Han's circle (?), National Museum in Poznań		c. 1600	emulsion (linen oil, caseine), oil-resin in lakes	lead white (hydrocerusite) $2PbCO_3 \cdot x Pb(OH)_2$	lead-tin yellow $2PbO \cdot x SnO_2$ iron yellow	vermilion HgS, iron red, organic red	purple: organic red, natural azurite $2CuCO_3 \cdot x Cu(OH)_2$	smalt $CoO \cdot x K_2SiO_3$ natural azurite $2CuCO_3 \cdot x Cu(OH)_2$	copper green	natural umber, organic black	
10	<i>The Tribute Money</i> , Anton Møller, History Museum of Gdańsk		1601	oil-resin: linen oil and addition of nut oil (?), natural resin (?)	lead white (hydrocerusite) $2PbCO_3 \cdot x Pb(OH)_2$	lead-tin yellow type I $2PbO \cdot x SnO_2$ iron yellow	vermilion HgS, minium Pb_3O_4 , iron red, organic red – carmine	purple: smalt $CoO \cdot x K_2SiO_3$ organic red indicating carmine	smalt $CoO \cdot x K_2SiO_3$ natural azurite $2CuCO_3 \cdot x Cu(OH)_2$		iron brown, charcoal	gold foil Au on so-called gold paint lead-tin yellow $2PbO \cdot x SnO_2$ vermilion HgS, oil-resin binder
11	<i>Sąd Ostateczny</i> , Anton Møller's circle, St James Church in Toruń		1603		lead white $2PbCO_3 \cdot x Pb(OH)_2$	lead-tin yellow $2PbO \cdot x SnO_2$ iron yellow	vermilion HgS, minium Pb_3O_4 , iron red		natural azurite $2CuCO_3 \cdot x Cu(OH)_2$ and lead tin yellow $2PbO \cdot x SnO_2$		charcoal	gold foil Au on so-called red pulment: iron red with addition of minium Pb_3O_4 , and lead white $2PbCO_3 \cdot x Pb(OH)_2$ emulsion binder


Cont. tab. 2

1	2	3	4	5	6	7	8	9	10	11	12	13
12	Seven Acts of Charity, Anton Møller, St Mary's Church in Gdańsk		1607	oil-resin: linen oil with nut oil (?), natural resin (?)	lead white (hydrocerusite $2\text{PbCO}_3 \cdot \text{x}$ Pb(OH)_2)	lead-tin yellow $2\text{PbO} \cdot \text{xSnO}_2$ iron yellow, organic yellow pigment	vermillion HgS, minium Pb_3O_4 , iron red, organic red – carmine		natural azurite $2\text{CuCO}_3 \cdot \text{x}$ Cu(OH)_2 natural ultramarine $3\text{Na}_2\text{O} \cdot \text{x}$ $3\text{Al}_2\text{O}_3 \cdot \text{x}$ $6\text{SiO}_2 \cdot \text{x}$ $2\text{Na}_2\text{S}$ small $\text{CoO} \cdot \text{x}$ nK_2SiO_3	natural malachite	iron brown, organic black	
13	Servitius Appius, Isaac van den Blocke, History Museum of Gdańsk		1608	oil or emulsion (fat tempera); oil-resin in lakes	lead white $2\text{PbCO}_3 \cdot \text{x}$ Pb(OH)_2	lead-tin yellow type $1.2\text{PbO} \cdot \text{xSnO}_2$ iron yellow	vermillion HgS, minium Pb_3O_4 , iron red, organic red – carmine	purple: organic red – carmine, small $\text{CoO} \cdot \text{x}$ nK_2SiO_3	natural azurite $2\text{CuCO}_3 \cdot \text{x}$ Cu(OH)_2 natural ultramarine $3\text{Na}_2\text{O} \cdot \text{x}$ $3\text{Al}_2\text{O}_3 \cdot \text{x}$ $6\text{SiO}_2 \cdot \text{x}$ $2\text{Na}_2\text{S}$ small $\text{CoO} \cdot \text{x}$ nK_2SiO_3			




Cont. tab. 2

1	2	3	4	5	6	7	8	9	10	11	12	13
14	Last Supper, Anton Möller, St. Catherine's Church in Gdańsk		1609– –1611	oil or emulsion (fat tempera), oil-resin in lakes	lead white $2\text{PbCO}_3 \times$ Pb(OH)_2	lead-tin yellow 2PbOxSnO_2 iron yellow	vermilion HgS, iron red, organic red		natural azurite $2\text{CuCO}_3 \times$ Cu(OH)_2 natural ultramarine $3\text{Na}_2\text{O} \times$ $3\text{Al}_2\text{O}_3 \times$ $6\text{SiO}_2 \times$ $2\text{Na}_2\text{S}_4$ small $\text{CoO} \times$ nK_2SiO_3	natural malachite	iron brown, organic black	gold foil on oil-resin, brown patine
15	Crucifixion, Anton Möller, St. Catherine's Church in Gdańsk		1609– –1611	oil or emulsion (fat tempera), oil-resin in lakes	lead white $2\text{PbCO}_3 \times$ Pb(OH)_2	lead-tin yellow 2PbOxSnO_2 iron yellow	vermilion HgS, iron red, organic red		natural azurite $2\text{CuCO}_3 \times$ Cu(OH)_2 natural ultramarine $3\text{Na}_2\text{O} \times$ $3\text{Al}_2\text{O}_3 \times$ $6\text{SiO}_2 \times$ $2\text{Na}_2\text{S}_4$ small $\text{CoO} \times$ nK_2SiO_3	natural malachite	natural umber, organic black	gold foil on oil-resin, brown patine
16	Concert of Angels, Hermann Han, Diocese Museum in Pelplin		1611	oil-resin; linen oil, natural resin (?)	lead white $2\text{PbCO}_3 \times$ Pb(OH)_2	lead-tin yellow 2PbOxSnO_2 iron yellow	vermilion HgS, minium Pb_3O_4 , iron red, organic red		small CoO $\times \text{nK}_2\text{SiO}_3$, natural azurite $2\text{CuCO}_3 \times$ Cu(OH)_2	copper green	iron brown, charcoal	gold powder with oil-resin binder on the co-called gold paint

Cont. tab. 2

1	2	3	4	5	6	7	8	9	10	11	12	13
17	Hens Gronau's family epitaph, Anton Moller's circle, St Mary's Church in Gdansk		1612	emulsion: linen oil, egg white – caseine; oil-resin binder: linen oil, natural resin (?)	lead white 2PbCO ₃ x Pb(OH) ₂	lead-tin yellow 2PbOxSnO ₂	vermilion HgS, minium Pb ₃ O ₄ , iron red, carmine <i>Dactylopius coccus</i> or <i>Porphyrophora spp.</i> , red lake – <i>Rubia tinctorum</i> L.	I – purple: natural azurite, organic red indicating red lake II – purple: small CoO x nK ₂ SiO ₃ , natural azurite III – pink: carmine small CoO x nK ₂ SiO ₃ , lead white 2PbCO ₃ x Pb(OH) ₂ , organic red – carmine	small CoO x nK ₂ SiO ₃ , natural azurite 2CuCO ₃ x Cu(OH) ₂	copper green	iron brown, charcoal (wood)	
18	Subislaw's baptism and the foundation of the monastery in Oliwa, Hermann Han, Church of the Holy Trinity in Oliwa (Archcathedral)		1613	oil-resin: linen oil, natural resin (?)	lead white (hydrocerusite) 2PbCO ₃ x Pb(OH) ₂	lead-tin yellow 2PbOxSnO ₂ , iron yellow	minium Pb ₃ O ₄ , vermilion HgS, iron red, organic red	small CoO x nK ₂ SiO ₃ , natural azurite 2CuCO ₃ x Cu(OH) ₂				

Cont. tab. 2

1	2	3	4	5	6	7	8	9	10	11	12	13
19	<i>Prussian attack on the monastery in Oliwa</i> , Hermann Han, Church of the Holy Trinity in Oliwa (Archcathedral)		1613	oil-resin: linen oil, natural resin (?)	lead white (hydrocerusite $2\text{PbCO}_3 \cdot \text{x}$ Pb(OH)_2)	lead-tin yellow 2PbOxSnO_2 iron yellow	minium Pb_3O_4 , vermilion HgS, iron red, organic red		smalt CoO $\text{x nK}_2\text{SiO}_3$, natural azurite $2\text{CuCO}_3 \cdot \text{x}$ Cu(OH)_2	copper green – copper resinate	iron brown, charcoal (wood)	
20	<i>Adoration of the Shepherd</i> , Hermann Han, Assumption of Mary Church in Peplin (Cathedral)		1618	oil-resin: linen oil, natural resin (?)	emulsion: linen oil, caseine; oil-resin lakes: linen oil, natural resin (?)	lead-tin yellow 2PbOxSnO_2 iron yellow			smalt CoO $\text{x nK}_2\text{SiO}_3$, natural azurite $2\text{CuCO}_3 \cdot \text{x}$ Cu(OH)_2		iron brown, charcoal (wood)	
21	<i>Assumption of Mary</i> , Hermann Han, Assumption of Mary Church in Peplin (Cathedral)		1618	oil-resin: linen oil, natural resin (?)	lead white (hydrocerusite $2\text{PbCO}_3 \cdot \text{x}$ Pb(OH)_2 and cerusite PbCO_3)	lead-tin yellow 2PbOxSnO_2 iron yellow	minium Pb_3O_4 , vermilion HgS, organic red – carmine		smalt CoO $\text{x nK}_2\text{SiO}_3$, natural azurite $2\text{CuCO}_3 \cdot \text{x}$ Cu(OH)_2	copper green – resinous copper	iron brown, charcoal (wood)	

Cont. tab. 2

1													
22	Coronation of Mary, Hermann Hen, Church of the Holy Trinity in Oliva (Archcathedral)		after 1624	emulsion: linen oil, caseine; oil-resin: linen oil, poppy seed oil (?), natural resin (?)	lead white (hydrocerusite) $2PbCO_3 \cdot x Pb(OH)_2$	lead-tin yellow $2PbO \cdot x SnO_2$ iron yellow	minium Pb_3O_4 , vermilion HgS , iron red, organic red	I – purple (robes); natural azurite $2CuCO_3 \cdot x Cu(OH)_2$ finely grinded, organic red indicating carmine II – purple (sky): smalt $CoO \cdot x nK_2SiO_3$ lead white $2PbCO_3 \cdot x Pb(OH)_2$, organic red indicating carmine	small CoO $x nK_2SiO_3$, natural azurite	natural azurite $2CuCO_3 \cdot x Cu(OH)_2$ and lead white $2PbCO_3 \cdot x Pb(OH)_2$ underlayer of lead tin yellow $2PbO \cdot x SnO_2$ addition of iron red	iron brown, charcoal (wood)		
23	St. Elisabeth serving the sick man, Hermann Hen, Assumption of Mary Church in Peplin (Cathedral)		before 1625	oil-resin: linen oil, natural resin (?)	lead white $2PbCO_3 \cdot x Pb(OH)_2$	lead-tin yellow $2PbO \cdot x SnO_2$ iron yellow	minium Pb_3O_4 , vermilion HgS , iron red, organic red	natural azurite $2CuCO_3 \cdot x Cu(OH)_2$			iron brown, charcoal (wood)		



Fig. 1. *The Tribute Money*, Anton Möller, 1601. Cross-section of the sample of yellow robe. Photography under the VIS. Photo by Andrzej Skowroński and Zuzanna Rozłucka

1 – white ground: chalk CaCO_3 ; 2 – white imprimatura: lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 3 – brown underpainting: iron red hematyt Fe_2O_3 , lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, organic black; 4 – pink underpainting: vermilion HgS , lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 5 – yellow painting layer: lead-tin yellow type I Pb_2SnO_4 , lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, natural azurite $2\text{CuCO}_3 \times \text{Cu}(\text{OH})_2$; 6 – egg white varnish



Fig. 2. Michael Loitz's epitaph, 1561–1564. Cross-section of a sample of purple robe. Photography under the VIS and UV. Photo by Andrzej Skowroński and Zuzanna Rozłucka

1 – ground: chalk CaCO_3 ; 2 – white imprimatura: lead white $2\text{PbCO}_3 \times \text{Pb(OH)}_2$; 3 – purple painting layer: organic red – carmine, smalt $\text{CoO} \times n\text{K}_2\text{SiO}_3$; red painting layer – organic red – carmine, smalt $\text{CoO} \times n\text{K}_2\text{SiO}_3$; 5 – varnish

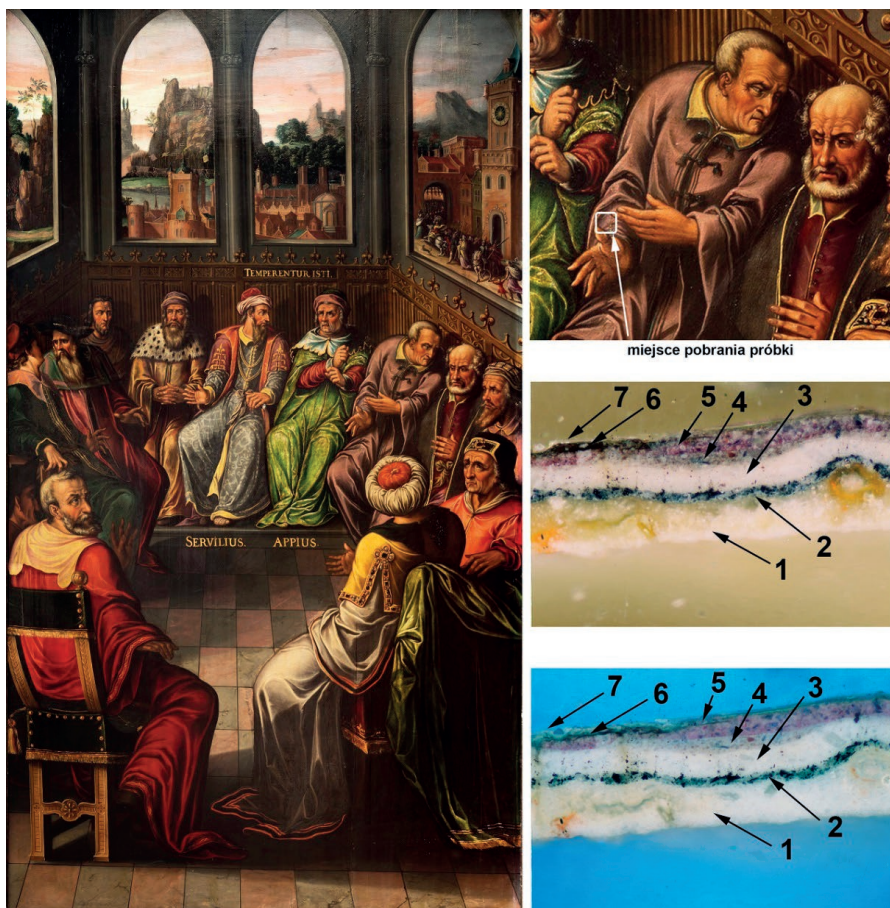


Fig. 3. *Servilius Appius*, Isaac van den Blocke, 1608. Cross-section of a sample of purple robe. Photography under the VIS and UV. Photo by Andrzej Skowroński and Zuzanna Rozłucka

1 – ground: chalk CaCO_3 ; 2 – grey imprimatura: charcoal, lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 3 – white underpainting: lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 4 – purple and blue painting layer: smalt $\text{CoO} \times n\text{K}_2\text{SiO}_3$, organic red indicating carmine; 5 – purple painting layer – organic red indicating carmine, smalt $\text{CoO} \times n\text{K}_2\text{SiO}_3$; 6 – red lake: organic red indicating carmine; 7 – varnish

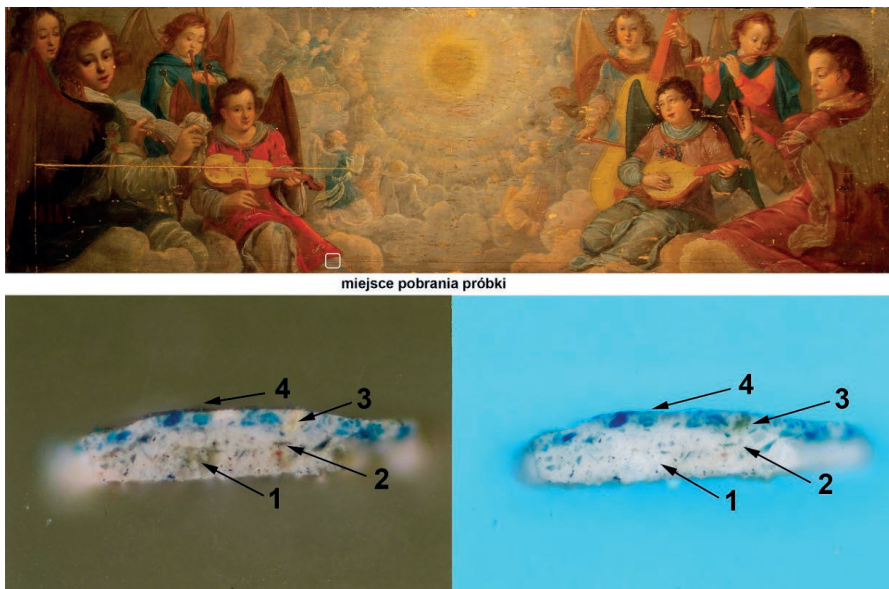


Fig. 4. *Concert of Angels*, Hermann Han, 1611. Cross-section of a sample of blue robe. Photography under the VIS and UV. Photo by Adam Cupa and Zuzanna Rozłucka

1 – grey ground: lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, chalk CaCO_3 , charcoal; 2 – light blue painting layer: smalt $\text{CoO} \times n\text{K}_2\text{SiO}_3$, lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 3 – blue painting layer: natural azurite $2\text{CuCO}_3 \times \text{Cu}(\text{OH})_2$, lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, lead-tin yellow $2\text{PbO} \times \text{SnO}_2$; 4 – secondary varnish

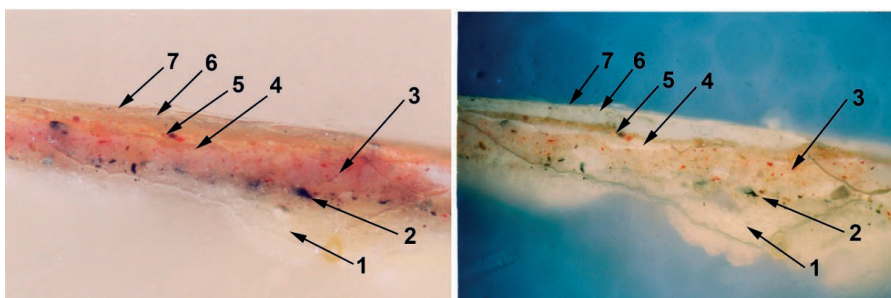


Fig. 5. *The Model of the World*, Gdańsk artist from Hermann Han's circle (?), c. 1600. Cross-section from the complex. Photography under the VIS and UV. Photo by Bożena Szmelter-Fausek and Zuzanna Rozłucka

1 – white ground: chalk CaCO_3 ; 2 – brown underpainting: iron brown pigment, charcoal; 3 – pink painting layer: vermilion HgS , lead white $2\text{PbCO}_3 \times \text{Pb(OH)}_2$, charcoal; 4 – varnish; 5 – pink painting layer: vermilion HgS , lead white $2\text{PbCO}_3 \times \text{Pb(OH)}_2$, charcoal; 6 – varnish; 7 – secondary varnish



Fig. 6. *Portrait of the Bishop Mauritius Ferber*, Anton Möller, 1590. Fragment. Photography under the VIS and infrared reflectography IR. Parallel lines of the drawing are visible through the painting layer. Photo by Božena Szmelter-Fausek

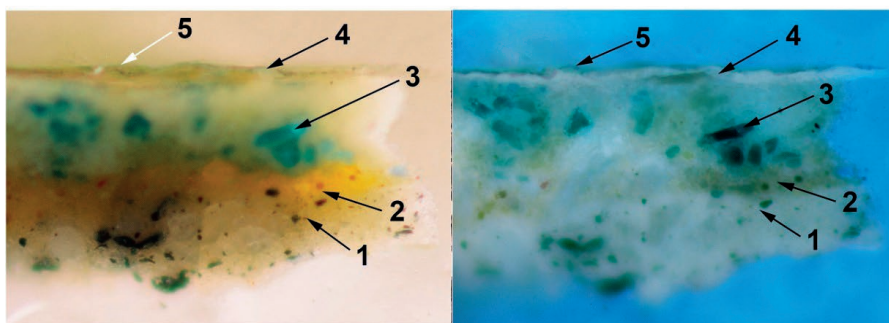


Fig. 7. *Coronation of Mary*, Hermann Han, after 1624, Holy Trinity Church (Cathedral) in Oliwa. Cross-section of a sample of green robe. Photography under the VIS and UV. Photo by Bożena Szmelter-Fausek and Zuzanna Rozłucka

1 – grey ground: lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, charcoal; 2 – yellow painting layer: lead-tin yellow type I 2PbOxSnO_2 , iron red; 3 – blue painting layer: natural azurite $2\text{CuCO}_3 \times \text{Cu}(\text{OH})_2$, lead-tin yellow type I 2PbOxSnO_2 , lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 4 – original varnish; 5 – secondary varnish

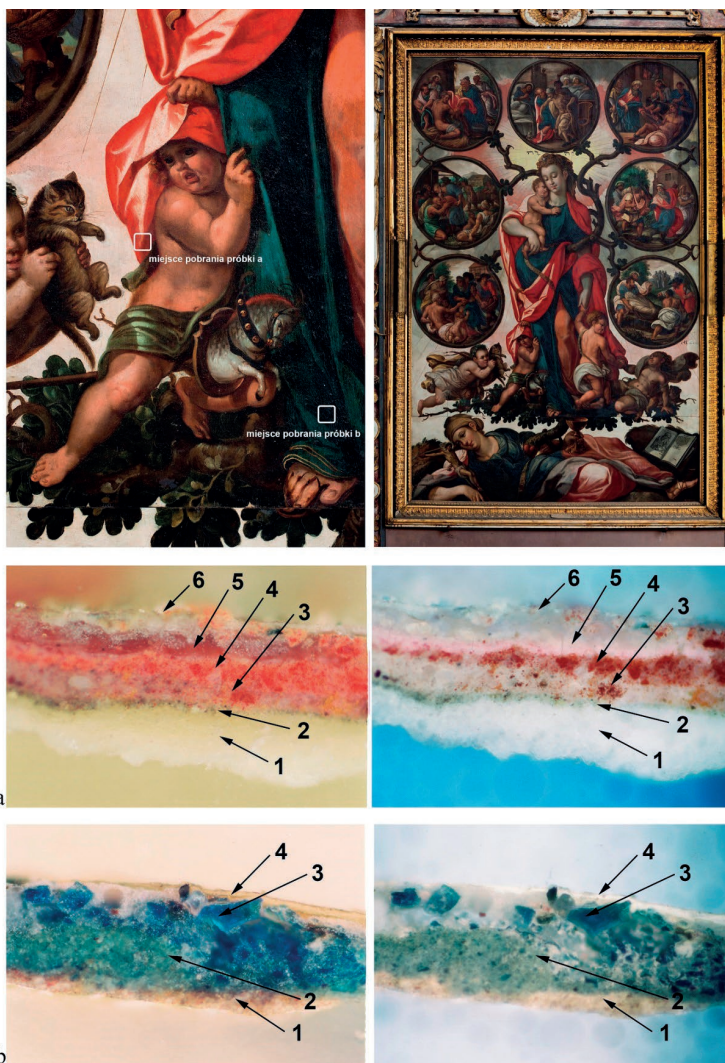


Fig. 8. *Seven Acts of Charity*, Anton Möller, 1607. Cross-section of a sample of red and blue robes. Photography under the VIS and UV. Photo by Andrzej Skowronski and Zuzanna Rozłucka

a) red robe: 1 – white ground: chalk CaCO_3 ; 2 – brown underpainting: organic black, iron red Fe_2O_3 , lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 3 – red painting layer: organic red indicating carmine, vermilion HgS , iron red Fe_2O_3 , lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 4 – red painting layer: vermilion HgS , iron red Fe_2O_3 , organic red indicating carmine, lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 5 – red lake: organic red indicating carmine; 6 – varnish

b) blue robe: 1 – brown underpainting: organic black, iron red Fe_2O_3 , lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 2 – blue painting layer: natural azurite $2\text{CuCO}_3 \times \text{Cu}(\text{OH})_2$, lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$; 3 – blue painting layer: natural azurite $2\text{CuCO}_3 \times \text{Cu}(\text{OH})_2$, natural ultramarine $3\text{Na}_2\text{O} \times 3\text{Al}_2\text{O}_3 \times 6\text{SiO}_2 \times 2\text{Na}_2\text{S}$, lead white $2\text{PbCO}_3 \times \text{Pb}(\text{OH})_2$, chalk CaCO_3 ; 4 – varnish

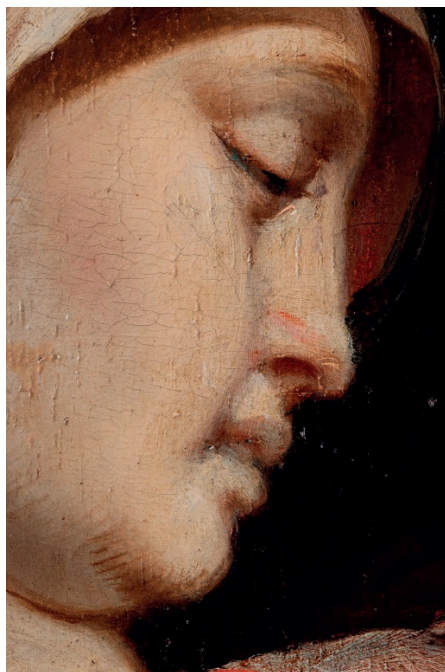


Fig. 9. *Crucifixion*, Anton Möller, 1609–1611. Fragment. Characteristic parallel brown lines of drawing emphasizing the shadows on the chin are visible. Photo by Andrzej Skowroński



Fig. 10. *Seven Acts of Charity*, Anton Möller, 1607. Signature AM in ligature 1607 made by Anton Möller the artist. Photo by Andrzej Skowroński

