— Art & Religion 7 —

From Conservation to Interpretation

Studies of Religious Art (*c.* 1100 – *c.* 1800) in Northern and Central Europe in Honour of Peter Tångeberg

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CONTENTS

THE EARLY MODERN PERIOD

POLYCHROME LIGHT IN MEDIEVAL NORWEGIAN CHURCH ART (12th-13th CENTURIES)[1]

Kaja KOLLANDSRUD

This paper focuses on light as a fundamental key to the visual perception of matter and form in the earthly world, its role in a Christian perspective, and how this is communicated in the physical polychrome object as a path to spiritual revelation. These are central themes in the author's current research into a deliberate visual vocabulary embedded in the polychrome expression of sculpture in Norway. This research examines the perception of religious polychrome objects seen through the 'medieval mind's eye' in its wider original context, and is based on examination of period texts of proto scientific and theological-philosophical nature, compared against analysis of original and reconstructed objects.

Both Sweden and Norway possess a significant number of extraordinarily well-preserved medieval painted sculptures.[2] Many retain a substantial amount of original polychromy which has never been overpainted, as is perfectly illustrated by the figure of St Paul from Gausdal (Fig. 1). But even in the

[1] I wish to thank my supervisors Lena Liepe, Department of philosophy, Classics, History of Art and Ideas, University of Oslo, and Giles E.M. Gasper, Department of History, University of Durham, for their sharing of knowledge, inspiration and firm guidance. Thanks are also due to Jeremy Hutchings, Armed Forces Museum of Norway, for good discussions and for going through my written English with a critical eye. Last but not least, this work would not have been undertaken without the many years in the stimulating work environment with my former colleagues Unn Plahter and Svein A. Wiik at the Studio for Conservation of Paintings and Polychrome sculpture within the Kulturhistorisk Museum (KHM — Museum of Cultural History, University of Oslo). This research is founded on the extensive and seminal analysis carried out by Unn Plahter.

[2] P. TÅNGEBERG, *Holzskulptur und Altarschrein. Studien zu Form, Material und Technik*, München, 1989; U. PLAHTER — E.B. HOHLER — N. MORGAN — A. WICHSTRØM (eds), *Painted Altar Frontals of Norway, 1250-1350*, London, 2004, vols. 2 and 3; M. BLINDHEIM, *Painted Wooden Sculpture in Norway, c. 1100-1250* (Medieval Art in Norway), Oslo, 1998; M. BLINDHEIM, *Gothic Painted Wooden Sculpture in Norway, 1220-1350*, Oslo, 2004; K. KOLLANDSRUD, *Technological Mapping of Norwegian Polychrome Wooden Sculpture, 1100-1350: a Preliminary Overview*, in E.H. HOFSETH (ed.), *UKM — en mangfoldig forskningsinstitusjon* (UKM skrifter, 1), Oslo, 2002, 125-141. A recent overview of polychrome sculpture in Europe was given in: U. PLAHTER, *Norwegian Art Technology in the Twelfth and Thirteenth Centuries: Materials and Techniques in a European Context*, in *Zeitschrift für Konservierung*, 28/1 (2014) 298-332.

Fig. 1 St Paul from Gausdal, Oppland (Norway), *c.* 1250-1300, 181.5 × 45.5 × 20 cm. Stockholm: Nordiska museet, on long-term loan to the Kulturhistorisk Museum at the University of Oslo (KHM C 35143). Photo: Svein A. Wiik © KHM, UiO

best-preserved examples the materials and binders, the balance between neighbouring colours, and, most conspicuously, the delicate nature of reflective metal surfaces has significantly changed over time. For many modern scholars, the altered surface has been an obstacle in the understanding of the pieces as a whole, since the changed appearance is difficult to interpret and to identify as original.

When discussing the role of these objects as imitations of goldsmithing, Unn Plahter reached the important conclusion that painters of the thirteenth century with their translucent glaze painting exceeded the ability of the goldsmith's to produce translucent enamels.[3] Here, the painted imitation surpassed the effect of the 'imitated'. The examination of the frontal from Komnes (Buskerud),

[3] U. PLAHTER, *Medieval Panting Materials and Techniques in Norway. To What Extent did the Painters Tempt to Simulate Goldsmiths' Work?*, in *Zeitschrift für Konservierung*, 24/1 (2010) 160-169; U. PLAHTER, *Materials and Techniques for Rendering Precious Appearance in Norwegian Painted Frontals and the Danish golden altars*, in P. GRINDER-HANSEN (ed.), *Image and Altar 800-1300. Papers from an International Conference in Copenhagen, 24-27 October 2007* (Publications from the National Museum Studies in Archaeology & History, 23), København, 2014, 195-206.

dated to *c*. 1230-1260, revealed how the characteristics of a metal surface was planned already in the carving of the wooden substrate, where the wooden profile mimics the deformation that occurs when twisting a profiled metal rod while hot.[4] The original imitation gilding is now lost.

The medieval painting technique with its clearly ordered and layered paint and limited palette, very well enables systematic mapping. Since the 1950s the painters' materials used have been thoroughly analysed and the diverse colours systematically identified by their hue as they occur in Newton's spectrum. The many combinations of the materials and the ways these have been applied were ordered, coded, counted and classified according to the materials identified. This analysis has brought to light clear and consistent tendencies in the way the diverse materials were used and in the technology that supported these developments. The material findings are in line with those found in Sweden and on the continent.[5] This type of methodical analysis together with Plahter's seminal work into the visual observation of the Norwegian frontals and sculpture has produced the rich datasets that underpin my research. As the painting techniques used in sculpture and panel paintings are identical, this article will focus on both.

Recreating former glory

Research-based reconstructions have demonstrated the degree of loss of painterly effects in the originals. The recreation, in the late 1980s, of the Virgin from Hedalen (Oppland), originally from the mid-thirteenth century, was a true break-through in this regard (Fig. 2).[6] It was based on a combination of visual

[4] K. KOLLANDSRUD — N. HUTH, *Beyond the Precious: Thirteenth-Century Painterly Effects in the Sculpted Frontal from Komnes, Buskerud, in Norway*, in GRINDER-HANSEN (ed.), *Image and Altar*, 229-246.

[5] For an overview of the historical background for the research situation see: TÅNGEBERG, *Holzskulptur und Altarschrein*, 1-2; E.S. SKAUG, *A Driving Force*, in J. NADOLNY — K. KOLLANDSRUD — M.L. SAUERBERG — T. FRØYSAKER (eds), *Medieval Painting in Northern Europe: Techniques, Analysis, Art History. Studies in the Commemoration of the 70th Birthday of Unn Plahter*, London — Oslo, 2006, xi—xv; L. KARGÈRE — M.D. MARINCOLA, *Conservation in Context: The Examination and Treatment of Medieval Polychrome Wood Sculpture in the United States* (Metropolitan Studies in Art, Science, and Technology, 2), New York NY, 2014, 11-50.

[6] The reconstruction was made in the restoration studio of the KHM as part of a research project finished in 1998. The work was carried out by the painting conservators Svein A. Wiik, Anette Høyer and the author with Unn Plahter. S.A. WIIK, *The Hedalen Madonna: One of Norway's Most Important Medieval Works of Art*, in K. BLOMSTRØM (ed.), *Colour Between Art and Science, Department of Colour*, Oslo, 1998, 318-335; U. PLAHTER, *Appendix: The Virgin*

observation and scientific analysis of the original sculpture, together with more than thirty years of experience drawn from material research into medieval painting. The fourteenth-century *Líkneskjusmið*, a rare fragmented Old Norse text that describes the procedures when preparing and applying the chalk ground and silver leaf gilding of a sculpture, was also consulted.[7] Using similar materials, binders and tools as in the time of its making, as far as our knowledge stretched at that time, together with reconstructed application techniques, the result was as close as possible to the original when it first came out of the medieval workshop.

The frontal from Tingelstad I, dated to the last quarter of the thirteenth century, is another example of early northern oil-based painting (Fig. 3).[8] It was originally placed in the medieval church of Tingelstad (Hadeland) and is now preserved in the Museum of Cultural History (Kulturhistorisk museum, henceforth abbreviated KHM) of the University of Oslo. A reconstruction of the panel was produced in 2012.[9] Once again the work was performed with intimate access to the original and was based on our present knowledge and former experience.

from Hedalen — Materials and Painting Technique, in BLOMSTRØM (ed.), *Colour Between Art and Science*, 56-57. For the reconstruction of the whole tabernacle ensemble, see also: M. STEIN, *Madonnaskapene i Hedalen og Reinli stavkirker. Forslag til rekonstruksjon av skapenes opprinnelige utseende*, in *Collegium Medievale*, 23 (2010) 58-91; for further notes on the perception of the ensemble see: K. KOLLANDSRUD, *A Perspective on Medieval Perception in Norwegian Church Art*, in N.L.W STREETON — K. KOLLANDSRUD (eds), *Paint & Piety. Collected Essays on Medieval Painting and Polychrome Sculpture*, London — Oslo, 2014, 51-66.

[7] U. PLAHTER, *Líkneskjusmíð: 14th Century Instructions for Painting from Iceland*, in L. BERCZELLY — M. MALMANGER — S. FUGLESANG (eds), *Norwegian Medieval Altar Frontals and Related Material*, Roma, 1995, 157-172; S. WIIK, *Líkneskjusmíð. Medieval Polychrome Technique in Iceland*, in *Zeitschrift fur Kunsttechnologie und Konservierung*, 9/2 (1995) 327-336.

[8] PLAHTER — HOHLER — MORGAN — WICHSTRØM (eds), *Painted Altar Frontals of Norway*, vol. 2, 269-272.

[9] The project was led by the paintings conservators Katrine Scharffenberg and Anne Milnes in collaboration with KHM. The reconstruction was made by order and financed by the Gran Kirkelige Fellesråd under agreement with Riksantikvaren (the Norwegian Directorate for Cultural Heritage). The reconstruction was an alternative solution to repatriating the original frontal, now in KHM. Boat builder Lars Stålegård from Kulturhåndverkerne carried out the carpentry, gilder Sarah B. Eggen applied the chalk ground and the silver leaf gilding, while the earlier mentioned painting conservators Scharffenberg and Milnes performed the painting. The work was carried out in the Conservation Studio for Painting and Polychrome Sculpture at KHM, side by side with the original panel. The project was supervised by the painting conservator Eivind Bratlie and the author. For more information on the original frontal see: PLAHTER — HOHLER — MORGAN — WICHSTRØM (eds), *Painted Altar Frontals of Norway*, vol. 2, and the blog that followed the making of the frontal step by step: rekonstruksjon.wordpress.com [accessed 15 December 2015].

Fig. 2 The Virgin from Hedalen, Oppland (Norway): original (*c.* 1250, now in the church) and reconstruction. The figure (140 × 52 × 33 cm) was the central figure of a tabernacle shrine that with the crowning measured up to a height of 350 cm. The reconstructed sculpture is in the Kulturhistorisk Museum at the University of Oslo. Photo: Eirik Irgens Johnsen © KHM, UiO

Fig. 3 The frontal from Tingelstad, Oppland (Norway) I, *c.* 1275-1300, 98.5 × 160 cm. The panel is now in the Kulturhistorisk Museum at the University of Oslo (C 5040). Photo: Mårten Teigen © KHM, UiO

The new frontal was mounted in the space once occupied by the original, in front of the altar in the old church of Tingelstad, a stone building from *c.* 1220.[10] This is now a museum church in which the lighting conditions in the choir are close to what they would have been when the frontal was first placed there (Fig. 4). When located in the original space, the imitation gold interacts with the constantly changing natural light, which brings the panel to life, as it were. The light play on its surface contributes to a softened perception of the picture plane where the ever-changing intensity disrupts the impression of the solid surface and adds to the depth of the coloured glazes. We experienced this as a visual dissolving of the surface, to such an extent that the picture can be perceived almost as three-dimensional. A photo taken from the main entrance on a normal, slightly overcast day in June (Fig. 5) shows how the natural light entering the space causes the imitation gold, that is a golden glaze over silver leaf, to glow in front of the altar.

[10] The church is also named Saint Petri, see Ø. EKROLL — M. STIGE, *Kirker i Norge 1. Middelalder i stein*, Oslo, 2000, 62-64.

Fig. 4 Tingelstad I frontal reconstructed and mounted in the same place the original once occupied in St Peter's church, Hadeland, Oppland (Norway). Photo: Anne Milnes

What are we looking at?

The golden effect was produced by the application of a yellow glaze over silver leaf that is burnished to a high gloss (Fig. 6). This technique gained popularity in the thirteenth century, being applied to prominent parts of paintings, seemingly replacing the former use of gold leaf in sculpture.[11] Analysis has identified the glaze as either unpigmented pure pine resin, often with linseed oil or

[11] PLAHTER — HOHLER — MORGAN — WICHSTRØM (eds), *Painted Altar Frontals of Norway*, vol. 2, 192.

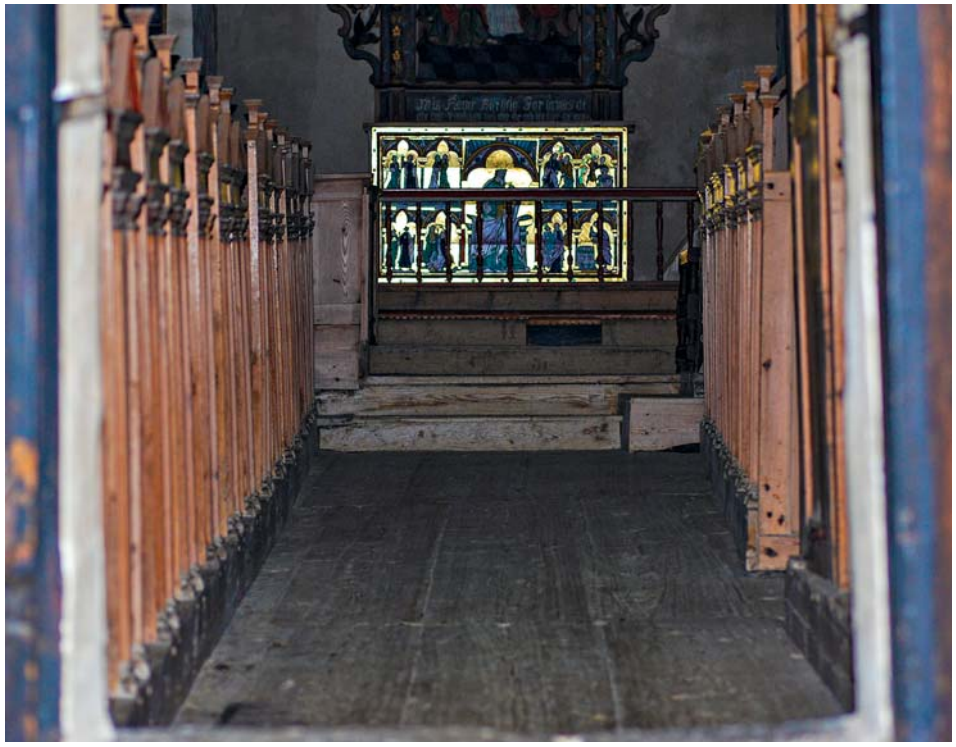

Fig. 5 Reconstruction of the frontal from Tingelstad I seen glowing in the natural incoming light from the windows. Photo: Kaja Kollandsrud (June 2012)

heat-bodied oil added to it.[12] The result is a clear yellow glaze with a high level of transparency. The principle is basically the same as the metal leaf tesserae

[12] GC-MS analyses have shown that the yellow glaze over silver leaf was mainly heat-treated pine resin that often contained some linseed oil, possibly to improve the handling properties and toughen the resulting film. Larch resin was identified in the frontal from Odda, now in the University Museum of Bergen, MA 8. For more on the analysis, see: PLAHTER — HOHLER — MORGAN — WICHSTRØM (eds), *Painted Altar Frontals of Norway*, vol. 2, xiv, 75-77, 168-174, 192; PLAHTER, *Norwegian Art Technology*, 315. GC-MS analysis of the yellow glaze of the imitation gold in the Virgin from Hedalen indicated that it contained pine resin with no addition of oil. See: PLAHTER, *Appendix: The Virgin from Hedalen*, 56. The glaze was reconstructed after Plahter's idea of collecting the first resin/turpentine extracted in the beginning of a traditional tar burning of resin-rich pinewood roots. The heated balsam was distilled with its natural turpentine before the higher temperatures turned the product into a non-drying tar. The colour was caused by heat only. The experience from the reconstruction of the Virgin from Hedalen was that the black outlines on the yellow glaze softened and displaced the soft resin, making no room for corrections. For practical reasons shellac therefore replaced the resin glaze on the silver

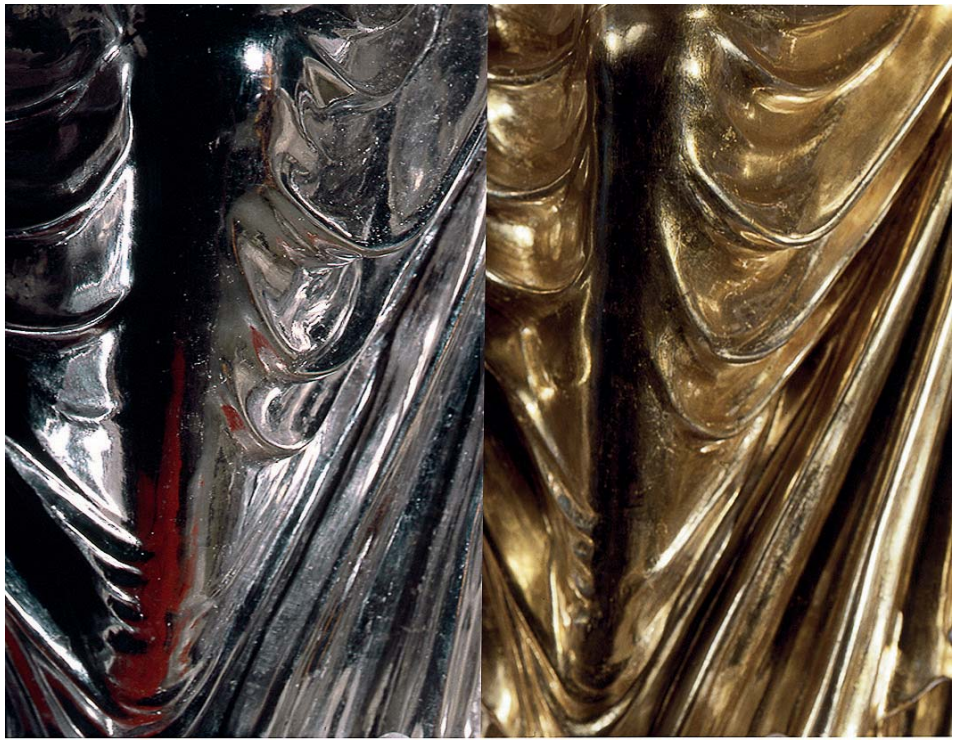

Fig. 6 Polished silver surface and imitation gold reconstructed by the application of a pure pine resin. Photo: Conservation studio © KHM, UiO

found in Byzantine and the Islamic Levant;[13] light travels through the translucent medium and is reflected back from the highly polished metal surface. The

in the reconstruction of the imitation gold in the frontal from Tingelstad I, to enable corrections in the black lines.

[13] In mosaic tesserae the metal leaf (gold/silver or their alloys) is sandwiched between a glass support and a thin protective glass layer, the cartellina. The cartellina can, like the glazes on silver in Norwegian polychrome, be coloured. This technique was practiced from Antiquity on and was used in abundance in Byzantine wall mosaics. M. VERITÀ — L. JAMES — I. FREESTONE — J. HENDERSON — M-D. NENNA — N. SCHIBILLE (eds), *The Leverhulme Network of the Composition of Byzantine Glass Mosaic Tesserae: Glossary of Mosaic Glass Terms* (ed. by B. BJORNHOLT), University of Sussex, 2009; L. JAMES, *Byzantine Glass Mosaic Tesserae: Some Material Considerations*, in *Byzantine and Modern Greek Studies*, 30/1 (2006) 29-47, here 45; P. LOUKOPOULOU — A. MOROPOULOU, *Non-destructive Analysis of Altered Gold-leaf Glass Tesserae From the Mosaics of the Daphni Monastery, Greece*, in H. ROEMICH — K. VAN LOOKEREN CAMPAGNE (eds), *Recent advances in glass, stained-glass and ceramic conservation 2013*, in *ICOM-CC Glass and Ceramics Working Group interim meeting and Forum of the International Scientific Committee for the Conservation of Stained Glass* (Corpus Vitrearum-ICOMOS), Zwolle, 2013, 31-39.

translucent glaze diffuse the reflected light by subsurface scattering, throwing the light back to the viewer from many different directions. The result is glowing and radiant, as if the glaze is internally illuminated. By comparison specular reflection of light from an unmoderated polished metal surface can be experienced as harsh and uninteresting. There are early examples where gold leaf was also varnished. When the glaze is applied onto the rougher surface of the oil gilding the light scattering diminishes as the glaze replaces the rough surface with smooth.[14]

When performing the challenging ground-gilding with silver leaf applied directly onto the chalk ground,[15] replication of the original quality of workmanship confirms that the glaze does not hide any flaws in the silver; on the contrary, these become exaggerated. This suggests that such a method was not chosen as an easy way of achieving a visually uniform golden surface.

In the painted figures on the Tingelstad I frontal the dense, mat blue of the azurite bound in an aqueous medium alternates between the saturated red and green oil-based glazes. Because the figures are underpainted with a lead white, that is less reflective than the polished silver, they appear as darker silhouettes when viewed at a distance, their colours only becoming apparent when the viewer comes closer. There are examples where the whole panel painting is based on coloured glazes applied to silver leaf gilding. This would have caused the entire surface to glow and radiate. These examples of the so-called transparent style are in agreement with a taste for bright and luminous glazes and include a substantial use of thick, red and green glazes.[16] The use of heat-bodied

[14] The application of a yellow glaze on the gold was identified on the crucifix from Hemse (Gotland, Sweden) dated on stylistic grounds to 1170-1190. See: P. TÅNGEBERG, *The Crucifix from Hemse*, [reprint from 1984], in NADOLNY — KOLLANDSRUD — SAUERBERG — FRØYSAKER (eds), *Medieval Painting in Northern Europe*, 1-10, here 7 and U. PLAHTER, *The Crucifix from Hemse: Analyses of the Painting Technique*, ibid., 11-19, here 18; Another example, probably oil/resin-based, is the early thirteenth-century sculpture from Dyste, Norway, now in KHM (C 1525). M. SELSJORD, *The 'Golden Madonna' from Dyste Church*, in *Technologia artis* (Yearbook of the Historical Archives of Historical Art Technology, 3), Praha, 1993, 113-116.

[15] 'Ground-gilding' is a type of burnished gilding without the application of a poliment on the ground layer. The term was first defined by J.M. NADOLNY, *The Techniques and Use of Gilded Relief Decoration by Northern European Painters,* c. *1200-1500*, PhD thesis, University of London, 2001, 122. See also: J.M. NADOLNY, *All that's Burnished isn't Bole. Reflections on Medieval Water Gilding. Part 1: Early Medieval to 1300*, in NADOLNY — KOLLANDSRUD — SAUERBERG — FRØYSAKER (eds), *Medieval Painting in Northern Europe*, 148-162. The use of a poliment, such as bole, has not been identified in the Norwegian material before 1350.

[16] Examples are Hauge (University Mueum of Bergen, MA 185), Kaupanger (University Museum of Bergen, MA 14) and Heddal (KHM, C 34746). See: PLAHTER — HOHLER —

oil made it possible to apply thick glazes while reducing the risk of paint deformation during drying while the addition of resin has normally been attributed to it aiding an increased transparency.[17] This created a deep saturated colour with a rich subsurface scattering of light within the layer.

Theory of colour

The following section will discuss how the medieval cosmos and its colours were described in terms of light. This is far removed from our modern Western understanding, based on Isaac Newton's theories developed from his experiment in 1672, when he resolved white light into its composing colours by refraction through a prism onto a white surface.[18] Both John Gage and Liz James have pointed out how the Newtonian approach to describing colour by their hue (blue, green, red, etc.) has dominated our modern Western understanding since this time to such an extent that 'colour' and the limited aspect of their 'hue' are used as virtually synonymous.[19]

This way of reading colour would indeed be foreign to a medieval mind, to which colour, form and light were inter-related parameters. The early classification systems, of which Aristotle was the most influential, were based on a tonal classification of the colours' inherent darkness and brightness, measured on a sliding scale between black and white, where black is the absence of light.[20] Aristotle based the tonal classification in his *Meteorologica* on his observation of how light changes throughout the day, from the bright white of midday through to the pitch-blackness of midnight. Furthermore, he associated colours with the four elements: fire, water, earth and air.

MORGAN — WICHSTRØM (eds), *Painted Altar Frontals of Norway*, vol. 3, 19, 23, 27; PLAHTER, *Norwegian Art Technology*, 315; PLAHTER, *Materials and Techniques*, 198.

[17] PLAHTER, *Norwegian Art Technology*, 315.

[18] A.E. SHAPIRO, *Artists' Colors and Newton's Colors*, in *Isis*, LXXXV/4 (1994) 300-360.

[19] J. GAGE, *Colour in History: Relative and Absolute*, in *Art History*, 1/1 (1978) 104-130, here 107; J. GAGE, *Colour and Culture. Practice and Meaning from Antiquity to Abstraction*, Berkeley CA, 1993, 70; Liz James discusses the pre-Newton colour perception in Byzantium and the Classical world in: L. JAMES, *Colour and the Byzantine Rainbow*, in *Byzantine and Modern Greek Studies*, 15/1 (1991) 66-95 and L. JAMES, *Light and Colour in Byzantine Art*, Oxford, 1996, 15, while Heather Pulliam points to the general up-to-date references of various art historical approaches to colour both in and beyond the Middle Ages. She applies the pre-Newton colour perception to insular manuscripts: H. PULLIAM, *Color*, in *Studies in Iconography*, 33 (2012) 3-14.

[20] GAGE, *Colour in History*, and JAMES, *Light and Colour*.

Analysis of the Norwegian material has suggested that the use of bright, unadulterated colours is characteristic for the medieval painter's palette in this period, which is the same as identified elsewhere in Europe.[21] The colours are built up in clearly layered structures within precisely defined fields of bright and pure colour in a single hue, consisting most often of one or two pigments. The colours could be desaturated and lightened either by adding white or by the application of saturated pure colour over a lighter underpaint, exposed in half-tones and highlights. If two pigments are mixed, it is often a lighter pigment within the same hue that were used to brighten the colour, such as, red lead mixed with the darker red vermilion; black was generally not employed to darken the paints in the Norwegian materials. This is concurrent with contemporary theory of Aristotle and Averroes where darkness is seen as the privation (*privatio*) of light.[22] Mixing black with colour would bring down its tonal value, making it less saturated and therefore devaluing the colour within the material hierarchy.

Whenever two differently coloured elements meet, they are delineated in black and the details within the defined areas are also drawn in black, such as the imitation of precious stones or architectural elements.[23] The dark lines define the form by bringing the image together.[24] The extensive use of outlining went out of fashion in the fourteenth century when a more directly

[21] For detailed information on the palette and the application of the paints, see: PLAHTER, *Norwegian Art Technology*, 316; PLAHTER — HOHLER — MORGAN — WICHSTRØM (eds), *Painted Altar Frontals of Norway*, vol. 2, 51-55, part III. The use of pictorial layers usually composed of one or two pigments, with nuances resulting from mixtures being rare, was also identified in the thirteenth-century Mosan sculpture, see: E. MERCIER, *The Polychromy of the Mosan Wooden Sculpture of the 13th century*, in *ICOM Committee for Conservation, Triennium newsletter*, 2008-2010/1 (2008) 8-10. For a high quality thirteenth-century work in England see: P. BINSKI — A. MASSING (eds), *The Westminster Retable. History, Technique, Conservation* (Painting and Practice HMPP, 2), Turnhout, 2009. See also: D. KARL, *Die Polychromie der Naumburger Stifterfiguren: Kunsttechnologische Untersuchung der Farbfassungen des 13. und 16. Jahrhunderts*, Regensburg, 2015.

[22] G. DINKOVA-BRUUN — G.E.M GASPER — T.C.B MCLEISH — M. HUXTABLE — C. PANTI — H. SMITHSON, *The Dimensions of Colour: Robert Grosseteste's* De colore. *Edition, Translation, and Interdisciplinary Analysis* (Durham Medieval and Renaissance Texts, 4), Toronto, 2013, 22-24, 20.

[23] The use of black contour lines has a long tradition. James describes the use of black outlines tightly set with single-colour tesserae in mosaics in Rome in the late sixth and early seventh centuries. Each form is clearly defined with dark outlines, resulting in a unified surface to indicate the basic form. Colour is used within this framework to create a glittering effect. JAMES, *Light and Colour*, 3.

[24] In two-dimensional panel paintings the facial features and drapery folds are also marked with black lines.

performed painterly style with fewer layers and more mixed paints were used to model light and shadow. The luminous imitation gold backgrounds in the panel painting can in this period be seen performed in the yellow opaque orpiment applied in one single layer.[25] The yellow colour then signalled the bright end of the spectre by its hue without the visual interaction of refracted light.

Within this framework of black outlines, the painter worked not only with hue, but also manipulated the form by varying its surface texture; matt surfaces often oppose richer glossy paint and the mirroring effect of applied metal leaf and foil. Opaque, transparent or semi-transparent paints contributed to the three-dimensional modelling, and glazes added depth and luminosity. The transparent paints were achieved by using linseed oil, which gradually becomes the favoured binding medium in northern Europe in the thirteenth century. Walnut oil has also been identified in addition to resins, gums, glues and egg tempera.[26]

These saturated pure radiant and unmixed pigments and metal foils were refined and precious materials resided high in the material hierarchy of the medieval cosmos. Unn Plahter has identified two dominant trends that appear to run in parallel in the latter half of the twelfth century: the 'lively painted' and the 'golden' objects.[27] This is the period before oil painting was widely practiced. Water-miscible systems and oil-based paints have been identified, both separate and within the same object. It is in the thirteenth century that the oil medium becomes the standard and the transparency of pigments with a high refractive index in this medium is explored fully.

The 'lively painted style' is characterized by opaque, bright and saturated primary colours, such as the blue lapis lazuli or further refined, ultramarine, vermilion red, yellow orpiment and tin foil decoration. The cross from a crucifix with unknown origin in the Oslo Museum of Cultural History is typical for the earlier painting bound in an aqueous medium (Fig. 7).[28] The bright pigments bound in a water-based medium create a lean matt appearance as reflected light is scattered from the rough opaque surface. Highlights are performed as

[25] PLAHTER — HOHLER — MORGAN — WICHSTRØM (eds), *Painted Altar Frontals of Norway*, vol. 2, 75.

[26] See the deeper discussion and further examples in: PLAHTER — HOHLER — MORGAN — WICHSTRØM (eds), *Painted Altar Frontals of Norway*, vol. 2, 160.

[27] PLAHTER, *Norwegian Art Technology*, 307.

[28] K. KOLLANDSRUD, *(311) Holzkruzifix*, in C. STIEGEMANN — M. KROKER — W. WALTER (eds), *Credo. Christianisierung Europas im Mittelalter* (exh. cat. Diözesanmuseum Paderborn), 2 vols., Petersberg, 2013, vol. 2, 366-368.

Fig. 7 Cross from crucifix of an unknown origin, *c.* 1170-1180, 146 (with tenon) × 88.3 × 3.8 cm, now in the Kulturhistorisk Museum at the University of Oslo (C 33267); reconstruction and original. Photo: Conservation studio © KHM, UiO

dotted lines in colour or white to accentuate and outline the forms. The parallel 'golden style' is dominated by the use of precious metals such as gold leaf and gemstones, both real and imitated. The Virgin from Hove (*c.* 1230) is an example of this 'golden style' in Norway (Fig. 8).[29]

There is a marked shift around the second quarter of the thirteenth century away from the opaque, rich and saturated colours of the 'lively painted style' towards a staging of light, with the polychrome expression based on the oil-bound painting with transparent and semi-transparent glazes. This would dominate the painterly expression of the remaining thirteenth century. Unn Plahter has called this the 'transparent style' of which the Tingelstad frontal is an example.[30] The oil medium becomes main-stream in a painting technique that plays on the effects created through degrees of translucency applied onto highly polished reflecting

[29] B. KALAND, *Baldakin fra Hopperstad — Madonna fra Hove*, in *Fortidsminner*, LIX (1973) 1-14.

[30] PLAHTER, *Materials and Techniques*, 199.

Fig. 8 The Virgin from Hove, Sogn og Fjordane (Norway), now in the University Museum of Bergen (Norway), dating from *c.* 1230, is an example of the 'golden style'. Tabernacle: 124 × 52.2; canopy: 25.7 × 51.2 × 48.7; Virgin: 94 × 45.5 × 35.5 cm; now brutally sawn off beneath the knees. Photo Svein Skare © University Museum of Bergen

metal surfaces or lighter underpaints. The adoption of techniques that acknowledge the interaction of light is also seen in architecture where the steadily larger windows and openings increase the illumination and the use of transmitted colour through stained glass on a more grand scale in cathedrals.

The concept of diaphaneity or translucency as a property of natural bodies derives from Aristotle's *De anima*. This he considers as an invisible quality and a potential attribute of air, water and so forth. Light is always needed to generate colour that, according to Aristotle, is on the surface of bodies and is active by itself when actualized by light.[31] The anonymous work *De coloribus* describes colours according to the elemental admixture theory of Aristotle's *De sensu et sensate* in which three factors contribute in the generation of colours:

> the light, the medium through which the light is seen, such as air and water, and thirdly the colours forming the ground, from which the light happens to be reflected.[32]

In the early thirteenth century Robert Grosseteste developed Aristotle's theory further. In his technical treatise *De colore* he takes into account the properties of the medium through which the light is passing acknowledging colour as both a property of light and matter: "Colour is light incorporated into a diaphanous medium".[33] Using mathematical concepts, he bases his colour theory on an infinite three-dimensional colour space, which describes intensity, hue, and saturation, and the material connection of the latter with scattering media. This replaces the Aristotelian one-dimensional arrangement; the sliding scale based on seven colours between white and black, with a three-dimensional scheme in

[31] C. PANTI, *Robert Grosseteste's Cosmology of Light and Light Metaphors: A Symbolic Model of Sacred Space*, In N. TEMPLE — S. HENDRIX — C. FROST (eds), *Bishop Robert Grosseteste and Lincoln Cathedral. Tracing Relationships between Medieval Concepts of Order and Built Form*, Abingdon, 2014; DINKOVA-BRUUN — GASPER — MCLEISH — HUXTABLE — PANTI — SMITHSON, *The Dimensions of Colour*, 22-24.

[32] H.E. SMITHSON — G. DINKOVA-BRUUN — G.E.M. GASPER — M. HUXTABLE — T.C.B. MCLEISH — C. PANTI, *A Three-Dimensional Color Space from the 13th Century*, in *Journal of the Optical Society of America*, A 29 (2012) A346-A352, here A347. Authorities have agreed that Aristotle did not write this tract. It has also been ascribed both to Theophrastus (371-287 BCE) and Strato († *c.* 269 BCE), but there is really no evidence upon which to determine authorship. The treatise probably emanated from one of the Peripatetic Schools.

[33] *Color est lux incorparata perspicuo*: DINKOVA-BRUUN — GASPER — MCLEISH — HUXTABLE — PANTI — SMITHSON, *The Dimensions of Colour*, 20. The following passage is based on this publication as well as on SMITHSON — DINKOVA-BRUUN — GASPER — HUXTABLE — MCLEISH — PANTI, *A three-dimensional Color Space*, and H.E. SMITHSON — G.E.M. GASPER — T.C.B. MCLEISH, *All the Colours of the Rainbow*, in *Nature Physics*, 10 (2014) 540-542.

which all colours are generated by the independent adjustment of three bipolar qualities, where black and white are the symmetric opposites. The quality of each pole is described by Latin word pairings: *clara-obscura* and *multa-pauca* describes bipolar qualities of light and *purum-impurum* describes the medium. Dinkova-Bruun et al. have interpreted these qualities as bright or dim light, copius or scarce light, and pure or impure diaphaneity. Used in combination, they can account for all possible colours in a continuous three-dimensional colour space, with infinite degrees of intensification or diminution along each of the polar directions, representing a significant step in the development of colour theory. According to Grosseteste, diaphaneity is by itself an active property and, contrary to Aristotle's teaching, colour exists within bodies, not just on their surface, and is actualized by the presence of external light, such as that of the sun.

The role of light, its nature and propagation

The investigation into the generation, emanation, reflection and refraction of light as it creates and forms the material world in geometrical configurations found its origins in the Classical traditions. The perception of light as a path for the enlightened 'mind's eye' to experience the divine affected how the material world was perceived in the various cultures that built on the Greco-Roman tradition: medieval Islam, Judaism and Latin Christianity. Colour was appreciated in terms of its ability to communicate and reproduce divine brilliant light in a visual language that aimed to turn earthly matter into objects for spiritual devotion.[34] We have seen how this was achieved with saturated pure radiant and unmixed pigments combined with precious metal foils in the painting.

The scientific investigation of the nature and propagation of light and human vision was regarded as an important discipline that involved both the optics of the eye and the cognitive reception and processing of the received information. This posed larger philosophical-theological questions and made its mark on contemporary science.[35] A renewed interest emerged in the ninth through twelfth centuries in the Islamic world, starting in Damascus, concentrating in

[34] E. JAMES, *Colour and Meaning in Byzantium*, in *Journal of Early Christian Studies*, 11/2 (2003) 223-233, here 223.

[35] J. CUNNINGHAM, *4 Lumen de Lumine: Light, God and Creation in the Thought of Robert Grosseteste*, in N. TEMPLE — J.S. HENDRIX — F. CHRISTIAN (eds), *Robert Grosseteste and Lincoln Cathedral. Tracing Relationships between Medieval Concepts of Order and Built form*, Burlington, 2014, 81-98.

Baghdad and spreading both east and west.[36] Building on the insights of ancient Greek and Hellenistic philosophers, together with the emerging writings of Arabic polymaths, mathematicians and physicians absorbed and eventually surpassed their ancient sources.[37] In the west this development reached its zenith during the thirteenth century in the development of theories of light and its metaphysical meanings. The rediscovery and translation of central texts into Latin, such as Aristotle, fuelled a new wave of scientific and theological writings.

The Classical inheritance was not replaced by Christian thinking, but rather became embedded within the ideas and tenets of the faith.[38] Analogies of light became pivotal in Christian theological interpretation where light and brightness acted as a bridge between the terrestrial world and the celestial. Metaphorical references to light became important throughout the period, both when directed to higher spiritual reading and in texts designed to reach wider audiences.

The renewed investigations into light and matter in the thirteenth century were regarded to have the potential not only to reveal the essential nature of material reality and cognition, but also to point beyond that, to the nature of God himself. The study of nature and its matter, form and colour became not only legitimate, but obligatory for a polymath and bishop like Grosseteste: "Thus to understand optics [especially geometrical optics] is to understand nature".[39] The study of God's creation was legitimate, because, in Grosseteste's words "The certitudes about the various species in the sensible world fall under faith (…) and [are] more easily acceptable under faith".[40]

The *Book of Genesis* was regarded as a foundation narrative of the world and a central source to look to understand God's plan and the divine cosmology (Fig. 9).[41] The first creation story describes how God created the world out of darkness by way of light:

[36] Personal communication with Giles E.M. Gasper, 16 October 2015.

[37] K.H. TACHAU, *Seeing as Action and Passion in the Thirteenth and Fourteenth Centuries*, in J.F. HAMBURGER — A.-M. BOUCHÉ (eds), *The Mind's Eye. Art and Technological Argument in the Middle Ages*, Princeton NJ, 2006, 336-359.

[38] JAMES, *Byzantine Glass Mosaic Tesserae*, p. 72. James discussed this relationship in the Byzantine mosaics.

[39] D.C. LINDBERG, *Theories of Vision from Al-Kindi to Kepler*, Chicago IL, 1976, 99.

[40] R. GROSSETESTE, *On the Six Days of Creation*, C.F.J. MARTÍN (transl.), *Auctores Brittanici Medii Aevi*, vol. 6/2, Oxford, 1996.

[41] BEDE, *On Genesis*, transl. by C.B. KENDALL (Translated texts for historians 48/II), Liverpool, 2008, 199; GROSSETESTE, *On the Six Days of Creation*.

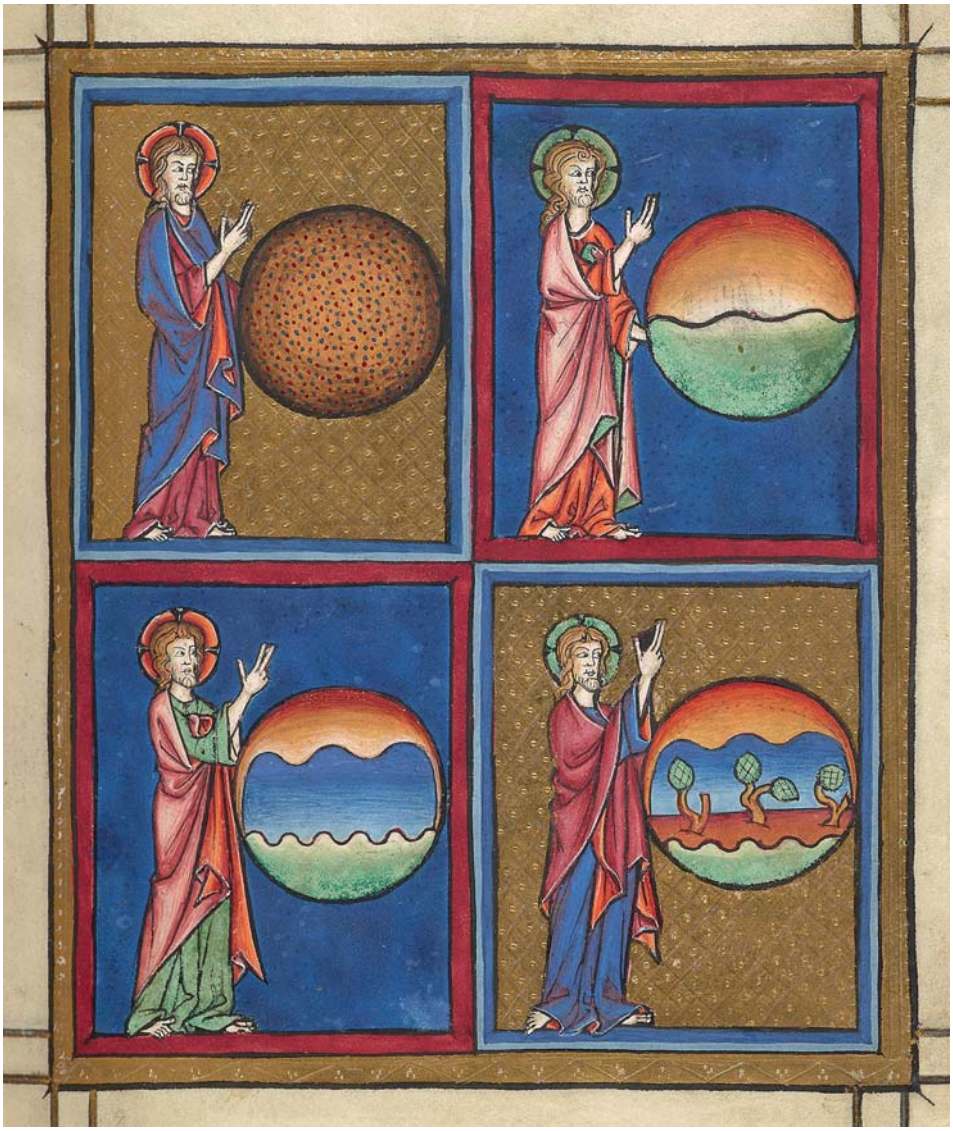

Fig. 9 Psalter-Hours of Guiluys de Boisleux, Arras (France), after 1246. Now in the Pierpont Morgan Library in New York, USA (MS M.730 fol. 9r). Photo © Pierpont Morgan Library, New York

> In the beginning God created the heaven and the earth. The earth was without form and void; and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters. And God said, let there be light: and there was light. And God saw that the light was good: and God divided the light from the darkness.[42]

When God utters his first command, *fiat lux*, he presented light as the '"Ur-creation", the act from which all else comes into being'.[43]

Grosseteste uses light extensively in his explanations of the physical universe and would later exploit its powerful role as a Christian metaphor. In his account of the nature of the body of the universe, he describes light by two qualities: *lux* and *lumen*. The first form of light, *lux*, is the original created light at its source, the spiritual light that enters the universe and gives three-dimensionality to matter. Lumen, however, is the light that is reflected inwards and participates in matter as refracted and reflected light that is connected to the material form or objects in nature.[44] Grosseteste argues that the human eye cannot perceive *lux*, but only *lumen*: the outflow and image of the first light, that is the quality that can be perceived as reflected or radiated light. *Lumen* carries the Divine light at its root, although the spiritual aspect is hidden to the unlearned man. At the core of the complex relation between these two qualities of light lies the relation between the generator and its images.[45] It is significant that God alone creates the world with *lux*. As a consequence, light plays a central role outside God himself, and therefore the material world reflects its creator.[46]

[42] Genesis 1:1-5 (Douay-Rheims translation); in Latin: *Dixitque Deus, Fiat lux, et facta est lux. Et vidit Deus lucem quod esset bona: et divisit lucem a tenebris. Appellavitque lucem diem, et tenebras noctem factumque est vespere et mane dies unus*.

[43] S.G. NICHOLS — A. KABLITZ — A. CALHOUN (eds), *Rethinking the Medieval Senses: Heritage-Fascinations-Frames*, Baltimore MD, 2008, vii.

[44] J.S. HENDRIX, *The Architecture of Lincoln Cathedral and the Cosmologies of Bishop Grosseteste*, in FROST — HENDRIX — TEMPLE (eds), *Bishop Robert Grosseteste*, 101-117; DINKOVA-BRUUN — GASPER — MCLEISH — HUXTABLE — PANTI — SMITHSON, *The Dimensions of Colour*, 21-22. It is important to stress that this is not a commentary on Genesis, but an exposition of classical and medieval cosmologies in a Christian framework.

[45] Y. RAIZMAN-KEDAR, *Plotinus's Conception of Unity and Multiplicity as the Root to the Medieval Distinction between Lux and Lumen*, in *Studies in History and Philosophy of Science. Part A*, 37/3 (2006) 379-397, here 381.

[46] G.J. WENHAM, *Word Biblical Commentary*, vol. 1: *Genesis 1-15* (Texas Word Books), Waco, TX, 1987, 38 as pointed to by G.E.M. GASPER, *Reflections of Light* c. *1070*-c. *1250. The Hexaemeral Tradition: Patristic Background, Hugh of St Victor and Robert Grosseteste* (unpublished lecture held at Pontifical Institute of Mediaeval Studies Interdisciplinary Seminar, 12 February 2004).

According to Cecilia Panti light metaphors are ubiquitous in the Neoplatonic sources, and an explicit description of light as incorpeoreal dates back to Plotinus's first *Ennead*, written around 270.[47] Augustine (354-430) described light 'as an active force'.[48] In his *Confessions* he explains the necessity and role of the external light in the enlightenment of the mind: "The mind needs to be enlightened by light from outside itself, so that it can participate in truth, because it is not itself the nature of truth".[49] Therefore the natural light from the rays of the sun in the form of *lumen* originates from the Divine source with love and truth at its core, whether reflected from the surfaces of goldsmith works, transmitted through stained-glass windows or interacting with the polychrome surfaces of exquisite paintings and sculpture.

Following the traditions of Augustine and the other Church Fathers, Pseudo-Dionysius, who was writing before 532, identifies the Godhead with light and radiance: "Every creature, visible or invisible, is a light brought into being by the Father of lights (…)", which he described as a spiritual light above all light, that illuminates every mind and renews their spiritual powers with its overflowing radiance.

Grosseteste developed his theory even further by paralleling light with the Creator. For him the theory of light became a precondition to the creation of matter and form, of which colour is part: "The first corporeal form, which they name corporeity [*formam primam corporalem*], I consider to be Light" are the opening words of his manuscript 'On Light' [*De Luce*] dating from *c.* 1225.[50] Like a modern cosmologist, he builds on the idea of the propagation of light and extrapolates it to explain the origin of the universe.[51] According to his theory the cosmos was created in a big bang-like explosion from one point of light, which multiplied, drawing matter along with it and thereby creating first the celestial realm followed by the terrestrial. The latter consists of ten spheres: nine above the moon and one below divided into the elements, representing the

[47] C. PANTI, *Robert Grosseteste's* De luce*. A Critical Edition*, in J. FLOOD — J.R. GINTHER — J.W. GOERING (eds), *Robert Grosseteste and his Intellectual Milieu*, Toronto, 2013, 193-238, here 196.

[48] J. MCEVOY, *The Philosophy of Grosseteste*, Oxford, 1982, 158 ff.; Panti, *Robert Grosseteste's* De Luce, 194.

[49] AUGUSTINE, *Confessions*, IV.xv.25.

[50] N. LEWIS, *Robert Grosseteste's On Light*, in FLOOD — GINTHER — GOERING (eds), *Robert Grosseteste*, 293-247, here 293 and PANTI, *Robert Grosseteste's* De luce, 204.

[51] R.G. BOWER, *Comparative Cosmologies: Robert Grosseteste and Modern Cosmology* (lecture held in Lincoln Cathedral, 9 April 2015).

imperfect earth.[52] He states that "The species and perfection of all bodies is light", arranged in a hierarchy in which higher bodies are more spiritual and simple, and lower bodies more corporeal and multiplied.

With the concept of *lux* representing the common corporeity there is an important development in Grosseteste's work. By abolishing Aristotle's theory that the superlunary universe was of an essentially different make up than the earth, he makes an important development towards a holistic, hierarchic cosmology.[53] The earth is made of the same matter as the cosmic spheres, but it is imperfect. The Divine source of the light emission, *lux*, is thus present in the diverse images residing in the lower hierarchy on the earth where it radiates and illuminates the world we see through its visible reflected nature *lumen*. There is, however, a hierarchic distinction due to:

> degree of density, perfection and beauty: the lux of the upper world is more rare, noble and perfect that the lux in the sublunary world, yet they are in principle the same.[54]

Academy and workshop

Medieval art exploited the effects of the changing nature of light that which constantly transformed, modified, and re-created the image in the church space before its audience.[55] The concept of light and colour in medieval society affected both the artist's use of colours and their reception in the viewer. However, there is little textual evidence of how the encounters occurred between artists producing religious objects and scholars who studied light, colour, optics and vision. In this article it is assumed that the works of art produced are concordant with the central focus on light and the theories developed at the time, and that the artist knew how to produce a patron's requirements for a polychrome work of art based on these principles. We might also turn this question

[52] R.G. Bower — T.C.B. McLeish — B.K. Tanner — H.E. Smithson — C. Panti — N. Lewis — G.E.M. Gasper, *A Medieval Multiverse: Mathematical Modelling of the 13th Century Universe of Robert Grosseteste*, in *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 470/20140025 (2014), 1.

[53] McEvoy, *The Philosophy of Robert Grosseteste*, 161.

[54] Cited after Raizman-Kedar, *Plotinus's Conception of Unity and Multiplicity*, 393.

[55] P. De Montebello, *Foreword*, in J. Hayward — W. Cahn (eds), *Radiance and Reflection: Medieval Art from the Raymond Pitcairn Collection* (exh. cat. New York, Metropolitan Museum of Art), New York NY, 1982.

around: it is very well thinkable that the art produced inspired the scientific and philosophical thinking of that era.

Few sources remain that can inform us on how knowledgeable the craftsperson and painter were in academic theory, but there are personalities known to have been well versed in both, such as the Benedictine monk, English chronicler, artist in illuminated manuscripts and cartographer Matthew of Paris who mentions Grosseteste in his writings and visited Norway in the year 1249. Paul Binski and Marie Louise Sauerberg have suggested an actual link connecting the style of Matthew's hand to the tabernacle door from Fåberg (Oppland).[56] Whether or not this is the case, it clearly illustrates the close cultural interactions at that time.

According to the new translation of *De Colore*, Robert Grosseteste states that those skilled in the principles of optics can appreciate his arguments when "Through skilful manipulation (*per artificium*) they can show visibly, as they wish, all kinds of colours".[57] In order to tailor their paints to their needs, the painters, with their hands-on knowledge of pigments and binders, had the experience of manipulating the medium and were certainly capable of creating the appropriate colours together with bringing out their brilliance through refraction and reflection.

The primary visible feature of objects, matter and form, is created through light and colour. For Grosseteste, colour is a manifestation of 'light at work' endowing all the material bodies around him with form.[58] Judgements of beauty are made according to the principles of light, in its harmony and distribution, such as it appears in symmetri, light, colour, and the brilliance of shining materials. John Hendrix has discussed how Grosseteste, in his *Posterior Analytics*, argues how beautiful objects that are receptive to the Divine light are made visible to a higher spiritual reading by the interior mind's eye. The more similar the object is to the *lux*, the more receptive it is, and when *lux* and its

[56] P. Binski — M.L. Sauerberg, *Matthew Paris in Norway: The Fåberg St Peter*, in Nadolny — Kollandsrud — Sauerberg — Frøysaker (eds), *Medieval Painting in Northern Europe*, 230-247.

[57] The quote from the *Commentary on Posterior Analytics* is discussed in Dinkova-Bruun — Gasper — McLeish — Huxtable — Panti — Smithson, *The Dimensions of Colour*, 29-30.

[58] Dinkova-Bruun — Gasper — McLeish — Huxtable — Panti — Smithson, *The Dimensions of Colour*, 69.

inherent spiritual properties are apprehended by the mind it can lead to greater clarity and certitude in thinking.[59]

In the material hierarchy the purified material is more elevated than its impure form. The most appropriate colours are the most beautiful,[60] such as the gemstone, pigment and drug ultramarine harvested from the mines in Afghanistan that according to the medieval *Orbis Terrarum* is situated right by the steps to the earthly paradise.[61]

The role of images as 'profitable helpers' along the path to salvation is elegantly explained by Saint John of Damascus (*c.* 675-749): "Images are a source of profit, help, and salvation for us all, since they make things so obviously manifest, enabling us to perceive hidden things".[62] The importance of the role of the clearly seen things made in the world as keys to understand the invisible in the visible is also expressed by Pseudo Dionysius who stated that the "invisible things of God from the creation of the world are clearly seen, being understood by the things that are made, even His eternal power and Godhead".[63]

The important role of the visible, tangible world as a path for people of all various backgrounds, including the uneducated, to reach to understanding is explained by Grosseteste in the way that:

> So the creation of the sensible world, on account of the way in which the world is imaginable and graspable by the external senses of the body, should be told in the opening part of Scripture. This is in order that anyone, even among the uneducated, may be able to grasp a story of this kind easily, through his imagination and through the images of corporeal things, and grow stronger in faith through the authority of the one who speaks.[64]

The mediation of light by colour imprinted in the works of art can act as a guide for the knowledgeable and receptive human intellect to the higher levels of spiritual enlightenment. The reiterated light in the images contributes to a visual demonstration of the presence of Divinity in the church. Bede (673-735)

[59] J.S. HENDRIX, *Neoplatonic Influence in the Writings of Robert Grosseteste* (School of Architecture, Art, and Historic Preservation Faculty Publications, 6), Bristol RI, 2008, 1-15, here 3.

[60] JAMES, *Byzantine Glass Mosaic Tesserae*, 70.

[61] S. BUCKLOW, *The Riddle of the Image*, London, 2014, 57.

[62] ST JOHN OF DAMASCUS, *On the Divine Images* (transl. D. ANDERSON), Crestwood NY, 1994, 74.

[63] PSEUDO-DIONYSIUS, *The Divine Names* (transl. C. LUIBHEID, *Pseudo-Dionysius: The Complete Works*), New York NY — Mahwah NJ, 1987, 697D.

[64] ROBERT GROSSETESTE, *On the Six Days of Creation. A Translation of the* Hexaëmeron (transl. C.F.J. MARTIN), Oxford, 1996, 49.

explains how "The saints (…) are able to shine not by their own but by His light" and that they in His light "appear glorious and Divine".[65] The brightly coloured images act in this way by contributing to the associative powers in the onlooker with their physical presence.

What did age do to the Tingelstad I frontal?

Time has left its distinct mark on the frontal from Tingelstad. The once golden glaze has darkened, its transparency is lost, and the reflective silver surface is blackened due to corrosion. Light no longer activates the surfaces and the rich colours to their original splendour. The medieval theologian Ulrich of Strasbourg (*c*. 1225-1277) sees beauty in the Neoplatonic tradition as the flooding of matter with form under the influence of the Divine light that operates in the depths of nature.[66] According to him:

> Every form is ugly the less it possesses this [intelligence of the] First Light due to the obstruction of matter, and more beautiful the more it possesses this light due to its elevation above matter.[67]

With the loss in the original panel of its ability to radiate light and expose bright colours, the central link in the visual mediation of the Divine is lost. Matter is no longer elevated by the presence of the radiant *lumen* light of which the invisible *lux* is a part. Furthermore, the modern lack of associative powers connected with the perception of colour in the culture that these works once belonged to does not support, but rather misleads, the experience of the onlooker today.

Physical reconstructions of these polychrome works may enable us to again experience and thereby understand more fully how they originally worked and fulfilled their function. The intangible is again made accessible and can lead the way to new and enlightened interpretations.

[65] BEDE, *On Genesis* (transl. KENDALL), 208-209.

[66] U. ECO, *Art and Beauty in the Middle Ages*, New Haven CT — London, 1986, 84. Original edition in Italian: *Sviluppo dell'estetica medievale* (Momenti e problemi di storia dell'estetica, 1), Milano, 1959.

[67] ULRICH OF STRASBOURG, *Summa de Summo Bono*, II, 3,5 (cited after Eco, *Art and Beauty*, 85).