Colour and Light in Ancient and Medieval Art

Edited by
Chloë N. Duckworth and Anne E. Sassin

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ROUTLEDGE

Colour and Light in Ancient and Medieval Art

The myriad ways in which colour and light have been adapted and applied in the art, architecture and material culture of past societies is the focus of this interdisciplinary volume. The iconographic, economic and socio-cultural implications of light and colour are considered by established and emerging scholars including art historians, archaeologists and conservators, who address the variety of human experience of these sensory phenomena. In today's world it is the norm for humans to be surrounded by strong, artificial colours, and even to see colour as perhaps an inessential or surface property of the objects around us. Similarly, electric lighting has provided the power and ability to illuminate and manipulate environments in increasingly unprecedented ways. In the context of such a saturated experience, it becomes difficult to identify what is universal, and what is culturally specific about the human experience of light and colour. Failing to do so, however, hinders the capacity to approach how they were experienced by people of centuries past. By means of case studies spanning a broad historical and geographical context and covering such diverse themes as architecture, prehistoric art, the invention of metallurgy and medieval manuscript illumination, the contributors to this volume provide an up-to-date discussion of these themes from a uniquely interdisciplinary perspective. The papers range in scope from the meaning of colour for the traditional societies of Rapa Nui (Easter Island) to the technical art of the glazed tiles of the Shah mosque in Isfahan. Their aim is to explore a multifarious range of evidence, and to evaluate and illuminate this truly enigmatic topic in the history of art and visual culture.

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This volume is dedicated to Jean (Ga), who taught me (Chloë) the importance of art, music and history, and to Fay and Fred (Mom and Dad), who instilled in me (Anne) a love of both art and history from early on.

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Preface

In today's world, we are used to being surrounded by strong, artificial colours, and even to seeing colour as an inessential or surface property of the objects around us. Similarly, electric lighting has given us unprecedented power to illuminate and manipulate our environments. With such a saturated experience, we find it difficult to ask what is universal, and what is culturally specific about the human experience of colour and light. Yet without addressing these questions, how can we ever hope to approach the experience of people in the past?

The contributions to this volume, which have been written by art historians, archaeologists, artists and conservators, seek to address the variety of human experience of colour and light, in case studies spanning a broad historical and geographical context and covering such diverse themes as wall art, the invention of metallurgy, and medieval manuscript illumination. In addition, students and specialists alike will find a useful resource in the introductory essay on the study of colour and light, which provides a brief but up-to-date discussion of these themes from a uniquely interdisciplinary perspective.

Contributors

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We are grateful to all of the authors who have contributed to this volume with their fascinating research subjects. The origin for this book lies in a session at the 40th Anniversary Conference of the Association of Art Historians, held in the Royal College of Art, Kensington, London, on the 10th–12th April 2014, at which several of the authors who have provided papers for this volume presented. Other authors were approached specifically by us due to our interest in their work, and we are most grateful to them for taking up our offer to contribute. We also thank *Cambridge Archaeological Journal*, who have allowed us to reproduce large parts of a landmark paper on the multiple origins of metallurgy by Miljana Radivojević (Chapter 2).

We would also like to express our gratitude to the anonymous subject-specific reviewers who gave up their time to provide expert peer review to the individual chapters in the volume. We also name Liz James, who kindly lent her time to read our introductory chapter. And of course, a special thank you must be made to Margaret Michniewicz, for her hard work in securing our contract, and to all the staff at Taylor and Francis for their help with bringing the book to press.

Finally, we thank our families, especially David, Martyn, Cerys, Bertie and Evie.

On colour and light

Chloë N. Duckworth and Anne E. Sassin

In 1993, John Gage noted that "colour is almost everybody's business but it has rarely been treated in a unified way" (Gage 1993, 7). In the years since he made this statement, the study of colour and light in art and material culture has gathered pace, and an increasing number of researchers in the fields of archaeology, art history, and conservation would now list these subjects as among their areas of speciality. More recently, in his seminal work *Chromophobia* (2000), David Batchelor convincingly argued for the existence of a persistent Western cultural prejudice against colour. In today's world, colour (in the form of pigments, light, and various materials) comes cheap. Our general reaction to this has been to denigrate it in favour of muted tones and understated palettes. Anything more than a splash of colour is open to criticism, and lighting follows suit: with the ability to bask in bright light 24 hours a day, we value more than ever the evocative effects of low lighting.

Despite these prejudices, or perhaps because of them, there have been notable efforts to disentangle our own assumptions about colour and light from the evidence presented in the art and material culture of past societies; to ascertain what is universal, and what is culturally specific, in the perception, categorisation, valuation, and treatment of these two related phenomena (see for example Bradley 2009; James 1996; contributions in Jones and MacGregor 2002). The lack of uniformity in the treatment of colour noted by Gage may, or may not, be a bad thing. Yet there remains a feeling, as voiced by participants in the conference session upon which this book is based, that interdisciplinary communication on colour and light could be better; that we archaeologists, scientists, art historians, artists, and conservators could do more to examine how they are studied outside of the narrow geographical and temporal foci of our own research specialisms (cf. Gage 1999; Lamb and Bourriau 1995). There remains a general unawareness, in short, of the *variety* of past human experience of colour and light.

This volume seeks to contribute to this understanding of the variety of human experience, by presenting original research on the manipulation, use, representation, perception, and meaning of colour and light in different contexts. The authors are from a range of backgrounds including art, conservation, archaeology, science, and art history. All are more used, perhaps, to presenting the study of colour and/or light to those in their own field, than to having to explain their research findings in the context of a broad focus on these themes in their own right. But this is the value of interdisciplinarity; for it is through change, the need for flexibility, through considering the problem from a slightly different perspective, that we experience those little flashes of inspiration which lead to new research directions and new ways of understanding the past.

The volume is thus not intended as an exhaustive treatment of colour and light, or a theoretical unification, but as a glimpse into the kaleidoscope of different approaches which may be taken in their study, through the examination of particular case studies of past societies. The scope of the book is at once global and (deliberately) limited. Global, because we are addressing themes of universal significance to human societies, using case studies which span three continents and a large swathe of human history; and limited, because the breadth of the subject is so vast as to render any exhaustive treatment impossible.

Naturally, the understanding of colour and light varies enormously between cultures, but the modern Western focus which dominates in this volume arises from a particular history of thought, which it is worth outlining. For the Classical authors, light was seen to derive from the eye itself, an idea later developed into the concept of *lux* and its product, *lumen*. Colour, on the other hand, was an inherent property of an object: for Aristotle, 'colours were static – an object's colour was fixed and there was no place for perceptual relativism' (Bradley 2009, 63). By the later 1st millennium CE, however, Muslim scientists, foremost among them being Ibn al-Haytham (known in the West as Alhazen), had further advanced the field of optics, and it was postulated that vision was the result of rays of light entering the eye, and not the other way around.

Medieval philosophical writings on both light and colour remained influential for centuries, as shown in this volume by Trevathan (Chapter 14), who considers not only Persian philosophical and religious texts regarding colour categorisation, but also the perspective of the 17th century tile-makers who decorated the Shah Mosque in Isfahan according to these *schema*. In addition to their longevity, medieval writings on optics could also have an immense geographical and cross-cultural reach. Thanks to the great wave of Arabic to Latin translations of the Toledo School and others, by the 13th century Christian European scholars such as Roger Bacon could read and be influenced by both Aristotle and Alhazen. For the Abrahamic religions, the study of light – which was both symbolic and physical manifestation of divinity – was not merely a practical but a philosophical endeavour, as illustrated by Francesca Galli (Chapter 10) in her treatment of Christianity and the 13th century science of optics.

The ever-important science of optics witnessed a change of direction in the 17th and early 18th centuries, in a process which was to culminate in the publication of Isaac Newton's *Opticks* in 1704. Newton had used glass prisms to demonstrate that white light was not, as previously thought, a uniform, pure substance, but was composed of (and could be split into) rays of different colours. As noted by Finlay (2007, 384), this effected a profound conceptual shift and provoked strong reactions from many quarters, particularly to the idea that the colours we perceive are no more than 'illusory' properties of light.

One such reaction was presented by Johann Wolfgang von Goethe in his 1810 *Zur Farbenlehre* (*Theory of Colours*). A deliberate departure from the rigorously scientific approach of Newton, it was themed around the human perception of colour. There subsequently emerged a sharp division of colour theory between the Newtonian and Goethian lines (Finlay 2007, 384). From a 21st century vantage point, it is rather easy to dismiss Goethe: Wittgenstein wrote of his work that it 'has not proved to be an unsatisfactory theory, rather it isn't a theory at all' (Wittgenstein 1951, 11). But while *Theory of Colours* singularly failed to topple Newton's careful experimentally derived hypotheses, Goethe's idea of a cultural bias to the perception of colour (he deliberately

avoided a detailed discussion of light: Goethe 1967, xvii–xviii) was a prescient one, going against the grain of Enlightenment ideology, but finding a later foothold in the more relativist thinking of the 20th century.

This Enlightenment wrangling aside, art and science have communicated better over colour and light than they have over many other phenomena, and the two are perhaps most closely linked in the study of human perception. A better physiological understanding of the mechanisms by which we perceive colour and light was initially sought by Thomas Young in the early 19th century, and was developed to a high level of understanding throughout the 19th and 20th centuries (see Baylor 1995). Today, most well-educated adults are familiar with the concept that certain wavelengths of light are recognisable by photoreceptor cells in the human eye, known as 'rods' and 'cones', even if the details of the wavelengths in question (400–700nm) and the function of the different cells are less familiar (rods are highly photosensitive, while cones distinguish between colours). As demonstrated by Katy Soar in Chapter 4, a lack of scientific insight into the functioning of the eye does not necessarily preclude the manipulation of the mechanisms by which it functions, and Minoan cultic spaces may have benefitted from a clever use of differently coloured paints combined with specific lighting conditions. In any case, and despite recent developments in the biological and evolutionary understanding of the eye, the relationship between the functioning of the brain and the visual experience of the individual remains largely unknown (Bruce et al. 2003, 77). This is a significant barrier to the study of the past human relationship with colour and light, as we remain uncertain about the extent to which we can apply 'universals' to human perception and categorisation.

One difficulty is that linguistic categorisation introduces a certain amount of bias to studies of these phenomena, particularly when an attempt is made to unify the study of colour and light across cultures. Because we can only express our individual colour experience through language, the latter has been central to the psychology and anthropology of colour, but language is itself inherently subjective and open to multiple interpretations. One of the lynchpins of the 20th century debate around language and the reception of visual information was the seminal study by Brent Berlin and Paul Kay, published in 1969 (Berlin and Kay 1969). The result of this study, which incorporated a total of 98 spoken languages and dialects, was a universalistic theory of linguistic colour development in which all languages were seen to go through a total of seven stages, each time increasing the number of 'basic' colour terms. Basic terms are defined as those which refer solely to the hue itself (e.g. 'red'), rather than to an external referent (e.g. 'cherry').[1] Stage I consists of the distinction between black and white; Stage II incorporates red; Stage III, green or yellow; and so forth up to Stage VII. The Berlin and Kay sequence implies both a universality of human experience (rooted in physiological oppositions in colour perception), and an evolutionary model of linguistic development. As noted by Jones and MacGregor (2002, 5), both of these factors have made it particularly tempting for adoption in the study of the past. Yet, critics of the model (e.g. Conklin 1973) have pointed out that the methods used for assessing respondents' colour vocabulary were flawed. In particular, they incorporated the Munsell colour system, which is based upon a set categorisation of colour by hue alone, and which does not prioritise features of colour that may be more valued in non-Western cultures, such as luminosity. In addition, the order in which 'basic' colour terms build up beyond Stages I and II has subsequently been found to differ between cultures. Even for Stage I itself it is perhaps rather misleading to refer

to 'black' and 'white'; light and texture are often inextricably bound up with colour definitions, and the polarisation between 'black' and 'white' is more frequently one between 'dark' and 'light' (for a fuller discussion, see Chapman 2002). In this book, the profound importance of texture, and its relationship with colour and light, is discussed by Vladimir Ivanovici (Chapter 6), in a consideration of Late Antique material valuation systems as perceptual filters which were deliberately manipulated in church design. Ivanovici's paper also gets to the heart of the themes presented at the start of this introduction, and he asks whether it is possible for a modern person to 'see' a church through Late Antique eyes.

In spite of its rather hefty portfolio of criticism, Berlin and Kay's model has highlighted some significant cross-cultural elements, such as a persistent focus on the 'extreme' colours black, white, and red, particularly notable in European prehistory (Jones and Bradley 1999; Duckworth 2012, footnote 6). An example of the significance of the colour red in material culture is discussed by David Govantes-Edwards (Chapter 1) in his treatment of colour symbolism in pre-contact Rapa Nui (Easter Island). The Berlin and Kay model also demonstrates a general human tendency towards reductionism in linguistic and symbolic treatments of colour; except in specialist contexts, we tend to stick to a relatively limited range of broad colour categories. Symbolic reductionism may be at play in the case study presented by Miljana Radivojević (Chapter 2), which uses a combination of scientific and archaeological data to argue that a long-lived colour selection preference for black and green minerals was a critical factor in the development of early metallurgy from c.5000 BC in the Balkans.

Nonetheless, it is clear that these linguistic considerations do not tell the whole story. A limitation in the number of basic colour terms in a given language, for example, does not necessarily reflect limitation in the use of pigments or other means of representing and manipulating colour (Baines 1985), and certainly does not imply a limited perceptual range, as Gladstone, drawing from Goethe, famously and erroneously hypothesised for the ancient Greeks.[2] In terms of understanding past art and material culture, among the most significant lessons to be taken from a scientific perspective on colour and light are that there exist biological universals related to the physical reception and processing of colour, but also culturally determined elements in the way we categorise, process, and interpret this information.

Even if we are able to accept a certain measure of universality in the human perception of colour and light, however, we must account for the effects of time on the artworks themselves. A particular difficulty with ancient art is in establishing how it was positioned and lit; i.e. the circumstances under which it was originally viewed.

The distortion wrought by time on material remains also affects our own classifications and can feed into assumptions about the relative importance of light and shadow, hue and brilliance. Renaissance concepts of the purity of Classical sculpture were founded upon a lack of recognition of the corrosive effects of time on the preservation of the statuary, much of which had originally been brightly painted. Yet this obsession with form – perceived in light and shadow – over colour was not wholly un-representative of the Classical world. In fact, we can trace textual and linguistic evidence for the importance of lighting and brilliance as far back as the Bronze Age in Mesopotamia and Egypt (Baines 1985, 283), while physical traces of their significance can be found yet earlier, in surface treatments such as burnishing and the use of varnishes. Hues, by contrast, were in many contexts seen as imitative, even potentially deceptive (e.g. Duigan 2004), and – in a striking parallel with the modern West – the

Romans themselves viewed polychromy, bound up with concepts of oriental extravagance, with a certain measure of ambiguity. The corrupting effects of polychromy and gilding by comparison with line are considered by Sharon Lacey in Chapter 12, in which the medieval practice of tinted drawings is considered in its social and religious context.

Still, it was the lost colours which most intrigued commentators from the 19th century on, as reflected in paintings seeking to bring to life the original appearance of Classical architecture (such as Jean Auguste Dominique Ingres's *Antiochus and Stratonice*, 1834/40; or Lawrence Alma-Tadema's *Phidias and the Frieze of the Parthenon, Athens*, 1868/9). This developing interest in colour over light – or at least, in colour divorced from light – may have had something to do with the increasing availability of synthetic pigments as a consequence of the Industrial Revolution, leading eventually to a modern world in which highly saturated colours were (and are) an everyday experience.

Such a disconnection with past experience may also be behind the 'shock' factor of the recent touring 'Gods in Color' exhibit, based on the work of Vinzenz Brinkmann, in which copies of Classical statues were displayed with their original colours more or less imaginatively restored. As demonstrated by this exhibit, the current state of preservation of art and material culture has a profound effect on our perceptions of past experience.[3] The work of the conservator is of prime importance in attempting to reconstruct this, but the long history of conservation practice is fraught with controversy. As noted by Marcia Hall with regard to Renaissance paintings:

> In the course of these many centuries we had slowly remade Renaissance painting in the image of academic taste. In early times dirt and smoke were removed by drastic cleaning that frequently stripped the surface. The strident colours that resulted offended the eye of later generations, who were now taught to prefer a Rembrandtesque obscurity. When varnishes were applied to renew the colours, they in turn darkened and yellowed . . . When, after World War II, conservators undertook to restore the paintings to their original state, all hell broke loose.
>
> (Hall 1992, 3)

It is thus apparent that the history of their conservation is an important part of the biographies of the artworks and artefacts we study, and that this can have a significant emotive power. This theme is taken up by James Beresford (Chapter 5) with reference to the ongoing debate over the repatriation of the marble friezes from the Parthenon in Athens, which often focuses upon lighting conditions. Beresford's paper is unabashedly polemic, and while some readers may disagree with his perspective, few could argue the relevance of these themes to the repatriation debate. Stephanie Aulsebrook offers a somewhat different, but equally fascinating, take on conservation in Chapter 3, demonstrating that the effects of surface corrosion could have been deliberately sought after and manipulated in the metal vessels of the Late Bronze Age Aegean, in which the antiquity of an object was an integral part of its value. Unfortunately, most of the evidence for such practices has probably been removed by over-zealous cleaning in the early 20th century, in a misguided attempt to restore the objects to their (assumed) original appearance. Here, we might pause to emphasise the contribution of the natural sciences, with developments in non-destructive analytical techniques such as X-ray fluorescence and X-radiography enabling a clearer understanding of

the composition of the original pigments, the extent of repainting, and other factors bridging the gap between original and current appearance.

Another key distinction in the study of human interaction with colour and light is that between their manipulation and their representation. 'Representation' in this sense refers to the attempt to depict an external referent (such as the hue of a garment or the effect of the morning sun), whereas 'manipulation' refers to the enhancement, filtering, or application of colour and/or light (such as painting with naturally occurring red ochre, or the use of a window to channel the sun's light). The manipulation of light is often most clearly apparent in architecture, a theme which is raised in several papers in this volume. Maryam Mahvash (Chapter 13) discusses the use of apertures, mouldings, and reflective surfaces in order to manipulate light and create transcendent spaces in medieval and pre-modern Persian architecture. In Chapter 8, Jorge Rodrigues considers the use of natural lighting as a deliberate component in the architecture of Portuguese Romanesque churches, and shows that alterations in light over the course of a single day were among factors incorporated into the design of a church's exterior, highlighting the importance of the lived experience of art and architecture. At all scales – be it a single day (Rodrigues), over the course of a year (Beresford), or over many millennia – fluctuation and change are key factors in the reception of art and architecture.

Representation is constrained by the properties of the artist's materials themselves, but these same properties also afford the opportunity to manipulate. This interplay is addressed in Chapter 9, in which Éowyn Kerr-DiCarlo focuses on Franciscan imagery of the life of St Francis of Assisi, examining the influence of different media (paint, gold, glass) used in the representation of light, and contextualising this within contemporary spirituality and symbolism. As illustrated in this and other chapters, the distinction between the manipulation and the representation of colour and light is not always clearly definable, but in some cases the interplay between these factors is of interest in its own right. For example, it is possible to trace shifting emphases in the value of both textile dyes and the pigments used to represent them, through paintings depicting the garments of socially or religiously significant individuals. These may be represented at different times *either* by the most expensive pigments, indicating the cost/value of producing the painting itself; *or* by the pigments which most closely resemble the most expensive dyes, indicating the cost or symbolic value of the clothes worn by the sitter. The colour and representation of textiles in Romanesque manuscript illumination are discussed by Andreas Petzold in Chapter 7, in which he also considers the role and significance of colour symbolism. These themes are also considered by Anthony McGrath (Chapter 11), who, drawing on a case study of the representation of light in Dominican images of Thomas Aquinas, also addresses broader themes of medieval colour.

Throughout this introduction, we have emphasised that there is no one approach to the study of colour and light in past contexts. Indeed, any study of these concepts is a uniquely difficult undertaking. Even when examining contemporary cultures, the barrage of literature on psychology and linguistics has failed to achieve a consensus on the human experience of colour, particularly on the distinction between universals and culturally dependent factors. To the interpretive pitfalls surrounding the categorisation of such subjective notions as 'colour' and 'light' we must add the profound difficulties of reconstructing a lost past based only upon partial, and often severely altered remains. But there is also hope, for if the study of the past has any great offering for

contemporary society, then it is surely a perspective on the range of difference possible between human cultures. The past is a vast resource, and through burrowing into the varied contexts in which colour and light were viewed, understood, and manipulated in past worlds, we catch a glimpse of our own reflections, and a deeper understanding of the ways in which we, too, inhabit and experience the world around us.

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Notes

1 On the other hand, as pointed out by Ohtsuki (2000, 38), 'Some of the etymologies [of "basic" colour terms] are still alive in the meaning of contemporary colour terms, the typical example in English being *orange*.' Turquoise, of course, is another.
2 Foreshadowing the more literal readings of the Berlin and Kay model, William Gladstone (d. 1898), the British politician and prime minister, cited evolutionary writings and the lack of a colour term for 'blue' in ancient Greek texts as evidence that humans had evolved the ability to see the full colour spectrum over time. He also argued that the 'primitive' human could distinguish only between light and dark, and noted that Homer employs terms for orange and red, but not for blue. See Schöntag and Schäfer-Prieβ (2007, 108).
3 An article in *Harvard Magazine* underscores the violence of the reactions which could be caused by the exhibit: 'in Hamburg . . . some museum-goers proclaimed that Classical art was now dead for them' (Reed 2007).

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1 Symbolic use of colour in Easter Island (Rapa Nui) in its Polynesian context[1]

David Govantes-Edwards

This chapter explores the symbolic, political and ideological value of colour, and more specifically, red, in pre-contact Rapa Nui. It explores the use (and avoidance) of red stone in semantic architecture – the world-famous ahu, moai *and* pukao *– as a possible reflection of the socio-political order of Rapa Nui. Stone carving was an axial activity for the Rapanui value system, and probably also for the political and territorial organisation of the island, and the role played in it by the careful codification of stone types of different colours accordingly matches that found in other forms of expression, such as headgear, tattooing and body painting. The paper shows that the meaning of colour was deeply inset in the island's ideology, that the brusque changes that led to the end of the so-called* moai *phase and the apparently radical transformation of the prevalent social system did not transform the value of colour which stands, in fact, as a solid argument for a considerable degree of continuity in the social fabric of Rapa Nui.*

Rapa Nui lies at the easternmost tip of the Polynesian Triangle. At a distance of 2,250 miles from South America and of over 1,300 from the nearest inhabited land (Pitcairn), it is the most isolated point of human habitation in the world. Despite its remoteness and its miniscule size (66 sqm), the island has received much attention from scholars and the public alike for the sheer scale of its cultural achievements during prehistory (which, for Rapa Nui, ends in 1722 with the first European contact). Its gigantic stone busts (*moai*) and other monuments have captured the imagination of the world for generations. Rapa Nui is triangular in shape, each corner presided over by a volcano (Rano Kao, Terevaka and Poike) that commands outstanding views over the largely treeless landscape below. The coasts are dominated by rocky cliffs, sometimes forming vertical drops of hundreds of feet straight into the sea, for example on the western side of Rano Kau. Beaches are scarce and small (See Figure 1.1 in colour plates).

In this chapter, I shall try to illustrate some aspects of colour symbolism during the island's prehistory (the pre-contact phase) and history (post-contact). This chapter will not present a large amount of new evidence, but colour and the role it played in the island's prehistory will be reviewed, and some new interpretations will be put forth. It is to be hoped that those familiar with the prehistory of the island find these alluring, and that those who are not, will find this chapter a valuable introduction to the fascinating past of Rapa Nui. I shall touch upon a variety of topics, from the uses given to different types of stone to the cultural concomitance between tattooing and rock carving. The first section will deal with the red stone quarried from the Puna Pau crater, the use and, crucially, avoidance of which is reflective of the socio-political value of the colour red in Rapa Nui; the following section will elaborate on the idea that these

symbolic meanings cannot be seen in isolation, that the value of the sensory qualities of materials can only be fully understood when they are considered in combination with other elements, such as access to resources and the organisation of labour; the third section will focus on the relationship between tattooing and rock carving; and finally, I shall argue that colour symbolism was a relatively robust cultural manifestation, and that it was one of the cultural traits that carried through what appears to have been a critical transformation of Rapanui society. Societies can change, often radically, but seldom so radically that they become unrecognisable for their inhabitants.

I hope to be able to show that Easter Island presents a robust albeit culturally specific example of the integrated use of colour into a whole construction of meaning in which multiple strands of the everyday and the sublime are interwoven.

For the archaeologist, Rapa Nui is not an easy nut to crack. Evidence-related problems are, apparently, endless and disarming. For one, reaching a consensus on the chronology of the cultural sequence is proving to be extremely difficult, a problem that affects Pacific archaeology in general. The number of identified sites is bewildering, and the chronological relationships between them are nearly impossible to determine. Stylistic-based seriation of petroglyphs and monuments remains highly problematic (Love, 1993, 104; Skølsvold 1993, 94), and chronometric techniques (radiocarbon and obsidian hydration) lack sufficient precision for the island's relatively short cultural sequence. In a very broad outline, the prehistory of Rapa Nui can be divided into three stages. The first phase runs from initial settlement (for which dates as disparate as 300 and 1200 CE have been proposed) and the construction of the earliest ceremonial platforms; second, a phase most easily characterised by the construction of *ahu* (monumental, ceremonial platforms, sometimes used for *moai*) and the carving of *moai*, often called *moai*-phase; and third, a phase which saw the end of monumental construction, the emergence of the 'Birdman' cult and the arrival of the earliest European visitors to the island in 1722 (see Mulrooney et al. 2009).

Concerning the ethnological evidence, while some authors, for example Van Tilburg (1994), give considerable credit to the information collected by the earliest archaeologists and ethnographers who visited the island, notably Routledge (1919) and Métraux (1940), others consider that this information is of little historiographical value (Flenley and Bahn 2003; Martinsson-Wallin 1994). Indeed, Métraux (1940, 33) himself claimed, 'I know of very few places in the Pacific where so little remains of the ancient culture.' Personally, I tend to side with the sceptics, albeit with qualifications. While I would argue that 20th-century accounts of specific, remote, events (for example, the arrival of Hotu Matua, first king of Rapa Nui) fall into the realm of mythology and should be paid little heed as historical evidence,[2] insights into general symbolic or ideological principles which may well have been passed down the generational line can be made use of with a little exegesis and common sense. In this regard, a certain degree of coherence with the eastern Polynesian cultural milieu is to be expected and can provide a convenient comparator. I am here operating under the assumption that the Rapanui are Polynesian both in origin and culture, a safe assumption to make once Thor Heyerdahl's stubbornly defended theory of the South American influence has succumbed under the unimpeachable weight of the evidence; see Flenley and Bahn (2003) for a comprehensive argument against Heyerdahl's fragile but well-publicised views.

The red scoria of Puna Pau

Regarding colour symbolism, certain parallels are obvious. In Eastern Polynesia, the colour red is consistently imbued with a prominent symbolic meaning. *Mana*, a concept that can be broadly equated with 'sacredness', and also the source of life, was often associated with this colour (Lee 1992, 186). The semantic connection red/blood/life makes frequent appearances in very different cultural and chronological horizons from the Upper Palaeolithic onwards. In fact, red is, along with white and black, the only colour for which all human languages have a specific term (Taçon 1999, 120). This is not to say that the meaning of the red colour is identical in every case. Symbols are polysemic. Yet metaphors which are based on a material reality are not arbitrary (Jones and MacGregor 2002, 8; 11). In this sense, in Eastern Polynesia blood was the substance that allowed the exchange between the world of light (*ao*), where human beings live, and the world of darkness (*po*), where the spirits dwell (Gell 1993, 133). Political and religious authority – the abodes of those with more *mana*, the necessary intermediaries between the *po* and the *ao* – was therefore frequently expressed in material symbols of power in which red stood out prominently. For example, red feather cloaks in Hawai'i, and the colour of Tahakai, the mythical princely Mangarevan hero (Earle 1990, 78; Gell 1993, 233).

In line with this Polynesian context, the colour red plays a crucial role in Rapa Nui symbolism. Perhaps the most spectacular manifestation of the importance of red for the Rapanui during prehistory is the use of red scoria stone in monumental architecture. There are several sources of volcanic red scoria on the island, most of which were exploited to a greater or a lesser extent (Seager Thomas 2014, 96–97; Hamilton et al. 2011, 174–5). Among these, however, the quarry of Puna Pau represents like no other the true symbolic power of the colour red for the ancient Rapanui. While other red scoriae were used only locally and with less discrimination, Puna Pau was the chosen source for all the *pukao*, the top-knots that crowned a number of *moai* all over the island, and the facia that decorated some of the largest *ahu* (See Figure 1.2 in colour plates). Crucially, Puna Pau red scoria was very rarely used for anything else, and is essentially absent from non-ceremonial architecture except for a number of isolated instances of later reuse. A parallel may be found in Hivaoa, in the Marquesas, where red scoria from the quarry of Teohopuau was exclusively used for the carving of *tiki* and *ma'ae* (Seager Thomas 2014, 95, 101; Van Tilburg 1994, 140).

Why was Puna Pau so special? Two factors combined to make it one of the central places of Rapanui ideology. First, it was a volcano. In ancient Polynesia, volcanoes (along with caves) were regarded as points of contact between the *ao* and the *po* (see above) (Richards et al. 2011, 205); places where the separation between the world of the spirits and that of men was punctured, and the two planes of reality could touch one another. They were charged, therefore, with enormous *tapu*, the situation of spiritual tension or danger that engulfs mortals who are in contact with the occult (Croucher and Richards 2014, 212; Shore 1989, 164). Second, the rock is a vivid red colour, the colour of kings and gods, of political and moral authority. The first time one peeps over the edge of the crater in Puna Pau, one is struck by the sharp contrast between the strong red colour of the rock face and the lush vegetation around it (See Figure 1.3 in colour plates).

That reasons other than practicality were considered in the choice of Puna Pau as the source of some of the most symbolically loaded building materials on the island

seems clear (Hamilton et al. 2011, 168). Puna Pau scoria is light and easy to work, but also friable and close to impossible to smooth out in the same way that other readily available types of stone in Rapa Nui can be. Furthermore, due to the way the rock is formed, facias are irregular and unpredictable, and not all areas are guaranteed to offer a block large enough for carving a *pukao*, which can be as large as 2.5 m tall and 2.5 m in diameter (Seager Thomas 2014, 95). The choice must have been driven by the ideological considerations outlined above, but conscious choice it was: '[i]n all artistic media on Rapa Nui, the materials chosen to make an object were not randomly selected. They were utilised for the qualities of colour and texture that they brought to the work, but they also had inherent attributes of value and status' (Van Tilburg 1994, 124).

The special status of Puna Pau scoria in prehistoric Rapa Nui is clear. As previously noted, it was the material used for the *pukao* and the horizontal facia that crowned some of the *ahu*. These ceremonial platforms were of paramount importance for the representation of political power on the island. Monuments are a physical and unmistakable manifestation of the prevailing socio-political order; the presence of the ancestors both legitimises and imposes political and spiritual authority (DeMarrais et al. 1996, 19). It is believed that the multiple construction phases attested by the archaeological record reflect conditions of fluid competition for prestige and political prowess (Hamilton et al. 2008, 177–9; Van Tilburg 1994, 78, 81). *Pukao* and facia, which appear to have been added simultaneously, are a striking addition. Their red colour stands out, in contrast with the yellow-grey *moai* and the dark grey basalt of the platforms, as a powerful statement (See Figure 1.4 in colour plates) (Seager Thomas 2014, 103). Notably, *pukao* and facia are features of only particularly large and elaborated platforms (Van Tilburg and Lee 1987, 142).

But what about the other red scoria types on the island? As previously noted, other red scoria sources were also used, perhaps not quite as restrictedly as Puna Pau scoria, but not indiscriminately either. They appear to be used in architecture mostly as recycled or reused blocks, and generally in marginal features. Also, they were used for the carving of a number of so-called 'aberrant' *moai*, which resist classification. Unlike Puna Pau scoria, these pieces did not travel widely across the island (Seager Thomas 2014, 101–5; Hamilton et al. 2011, 174–5),[3] probably because their sources lacked Puna Pau's potent ideological dimension. They were nonetheless given special consideration, and the main reason we can think of is their colour, which can operate as a material metaphor of the blood of the ancestors (Hamilton et al. 2011, 170–1; Jones and MacGregor 2002, 7). The idea that these 'aberrant' *moai* were an early stage in the development of *moai* statuary has been put forth. According to this idea, after early experiments, red scoria was replaced by the better-suited Rano Raraku tuff, but this ignores 'the documented significance of the color red as well as the demonstrated use of the material in ideological contexts [. . .] Color symbolism in Polynesia was neither casually employed not arbitrarily rejected' (Van Tilburg 1986, 24).

What is the meaning of *pukao*? Unfortunately, this question cannot be answered with certainty, although some informed guesses have been suggested. The connection of the red colour with the gods, royalty and the ancestors seems to points towards some symbol of status, similar to the Hawai'ian red feather helmets, or other form of chiefly headgear. More generally, the notion that these *pukao* may have had some sort of funerary meaning is quite popular. In the Marquesas, stones are set on the top

of the heads of statues which represent dead people, and *pukao* may have had a very similar symbolism (Rivers 1920, 301). Also, funerary monuments in Rapa Nui are found in association with intentional scatters of *hanihani* granules or reused blocks (Seelenfreund and Holdaway 2000, 103; Van Tilburg 1994, 100, 104; 1986, 5), which seems to give plausibility to this connection between Puna Pau red scoria and funerary contexts.

A complex interweaving of meaning

In the previous section, I have elaborated upon the restricted use of Puna Pau red scoria, but there is one type of stone that was used with as many, if not more, restrictions. The tuff from the volcanic crater of Rano Raraku was exploited for the carving of most *moai*, and for the carving of *moai* alone. Rano Raraku tuff may not be as visually striking as Puna Pau red scoria: its colour is a light cream, almost yellowish, and it changes to a variety of tones with weathering; but its visual qualities were certainly played with in the composition of *ahu*, where its freshly-quarried, light colour would stand in sharp contrast with the dark basalt blocks used to build the platforms upon which the *moai* stood, not to mention the deep blue of the sea behind.[4] Plausibly, the use of different types of stone quarried in different parts of the island (*pukao* and facia from Puna Pau, *maoi* from Rano Raraku, basalt from elsewhere) in the construction of some *ahu* was seen as a symbolic map of the island as a whole, a monument in which all important parts of the island were duly represented in combination with the others. The prominence of the position of Puna Pau red scoria in this symbolic map, due to its colour qualities, is apparent (Hamilton et al. 2011, 172; Lynch 1998, 64).

This is not unparalleled; Cooney (2002, 96) suggests that the colour of Irish Neolithic stone axeheads is important, as they advertise the source of the stone in the landscape, and Jones claims that Neolithic tombs in Arran purposely combined the red and white stones of which the island is made in order to become a monumental portrait in which the island as a whole could be recognised: "the orientation of the Arran tombs had little to do with astronomical orientations, and more to do with orientations of local significance" (Jones 1999, 344). In addition, according to Scarre (2004), some of the stones chosen for the construction of Western European megalithic monuments were selected, and therefore assigned meaning, because of their remoteness or inaccessibility, which can be understood in both a physical and a spiritual sense. Polychromy involving the use of precious materials of different origins in LBA Egyptian glass vases was meant to advertise control over resources (Duckworth 2012), and as we shall see below, similar concerns may have played a significant part in the design of ceremonial platforms.

As in the European Neolithic, stone held a position of privilege in the materialisation of the Rapanui social, political and religious structure. In Polynesia, stone is believed to be animate, a living thing rather than an inert material, which is the reason that quarrying was considered to be a consecrated activity, of which more later. Indeed, some stones are thought to be the abode of a spirit (*aku aku*) and consequently left alone (Lee 1992, 27). The Rapanui enhanced this quality by carving eyes in the rock face of the quarries of both Puna Pau and Rano Raraku (Seager Thomas 2014, 101), discussed below. The special consideration of certain stone sources was also potentiated by special sensorial features, which in a way removes them yet further

from the 'sphere of the everyday' (Hamilton et al. 2011, 170, 179). Rano Raraku achieved this special sensorial status by sheer monumentality, whereas Puna Pau is a secluded, windless, silent small crater, where one feels isolated from the rest of the island: it works well as an entrance into the *po*, and it is, of course, blood-red.

Areas charged with much *tapu*, being the point of contact between the *po* and the *ao*, were for the Rapanui places to be approached only with extreme caution and under severe ritual constraints, in a striking parallel with the Great Langdale stone-axe factories in the Cumbrian mountains and the off-shore islands exploited for stone-axe material in Ireland in the European Neolithic (Hamilton et al. 2011, 170).

Rapanui monumental architecture, therefore, prominently features the contrasting sensory characteristics of two types of stone which come from different but similarly 'special' localities, both of which are volcanic craters, suggesting a direct link with the eastern Polynesian religious/ideological milieu (Hamilton et al. 2011, 178). The symbolic potency of these types of stone and their sensory qualities are further enhanced by the very likely sacred value of stone quarrying in Rapa Nui, which is in direct connection with the consideration of stone as animate, a belief found in other eastern Polynesian societies, such as the Society Islands and the Marquesas (Seager Thomas 2014, 105–6). Stone carving was considered to be an activity full of *tapu*; ritual precautions were to be maintained, and those involved in quarrying were to observe severe restrictions to preclude any contact with the world of the everyday (Richards et al. 2011, 198; Handy 1927, 282). It is important to recognise that, as a craft which carried not only religious/symbolic significance but was potentially one of the pillars of the reproduction of the social order, the activity of stone carving, and along with it, the statues, their sensory qualities, and the locations of carving, all formed a composite, intertwined unit of meaning. None of these symbolic modules had any value in isolation from the rest (see Dobres and Hoffman 1994 for a pertinent theoretical discussion). 'There is a conceptual interweaving of these craters as natural phenomena, the distinct stone that each yields and its materialization through quarrying into representations and adornment of the ancestors and the restricted contexts of *ahu* and burials in which Puna Pau scoria and Rano Raraku tuff occur outside the quarries' (Hamilton el al. 2011, 179).

The sacred, and restricted, nature of quarrying may find reflection in two further phenomena. It has been previously noted that, in some Neolithic societies, the sacredness of quarrying extends not only to semantic architecture, but also to tool-sourcing. There are many examples of this in Pacific prehistory, including Mauna Kea (Hawai'i), Eiao (Marquesas), Putuora (Tahiti) and Ngilipitji (Australia) (Kahn 2009, 79; Bayman and Nakamura 2001, 249; Jones and White 1988, 51) (for an ethnographically documented example see Burton 1984, 240). In Puna Pau, most of the stone tool remains come from quarries in Rano Kau, another prominent location in Rapanui ideology (including the village of Orongo, centre of the Birdman cult). As with Puna Pau scoria and Rano Raraku tuff, access to these stone types is reflective of socio-political power and control over raw materials and the landscape (Taçon 1991, 194). The key point that I am trying to make is that by limiting use of a certain type of stone and ascribing it symbolic or religious meaning, these materials, quite regardless of their physical availability, became 'rarefied' and thus their value increased.

Also, as previously noted, it is not uncommon for landscape features with a strong symbolic value to be enhanced or otherwise adorned. Rano Raraku is a good example of this. Over the past few years, the joint University College London and University of Manchester 'Landscapes of Construction' project has found that many of the crater's quarry bays were decorated with engraved or bas-relief eyes, in pairs or alone (LOC

2014). The study of these eyes is still at a preliminary stage, and no patterns have yet been detected (for example, in the potential effects of different lighting conditions), but it would be rather odd if these eyes were not symbolically connected with the eyes that were attached to some *ahu moai*. These eyes were made of coral and pumice, and some of them had obsidian or red scoria pupils; these colours would contrast with the creamy colour of the *moai*, giving them a striking appearance (See Figure 1.4 in colour plates) (Flenley and Bahn 2003, 107; Van Tilburg 1986, 4).

In fact, the idea of human enhancement of a meaningful landscape feature can be pushed further; from one perspective, the whole of Ranu Raraku can be considered a massive altarpiece for the display of the ancestor cult. The face of the interior and, especially, the exterior quarries are dotted with a large number of discrete quarrying areas or bays, where dozens of *moai* of all sizes are still attached to the rock face. A dominant idea is that these are unfinished *moai*, that what we see is the result of the alleged ecological and social collapse of the island catching up with *moai* quarrying. This is not the place to elaborate too much upon this, but I believe there are a number of compelling arguments to suggest that these *moai* were not meant to go anywhere,[5] that they are a conscious, intentional composition, a truly phenomenal sculptural tableau, as well as constituting a prime example of the human enhancement of a natural feature, in which colour and light are incorporated into the end result to spectacular effect (See Figure 1.5 in colour plates) (see for example Skjölsvold 1961).

Petroglyphs, wall-painting and tattooing

Petroglyphs are a very important, if much less known, part of Rapanui archaeological heritage. Although with petroglyphs, dating is yet more problematic than with other types of archaeological evidence (Van Tilburg and Lee 1987, 137), they can still be interrogated for their meaning. Here, I shall follow two interpretations, which are not mutually exclusive, that make them highly relevant to the role played by colour in Rapa Nui society, as a direct link can be drawn between them and the practice of tattooing and body-painting, which is no less than the transformation of the body into a medium for the conveying of meaning through colour.

Petroglyphs have been regarded as the tattooing of the landscape for the demarcation of sacred areas and thus for the 'socialisation' of a landscape that is otherwise barred from social practices (Rainbird 2008, 266; 2002, 241). In Polynesia, although some variations occur from place to place, body tattooing is practiced ritually, often as a rite of passage, the preparation of an individual for a place in the social structure; in short, his or her socialisation. Some petroglyphs appear to form a sort of protective ring around sacred localities, much in the same way that tattooing is considered in Polynesia a kind of additional membrane that protects the skin from *tapu* influences, rendering it safe (Croucher and Richards 2014, 213; Gell 1993, 73). In general, many Polynesian rites involving *tapu* are associated with symbolic wrapping and binding, a practice that could also be extended to the 'wrapping [of] places in architecture' (Richards et al. 2011, 201; Lee 1992, 200; Shore 1989). This is easily visible in the surroundings of the sacred village of Orongo, in Rano Kao, which is encircled by a protective ring comprising over 1,200 petroglyphs (Flenley and Bahn 2003, 179).

Significantly, tattooing was considered a highly *tapu* practice, and its practitioners were dangerously charged with sacredness; in a phenomenon that is heavily reminiscent of stone carving (and petroglyph crafting), tattooists were subject to restrictive

bans to their behaviour, not only while practicing tattoos but also for some time afterwards. There is a likely relation between the large number of petroglyphs found around Rano Kao, a volcano and thus believed to be a gate to the underworld, and its bodily equivalent in facial orifices, which were frequently profusely tattooed (Croucher and Richards 2014, 214).

The parallels in Rapa Nui are yet more striking if we consider the carving of petroglyphs on monuments such as *ahu*, *pukao* and *moai*. In many cases, these petroglyphs were clearly carved at a late date, and their meaning and relationship with the original monument is hard to gauge (for some ideas, see Van Tilburg 1994, 82, 140; Lee 1992, 122–6). However, in a number of *moai*, the reference to tattooing or/and body-painting is difficult to miss; these include curved lines on shoulders, spirals on the buttocks, girdles around the waist (Flenley and Bahn 2003, 105; Van Tilburg 1994, 135; Van Tilburg and Lee 1987, 138) and paddles on the back and abdomen, called *pare*, which in some Polynesian languages means protection or obstacle (Gell 1993, 273; Métraux 1940, 244) (Figure 1.6). Also in connection with the link between semantic architecture and tattooing/body-painting is the revealing fact that the three colours that appear in combination on the largest and, presumably, most sacred *ahu*, red, white and black, were also the three colours most meaningfully used for body-painting (Hamilton et al. 2011, 182–3).

Indeed, largely on the basis of ethnographic accounts, we know that these three colours feature prominently in ritual situations such as, among many examples, the ceremony of *manu mot e poki*, a rite of passage in which the initiates were decorated with circles around the waist and on the buttocks with a pigment known as *marikuru* ('whitish chalk'). Similarly, the *tangata manu* Birdman had his head shaven and painted red, or red or black, a combination also to be found in other ritual settings, for example the rain-propitiatory invocations to Hiro, god of the sky (Arredondo 1993, 217).

Figure 1.6 Back of the *moai* known as Hoa Hakananai'a, currently at the British Museum (left); tattoos on bird-child (right).

From Routledge (1919).

Some have suggested that the position of the *ahu* encircling the coastline of Rapa Nui forms a kind of membrane that engulfs the island, protecting it, in the same way that canoes are understood as a wooden membrane that separates and safeguards man from the ocean, or tattoos and body paint a protecting layer that makes humans safe in their dealings with the occult (Richards 2008, 215; Flenley and Bahn 2003, 109). If we consider that, in Polynesian societies, the building of a canoe represents a collective endeavour in which the efforts of society are put together in the construction of an artefact that embodies the whole community, just as *ahu* can be believed to represent Rapa Nui in its entirety (see above and Hamilton et al. 2011, 169–70), we begin to see that architecture, colour, labour, symbolism (for example, of wrapping), belief and power all come together in a closely knit construction of meaning.

Colours that do not fade: Colour and continuity in Rapanui culture

Colour itself constitutes a solid argument for a strong degree of ideological continuity in Rapa Nui culture, even after the transformation that caused the end of the *moai* construction phase. There is plentiful ethnographic evidence of the use of colour during post-contact ceremonial, and there is no obvious chasm between the role played by colour at the time of contact and during earlier stages, as far as the latter can be gauged. Based chiefly on these ethnographic accounts, Seelenfreund and Holdaway (2000, 106–7) see subtle changes in the way different colours were used due to the warrior-dominated society borne of the crisis that precipitated the end of the *moai* phase, in the canonical version of Rapa Nui recent prehistory. Specifically, they see the colour black, allegedly associated with the *miru* (the aristocratic class that dominated the *moai* phase), relegated to a position of disfavour. The evidence is, in my opinion, too patchy and inconsistent to allow for fine-grained conclusions such as this. The important thing about Seelenfreund and Holdaway's discussion is that it makes it clear that colours and their symbolism were understood in essentially the same way throughout the whole prehistory and history of Rapa Nui; whatever the social transformation was, the result was still understandable for all involved.

Furthermore, some late manifestations of Rapa Nui culture (Van Tilburg 1994, 92) are also related to uses of colour that are strongly evocative of those found in the *moai* construction phase. Pyramidal *ahu* are a type of late funerary construction that lacked the monumental characteristics of earlier monuments (upon which sometimes they sit). In addition, they were used for inhumation, since a shift in funerary customs was one of the changes to take place during late prehistory times on the island (Love 1993, 105–6; Stevenson 1986, 74). These monuments are often found in association with scatters of red scoria, coral and obsidian flakes, which stand perhaps as a statement for the continued legitimacy through colour of the constructors (Shaw 1996, 102; Seelenfreund and Holdaway 2000). Another example of this is the famous *moai* Hoa Hakananai'a, now in the British Museum. This *moai*, which is post-contact in date, combines a number of *moai* phase features, including its morphology and style, and the use of colour paint (now lost) on its painted back; with others that relate it to the (later) Birdman cult, for example the iconography of the painting and its original location, in the village of Orongo (Van Tilburg 1994, 139). This is a startling combination of characteristics, which almost present Hoa Hakananai'a as a deliberate link between two stages in the history of the Rapanui.

Finally, in connection to this it is worth noting that wall painting was widely practiced during the later periods, as attested by European visitors, but the very apt use of the differing characteristics of red, white and black in this indicates a long tradition and expertise, as seen for example in Ana Kai Katanga (See Figure 1.7 in colour plates) (Lee 1992, 187). The art of tattooing, also as witnessed by the early visitors, points in the same direction of a continued, coherent and well established tradition which has direct symbolic links with previous periods (as demonstrated by the parallel between tattooed motifs and carvings on *moai*).

Final remark

Colour, taken in isolation, is nothing more than an electrical neuronal response. Colour in combination with architecture, beliefs, labour systems, the landscape and a long *et cetera* can mean power, authority, assertion, death and more. This is what I have tried to show in relation to the prehistoric society of Rapa Nui. By way of standing as an explicit (for example, in the *pukao*) and an implicit (for instance, by the restricted use of some kinds of stone) statement of meaning, colour was a prominent element in the networked semantics of Rapa Nui society, in which the visual was of paramount importance. In this case we must leave the microscope aside and take the dust off the wide-angle lens.

Notes

1 This work has been written within the framework of the AHRC-funded Rapa Nui Landscapes of Construction Project, directed by Prof. Sue Hamilton (UCL) and with the participation of Prof. Colin Richards (University of Manchester) and Prof. Kate Welham (Bournemouth University). I would like to thank Prof. Hamilton and all the other members of the LOC team for offering me the opportunity of taking part in the project and to work with such an amazing team in a no less amazing setting for an archaeologist.

2 Oral accounts are nearly always more representative of the times of the informant than of the epoch he or she is referring to. People tend to make sense of their present, and this inevitably alters their perception of the past. See also Flenley and Bahn (2003, 41) and Martinsson-Wallin (1994, 133).

3 The only 'aberrant' *moai* which can be proven to have travelled relatively far is at Vinapu, and significantly, it is made of Puna Pau scoria.

4 Yellow has a deep symbolic meaning in Rapa Nui and the Pacific. Barkcloth capes used as chiefly gear were died yellow, and the most prominent families of the Marquesas were also associated with that colour. In Mangareva, turmeric, which is used for the extraction of yellow dye, had its own god.

5 Among other reasons, it must be pointed out that Routledge already realised that some 'quarry dwellers' are much larger than any *moai* found outside the quarry. Also, these statues, along with those found alongside the roads, lack eye sockets, which are only found in *ahu moai*, seemingly indicating that they belonged to a different category altogether. Also Van Tilburg (1994, 134).

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2 The colourful world of metal invention in the 5th millennium BCE Balkans[1]

Miljana Radivojević

The quest of the 'when' and 'where' of the world's earliest metallurgy remains a contended topic in modern scholarship. This study looks beyond the focus on origins by presenting a tentative model of 'how' and 'why' metallurgy was invented, looking into choices and skills involved in the selection, experimentation and processing of distinctively coloured copper minerals and ores throughout c. 2,000 years in the Balkans. The body of evidence is built around the currently earliest recorded evidence for copper smelting dated to c. 5000 BCE, discovered in the Serbian Vinča culture site of Belovode. The process of invention is explored through the lens of a microscope, including optical and compositional analyses of a selection of copper minerals and metal production evidence: ores, slags, slagged sherds and metal droplets recovered from seven settlements in Serbia, spanning from the late 7th to the late 5th millennium BCE. The data indicate an independent technology trajectory of metal smelting in the Balkans, and suggest the persistence of a technological 'meme' – the focus on black and green minerals – throughout the development of metallurgy in the 5th millennium BCE.

The discovery and subsequent adoption of metal coincides with a whole new era of fundamental economic, social and cultural changes in the lives of prehistoric communities across Eurasia, and has therefore been recognized as an important chronological backbone for the periodisation of later prehistory worldwide. Although the beginnings of metallurgy have received impressive scholarly attention, the earliest origins of metallurgy in Eurasia remain contentious, and the timing and location of the first European metal extraction (smelting) is one of the most eagerly argued topics in prehistoric archaeology.

This is not only due to the fragile nature of the early evidence for metal extraction, but also to the established conventional perspective on the early development of metallurgy. The latter rests on three major assumptions that set the foundations for understanding the emergence of metallurgy in Eurasia: the metal smelting skill has only been discovered once in the human past; this happened in a centre in the Near East; and it evolved in a unilinear fashion.

The recent study of c. 7,000-year-old copper smelting evidence from Belovode, a Vinča culture settlement in Serbia, has challenged the traditional narrative of the evolution of metallurgy, predating the earliest previously known evidence by over half a millennium, occurring at a location remote from the Near East, and most significantly, reviving the possibility of multiple, independent inventions of Eurasian metallurgy (for opposing views see Roberts, Thornton et al. 2009; Radivojević, Rehren et al. 2010). Nonetheless, there has been little research specifically addressing 'how' and 'why' metallurgy emerged and evolved.

The invention of metallurgy, as of any other novel technology, must have evolved through the accumulation of knowledge of the components of the process. This knowledge was built through experimentation, recombination or re-application (to a new purpose) over a period of many years (Basalla 1988; Wiener 1993; Lienhard 2006). Thus, it is likely that it would have taken a few generations of craftspeople for the invention to develop, and several decades, or centuries, of evolutionary process until it reached a form that functioned to a desired purpose (Jewkes, Sawers et al. 1969; Roberts and Radivojević 2015).

Cyril Stanley Smith (1981) was among the first to recognise that the origins of technological breakthroughs (such as metallurgy) were motivated more by appreciation for colour, acoustic properties, scent or reflectance of materials than by the pursuit for better tools or weapons. As he noted, the 'desire to beautify the utilitarian has always stretched the ingenuity of the mechanics' (Smith 1981, 330).

Archaeometric studies have long been used to identify inventive and innovative technological skills at analytical scales invisible to the naked eye. They also emphasise the importance of understanding the interaction of environment, physical properties of materials and social practices involved in their manufacture (see the concept of 'embedded technologies' in Sillar and Tite 2000). For instance, the connection between distinctive colours, brilliant surfaces and ritual power and potency has already been made in ethnographic studies (Chapman 2007a; Chapman 2007b). Art, technology and aesthetics have already been addressed within a technical system called 'the technology of enchantment' (Gell 1992). Enchantment is argued to be associated with technology, and is most potent during ceremonial or commercial gift exchange, or rituals. Furthermore, the power of artistic objects is particularly distinctive when it comes to their visual properties, such as colour, or shine. An excellent example of integration of aesthetics and materials science is provided by Hosler (1994), who explores the significance of aesthetics and sound in metal use in historic West Mexico and discusses how these properties shaped the Mesoamerican worldview.

Balkan copper

Five grams of copper slag from the site of Belovode dated to c. 5000 BCE and published in Radivojević et al. (Radivojević, Rehren et al. 2010) represent the earliest recorded evidence for copper production in Eurasian metallurgy. This small assemblage attests to the Balkans as one of the heartlands of Old World metallurgy, and stands out as unprecedented in size, quality and resolution when compared to the insufficiently contextualised or analysed materials from three other potential heartlands of metallurgy: Anatolia; Iran; and Iberia.

Importantly, the quantity of extant production evidence from the Balkans still stands in stark contrast to c. 4.7 tonnes of extant massive copper implements that circulated in this area in the 5th millennium BCE (Pernicka, Begemann et al. 1997; Ryndina 2009). The unparalleled abundance of metal artefacts, along with their similar technology of working and distinctive typological features prompted Chernykh (1978) to define the Balkan-Carpathian region as a metallurgical province, which influenced the beginnings of metallurgy north of the Black Sea region, and beyond.

Besides yielding the evidence for the world's earliest copper smelting, Balkan craftsmanship in the 5th millennium BCE stands out for the skilled execution of material culture, with preferences for brilliance, colour aesthetics and geometric thinking dominating the performance of craftspeople at the time (Chapman 2011). Among the Vinča culture communities in particular, there is a notable preference for black (Radivojević and Rehren 2015), which is also argued to be the major factor in the production of black-burnished ware in this culture (Chapman 2006). The colourful aesthetics of the 5th millennium BCE Balkans have their roots in the Mesolithic (cf. Srejović 1972; Chapman and Richter 2009), when colour constituted a central role in the culture of living and dwelling (Chapman 2007b). It is hence thought that antecedent aesthetics were a crucial prerequisite for the introduction/invention of copper and gold objects, both of which substantially contributed to the colour spectra of material culture at the time (Chapman 2002).

In this paper the evidence assembled from several Balkan Transitional/Early Neolithic and Early Chalcolithic Vinča culture settlements (c. 6200–4400 BCE) will be investigated. The 'microstructure' of the metal invention process is revealed through optical and compositional analyses of a selection of copper minerals and ores, slags

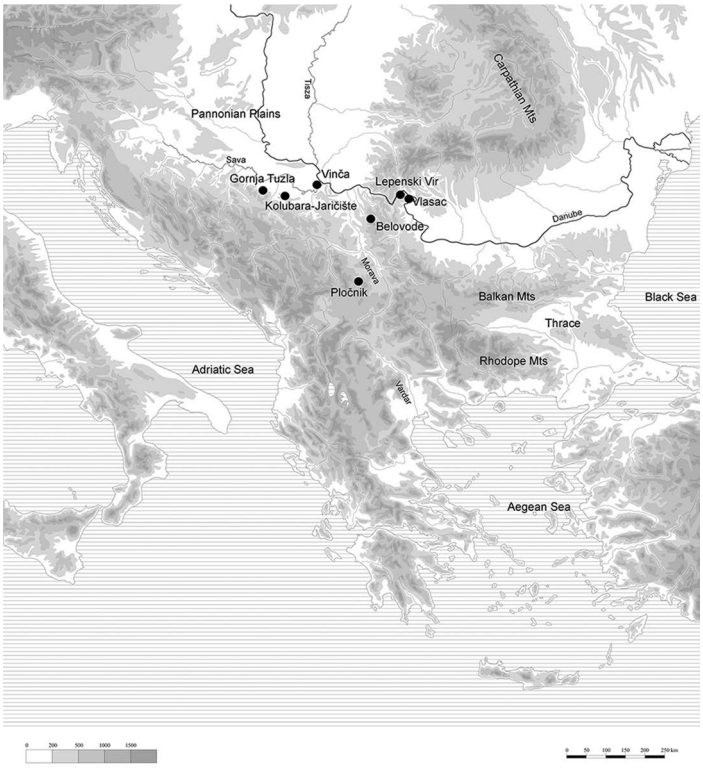

Figure 2.1 Map of studied sites.

Map courtesy of M. Milinkovic, Faculty of Philosophy, Belgrade.

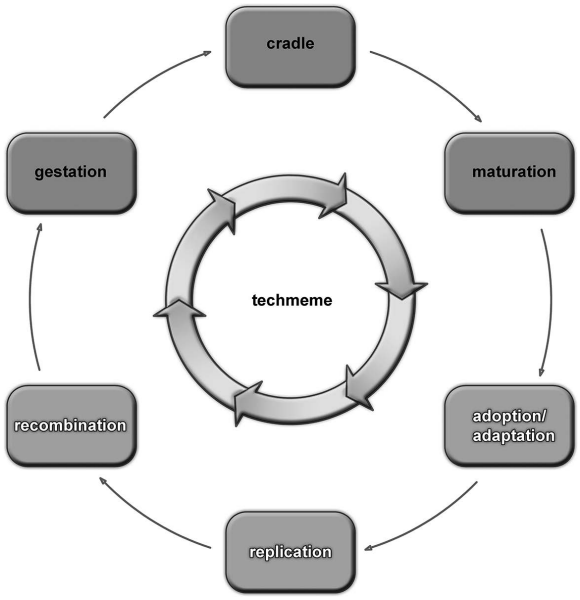

Figure 2.2 A lifecycle of technological invention and innovation. Three stages of invention: gestation; cradle; and maturation are followed by three stages of innovation: adoption/adaptation; replication; and recombination. The technological information, or the techmeme, is at the core of the entire process.

and other production waste including slagged sherds and copper metal droplets, uncovered from seven settlements: Lepenski Vir, Vlasac, Kolubara-Jaričište, Belovode, Vinča, Pločnik and Gornja Tuzla (Figure 2.1), all dated to between the late 7th and the late 5th millennium BCE. This research suggests a unique and independent technological trajectory for the emergence of metallurgy in the Balkans, and follows its evolution from mono- to polymetallic within this period.

Techmemes and invention

Technology, as much as culture, evolves through time, or to use the words of Darwin, 'descends with modification'. As O'Brien and Lyman (2000, 7) advocated, products of technology are active components of the adaptive processes, rather than adaptive reflections of human evolution. Material culture is therefore a part of human phenotype in the same way that bones or skin are, and as such it has the same capacity to yield data crucial for understanding the process of evolution as well as the specific behaviour of its creator. The unit of cultural transmission is contained in the idea of a *meme* (Dawkins 1976; Shennan 2002), which differs from a *gene* by operating within the specific properties of a given *cultural* system. As such, memes are shaped by an array of psychological and social mechanisms in addition to the forces of natural selection (for discussion see Atran 2001; contra Mesoudi, Whiten et al. 2006; Henrich, Boyd et al. 2008).

Following arguments put forth in Radivojević (2015), various social, environmental and physical processes affect the trajectory of a technological invention, which evolves with variable success through variation and replication via transmission mechanisms. The accumulation of technologically transmitted attributes ('techmemes') over time triggers new inventions, which accordingly enter a new cycle of technological evolution. Figure 2.2 illustrates these points through a simplified representation of a lifecycle of technological invention and innovation. The underlying technological information, the techmeme, which is transmitted, and which varies and accumulates throughout this process, takes the central place in the described lifecycle.

My intention here is to explore the technological context of the invention of metallurgy in the Balkans by identifying variables (techmemes) in the metal production process and their evolutionary potential to replicate and recombine during the period under study, primarily from a technological point of view. Hence the physical constraints of the metal production process will be the primary focus of my approach for investigating the invention and subsequent innovation of metal making in the Balkans. My aim is to demonstrate how technological analysis of the earliest archaeometallurgical debris can be used to address the very emergence of metallurgy in this region as well as to advance our fragmentary knowledge of the metal producing communities at the time.

Materials

The study assemblage for this research originates from seven different sites in the Balkans (Figure 2.1). I selected copper minerals coming from domestic contexts of three well dated late 7th millennium BCE occupations at the sites of Lepenski Vir, Vlasac and Kolubara-Jaričište (Radivojević 2012; Radivojević 2015, 325, Table 1) in order to explore copper selection practices predating smelting activities in the area (Radivojević 2015, 325, Table 1). These black and green mineral lumps, unlike documented copper mineral beads from Lepenski Vir (Srejović 1972, 146), bear no traces of processing such as polishing or drilling. Interestingly, at the site of Vlasac, fist-sized lumps of these coloured minerals amount to an incredible seventy pieces discovered together within the site's Transitional/Early Neolithic phase, dated tentatively to c. 6200 BCE (Radivojević 2015, 325, Table 1).

The remaining four sites (Belovode, Vinča, Pločnik and Gornja Tuzla) belong to the Late Neolithic Vinča culture phenomenon, dated between c. 5400 and c. 4600 BCE (in Gornja Tuzla the end date is c. 4400 BCE, see Radivojević 2012, 150; Radivojević and Rehren 2015), and yielded various materials attesting both copper mineral use and archaeometallurgical activities during the designated period (Radivojević 2015, 325, Table 1). Archaeometallurgical materials at these sites mainly date to the Gradac Phase of the Vinča culture, starting c. 5000/4950 BCE, and continue to appear in the excavation record until its end, c. 4600 BCE (Radivojević and Kuzmanović-Cvetković 2014). The earliest occurrence of archaeometallurgical materials is recorded in Belovode at c. 5000 BCE, followed by slag from the site of Vinča dated to c. 4800 BCE and the Gornja Tuzla slag documented from the horizon dated to c. 4400 BCE (Radivojević 2012, 119 ff.). Copper mineral use appears throughout the entire sequence of this culture in all sites, and in domestic contexts only. The sampling procedure included both minerals preceding and associated with metallurgical activities in the Vinča culture sites,

amounting to thirteen samples in total presented here (2.3; Radivojević 2015, 325, Table 1).

Thirty samples in total were studied in detail at the Wolfson Archaeological Science Laboratories, Institute of Archaeology, University College London. The rationale for separating copper mineral use from copper ore smelting is based on the type of activities undertaken during their processing. While 'cold' techniques are used to process copper minerals into pigments or beads, the 'hot' extraction of copper from its ores produces a different type of material, and therefore yields a different kind of economic benefit (Radivojević, Rehren et al. 2010, 2779). Thus, I will use the term 'mineral' throughout the text until analyses reveal which copper minerals were used as copper ores (i.e. sources of metallic copper).

Archaeometallurgical materials in this study include slags, slagged sherds and copper metal droplets (See Figure 2.3 in colour plates; Radivojević 2015, 325, Table 1). Slag is a by-product of copper smelting that separates from metal during extraction, and is represented here by ten green-stained and strongly magnetic droplets from the sites of Belovode and Vinča. Slagged sherds (five in total, from Belovode and Gornja Tuzla) were most likely fragmented pottery pieces that lined a hole in the ground and preserved some of the liquid slag spillage on them (Figure 2.3).

Copper minerals (c. 6200 BCE–c. 4600 BCE)

Analyses of thirteen copper minerals indicate two compositionally distinctive groups: oxide and sulphide minerals, which would be separated by traditional archaeometallurgical approaches as they demand different conditions for metal extraction. Yet, together they form a single colour-coded group: green and black/grey (See Figure 2.4 in colour plates). The oxide minerals are more granular and black-and-green, which is a colour feature also detected under the microscope as two phases: bright green crystals (probably as carbonate) and grey oolithic structures, with strikingly similar copper and manganese content throughout the studied samples.

Three copper minerals in total were found to contain sulphur in addition to copper oxides (Belovode 3, 33b and Pločnik 72m). Macroscopically, these appear more solid than the black-and-green oxide minerals, although they too have distinctively coloured cross-sections in shades of green and grey, with metallic lustre (Figure 2.4).

Microanalyses of copper minerals from seven different sites spanning c. 1,600 years show that during this period a pattern of selecting manganese-rich mineral batches can be observed. Their common features are black and green appearance and similar composition, which is striking as a particular selection choice for a period spanning the Early Neolithic to the end of the Vinča culture. These minerals were selected over others available, for technological and cultural reasons to be explored further in this research, and clearly indicate an awareness of their material properties throughout c. 1,600 years across the central Balkans (Radivojević 2015).

The presence of sulphide copper minerals in the 5th millennium BCE Chalcolithic settlements is noteworthy, as this is rare and still not well documented in this period. Importantly, both oxide and sulphide copper minerals have a distinctive colour pattern of green and black/grey, due to either their manganese, or sulphur content. This implies that at the very early stage of Balkan pyrometallurgy, copper smiths from Belovode and Pločnik were *experimenting with different kinds of black and green*

minerals, and that the outer appearance of these minerals played a significant role in the selection process.

Production evidence (c. 5000 BCE–c. 4400 BCE)

All Vinča culture copper slags (free slag samples and slagged masses on pottery sherds) present markedly similar macro- and microstructure of a slag matrix that solidified from a fully liquefied state. According to the fully molten state of copper metal prills embedded in studied samples, the working temperatures reached c. 1083 °C. The main constituents of slag matrices in these samples are silica, alumina, lime, iron and copper oxides, amounting to around 80 per cent on average, followed by elements mainly coming from fuels: phosphorus, potash and magnesia, which amount to another 5–13 wt% (weight percentage) on average (Radivojević 2015, 332, Table 2).

Since the co-occurrence of cuprite, delafossite and iron spinels dominates the slag samples, it appears that a partially oxidised atmosphere prevailed, which was sufficient to smelt copper (Elliott 1976). Thus, the redox conditions suggest that the overall gas atmosphere was slightly oxidising/moderately reducing, which resulted in the successful production of copper metal and the formation of heterogeneous slag in the sites of Belovode, Vinča-Belo Brdo and Gornja Tuzla. Significantly, a striking microstructural similarity of slag samples from the sites of Belovode, Vinča and Gornja Tuzla suggests a similar technological principle of smelting in these sites, despite the fact that the smelting events discussed were separated by up to six centuries (Radivojević 2015, 330, Figure 6).

Another unifying point for these samples is the choice of ores, indicated by ore fingerprints in each of the glassy slag matrices (Radivojević 2015, 332, Table 2). For Belovode samples, the strong cluster of a selection of glassy matrix data along the CaO-MnO axis demonstrates the use of manganese-rich black-and-green copper minerals (Radivojević 2015, 331, Figure 8). The signature of the slag sample Vinča 79, besides the significant manganese intake (Radivojević 2015, 332, Table 2), also includes increased iron and phosphorus concentrations, which match closely the composition of blue/green phosphate vivianite [$Fe_3(PO_4)_2 \bullet 8H_2O$]. Hence, the likely combination of ores smelted at this site for this particular event could have been a mix of manganese-rich black-and-green copper minerals and blue/green vivianite; the composition of Vinča 91 slag matrix, on the other hand, indicates the use of the former type of ore only (Radivojević 2015, 331, Figure 9). At the site of Gornja Tuzla, the slag glass matrix plots near the projection of secondary minerals of the phosphates/arsenates family such as scorodite ($FeAsO_4 \cdot 2H_2O$), strengite ($FePO_4 \cdot 2H_2O$) and arthurite ($CuFe_2(AsO_4,PO_4,SO_4)_2 \cdot 4H_2O$) (Radivojević 2015, 333, Figure 10).

Whatever exact minerals were present in the ore charges that produced the slag samples analysed here, they most likely possessed strong colours in the range of green/blue (i.e. vivianite, arthurite, apatite, scorodite), and violet (i.e. strengite), in addition to black and green manganese-rich malachite (Belovode and Vinča only). These brightly coloured minerals appear to have been collected by the Belovode and Vinča ore prospectors in paragenesis with dark-coloured manganese minerals. This may well have been the case for Gornja Tuzla, too. For instance, scorodite is the most common weathered mineral originating from the primary arsenic ore, arsenopyrite.

Interestingly, the weathering of arsenopyrite results in green/blue scorodite and red/black goethite [FeO(OH)] (Murciego, Álvarez-Ayuso et al. 2011, 594). Thus, the allure of green and dark/black minerals found together in the landscape could have been a decisive factor for collection by the smiths working in all three sites, Belovode, Vinča and Gornja Tuzla.

A possible source for all these minerals in paragenesis with copper and iron ores is the Bor district in eastern Serbia, which is not too far from the studied sites (Belovode being the closest at c. 50 km distance). It contains massive sulphide deposits of cupreous pyrite, with rich primary and secondary copper minerals (Sillitoe 1983; Janković 1990) and polymetallic enrichments that makes the occurrence of scorodite and strengite, and other phosphates such as apatite and vivianite, very likely.

The allure of green and dark/black minerals could have therefore represented a decisive factor in selecting these colour-coded ores for early metal extraction. Although it is not clear from the analyses whether black and green minerals were selected separately or as a mixed ore, the conclusion that emerges is the existence of a common knowledge concerning the suitability for smelting of distinctively coloured mixed minerals, as opposed to the uniformly green, pure malachite selected at the same time for bead making (Radivojević, Rehren et al. 2010; Radivojević 2012, 306; Radivojević and Rehren 2015). It is not argued here that the pure green malachite was not also smelted, but rather that the black and green minerals were intentionally selected for metal making in the sites of Belovode, Vinča and Gornja Tuzla, for more than half a millennium, as a sole or a combined ore charge. These minerals form the colour-coded 'core' of the invention and innovation cycle of early Balkan metallurgy, as demonstrated above with the presented analytical evidence (See Figure 2.5 in colour plates).

The colour factor emerges as particularly important in the light of the earliest tin bronze artefact discovered at the site of Pločnik (Radivojević, Rehren et al. 2013). The hereditary selection and experimentation with the properties of tainted, black-and-green copper-tin rich ores (as in stannite, $Cu_2(Fe, Zn)SnS_4$) is argued as a potential driving factor for the invention of tin bronze metallurgy in the 5th millennium BCE Balkans.

Invention and the shades of green

Macroscopic, microstructural and compositional analyses have revealed a particular preference for black-and-green copper minerals by prehistoric communities inhabiting seven different Balkan settlements between c. 6200 and c. 4400 BCE. There is no doubt that such a preference must have been shaped by the easy access to abundant copper deposits in the Balkans, as the Early Neolithic communities are known to have utilised these sources for bead making from pure green malachite (Srejović 1972, 146; Radivojević 2012, 399). Nonetheless, the only other type of copper mineral singled out from a plethora of available geological choices by the same communities was the black-and-green manganese-rich one. This dual selection principle (pure and tainted minerals) also continues in the Vinča culture, as demonstrated by previous research (Radivojević, Rehren et al. 2010, 2784 ff.), implying that the decisions made towards their selection were guided by their colour as well as knowledge of their material properties.

Despite the fact that the function of the manganese-rich copper minerals from the Transitional/Early Neolithic settlements of Lepenski Vir, Vlasac and Kolubara-Jaričište

cannot be designated, these would not have seemed significant for the evolution of Balkan metallurgy had they not been encountered again around a millennium later in the context of the earliest copper smelting activities at the sites of Belovode and Vinča. Although these manganese-rich minerals were apparently not smelted at the other two sites, Pločnik and Gornja Tuzla, the choice of smelted ores is assumed to have remained black-and-green. While the choice of black and green ores in Gornja Tuzla has already been mentioned above, the copper metal droplet from Pločnik (sample 52) was most possibly a product of heat-treating a mineral paragenesis of cuprite and copper sulphides, the latter of which stains the green mineral with dark inclusions. Hence, the evolutionary trajectory of copper metallurgy in this part of Eurasia was shaped by the knowledge of material properties of black-and-green manganese-rich copper minerals, which was acquired during a millennium-long selection by the Neolithic communities in the Balkans prior to their smelting. This long-lived similarity in selection practices implies that information about the properties and location of these minerals was possibly culturally transmitted and part of the shared cultural and technological tradition. Although the mechanisms of transmission are not clear, the provenance analyses of the black and green manganese-rich minerals from Lepenski Vir, Vlasac, Kolubara-Jaričište and Belovode contribute to this argument by revealing their likely origin from the same (local) source (Radivojević 2012, 399 ff.).

The black-and-green manganese-rich copper mineral was thus the *techmeme* of copper metallurgy in the Balkans. The knowledge of its properties appears hereditary; it mutated, varied, multiplied and descended with modification throughout the observed c. 2,000 years (Radivojević 2015). During at least the last six centuries of this period, the Vinča culture copper smiths were aware that black-and-green copper ores were suitable for the production of metal under the variable conditions of the smelt. The advantage of these particular ore types is the nature of manganese oxide, which is known to facilitate the formation of a melt under lower operating temperatures than those required when, for instance, iron oxide is present in the system (Huebner 1969, 463, Figure 3; Heimann, Kreher et al. 2001, 233). Therefore, the advantageous chemical-physical properties of manganese oxides enabled an easier reduction of copper ores to metal and slags within less-controlled smelting environments.

It may be concluded that the physical environment of the observed copper smelting process determined its success and accordingly reinforced the preference for black and green ores among the Vinča culture smiths. Such understanding was crucial for a successful transformation of ore to metal, and was preceded by another transformation, that from the perception of black and green *minerals* into black and green *copper ores*.

Interestingly, the colour of green flames occurring during the metal smelting process were yet another indicator of the importance of aesthetics in informing about the qualities of ores, or process temperature (See Figure 2.6 in colour plates). These also probably allowed for the visceral experience of material transformation in a context likely loaded with community rituals, as already observed ethnographically around the globe, as well as during the experimental reconstruction.[2]

The colourful world of early metallurgy

The knowledge of metal extraction in the Balkans appears to be the result of an evolutionary potential of black-and-green minerals, whose history of selection goes back

to the late 7th and early 6th millennia BCE. The invention of metallurgy required the formation of appropriate interconnections between environmental surroundings, social practices and the physical properties of raw materials: it was not only about the (technical) moment of turning mineral into ore, but also about other components of the invention process that facilitated its maturation in the hands of an inventor.

These interconnections were most likely forged through a deep and enduring preference for colour aesthetics whose full expression in the Balkans culminated in the 5th millennium BCE (Bailey 2000; Chapman 2002; Chapman 2007a; Chapman 2007b; Chapman 2011). Besides the aesthetic preference seen in the outstanding degree of proficiency for decorating or painting pottery vessels, there is also a notable preference for black in the Vinča culture (Chapman 2006), potentially one of the reasons for experimenting with black-and-green ores.

Both dark burnished pottery wares with highly reflective surfaces and obsidian (black volcanic glass) are frequently found in the material culture of these communities (Chapman 2006). Graphite-painted pottery with silver-like brilliance also emerged at the beginning of the 5th millennium BCE in western Bulgaria, and spread across the area (e.g. Renfrew 1973; Todorova 1986). As well as its significance in mineral selection, manganese oxide was also used for developing a deep black colour for pottery decoration in northeast Bulgaria (Gaul 1948, 100; Todorova 1995, 88).

Graphite pottery painting emerges as specifically relevant in relation to the early copper smelting technology. The decoration of pots with this technique also required a good understanding of redox conditions, and its two-stage process is technologically reminiscent of a two-stage copper smelting.

The fact that the unique black-and-green techmeme has no parallel at the time marks its evolution in this region as strongly independent in comparison to similar and (almost) contemporary metallurgical developments worldwide. This study, however, does not claim that the very thought of metal extraction was conceived in the Balkans. Pyrometallurgy, as any other idea, had multiple origins, but it was the Vinča culture population that advanced this idea and emerged as the first metal producing and consuming society in western Eurasia. The social institutions supporting the production, logistics and markets for metal were already in place. Although the archaeological record does not clearly demonstrate why such institutions were established, and what the underlying mechanisms may have been, some clues can be found in the preference for shiny and colourful objects in the 5th millennium BCE Balkans. It could be that the emphasis on brilliance in material culture rendered metal production practical, and metal artefacts desirable.

The consistency of metal producing technology throughout the observed evidence from Belovode, Vinča and Gornja Tuzla speaks of a knowledge that was probably learned as a traditional 'package' by the same gender offspring or an apprentice (cf. Shennan and Steele 1999). However, although (traditional) environmental learning of metallurgical skills might have taken place in the initial phase of practicing metallurgy, the pace of its spread was probably dictated by forces of biased transmission (cf. Henrich 2001). Henrich (2001, 1009) argues that all individuals, regardless of their economic position and exposure, are equally likely to adopt an innovation early; however, their position in a society, such as high status, will be crucial for dictating the pace of an innovation transmission.

The archaeological record of the social role of Vinča culture copper smiths is yet not well known. It is worth mentioning that the identified metal workshops from the sites

of Belovode, Vinča or Gornja Tuzla do not contain unusual archaeological materials, as ceramic material and figurines from these features do not stand out in typology, or the size of the assemblage (Radivojević 2012, 424). Thus, it may be assumed that copper smiths were an integral part of the Vinča culture society, although the scale of their occupation (full/part-time) is currently difficult to estimate. Furthermore, nothing in their known material status implies that they had a higher-ranked position in a society, which makes them unlikely candidates to dictate the spread of metallurgical innovation.

The recent discovery of a group of forty-three ceramic figurines and eleven miniature clay tool models in the context of the late Vinča culture settlement of Stubline located near the river Sava in western Serbia prompted debate about the existence of social inequality in Vinča culture society (Crnobrnja 2011). Namely, the spatial arrangement of forty-two carelessly shaped figurines around a larger one with a modelled clay 'sceptre', inspired Crnobrnja (2011) to argue that it represents socially hierarchized groups. However, what has not been emphasised enough in this explanation is the importance of the meticulously manufactured clay tools and sceptres (unlike the figurines), which may actually be the most important storyteller of the Stubline finds. The small clay models of axes typologically look a lot like contemporary copper hammer-axes from the mid 5th millennium BCE Balkans, while the clay 'sceptre' carried by the largest figurine resembles a golden 'sceptre' from the Varna cemetery (cf. Ivanov 1988).

Thus, since the social elites in the mid 5th millennium BCE were recognised amongst individuals buried with gold and/or copper metal artefacts, as in the cemetery in Varna (Renfrew 1986), the Stubline set of figurines represents an interesting example of a potential social status display in Vinča culture society. The role of metal objects in this group of figurines is prominently displayed, and indirectly speaks of the social importance metallurgy might have had for the Vinča culture society. Also, the potential account for a social role of metal objects in the Stubline set of figurines stands out from the predominantly economic context of metal consumption in this society.

Although this set of figurines is a singular and isolated find, it could suggest the existence of a metal-consuming 'elite' at the time. The likely presence of this metal-consuming 'elite' reinforces the assumption that the spread of metallurgy in the 5th millennium BCE Balkans could have been dictated by preferences of higher-ranked individuals in Vinča culture society. Nevertheless, one must not forget that prestige bias, although very likely the predominant force in the spread of metallurgical innovation, was just one of the forces that shaped its transmission.

The demands of higher-ranked individuals paired with the accumulation of learned skills in a metal producing community could have stimulated another cycle of inventions in metallurgy, which introduced gold, tin bronze, lead and silver in the mid to late 5th millennium BCE exchange networks, although in a limited mode of production (Radivojević, Rehren et al. 2013, 1041–2). An important conclusion following the emergence of this polymetallic horizon is that the understanding of material properties of other metals, such as silver or gold, implies that various technological solutions were actively pursued (cf. Leusch, Armbruster et al. 2015; Aulsebrook, this volume), marking the horizon of their emergence as polytechnological as much as polymetallic.

The evolutionary trajectory of the Vinča culture metallurgy emerges as a regional phenomenon during the course of the 5th millennium BCE. The continual production of metal implements in this period demonstrates that the learning network of Vinča metal smiths eventually exceeded its initial size and remained resistant to the collapse of the Vinča culture in the mid-5th millennium BCE. It appears to have expanded

beyond the traditional concept of a 'culture' and followed its own dynamics of functioning, very much resembling the phenomenon of the Balkan-Carpathian metallurgical province (cf. Chernykh 1978). Given the current state of evidence, the inception of the 5th millennium BCE Balkan network of copper smiths is to be sought in the invention of metal extraction within the Vinča culture, as revealed here through the lens of a microscope.

Notes

1 The integral version of this text has been adjusted based on the one published in *Cambridge Archaeological Journal* 25 (doi:10.1017/S0959774314001097). The CAJ has kindly allowed the re-print of the illustrations, and of sections of the published paper.
2 The author also designed a set of experiments to reconstruct the earliest metal smelting practices in the Balkans in summer 2013, which involved archaeologists as well as local community, and emphasized the role of communal practice in conducting the extraction of copper metal.

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3 Late Bronze Age manipulation of light and colour in metal[1]

Stephanie Aulsebrook

In the study of ancient metal artefacts, archaeologists have often privileged technological and narrow function-orientated interpretations. Yet aesthetic considerations were also key to decisions made by artisans, with colour and reflectivity essential properties of metals. Investigation into the metallurgy of Central and South American cultures have shown how factors such as these could be of equal or even greater importance. Can we find similar examples in other past societies? This paper explores how two natural properties of metals were manipulated by Late Bronze Age Aegean artisans, through the case study of metalware from the Greek mainland (c. 1700–1200 BCE).

Colour is inextricably linked to the composition of metals, and polychrome metalware was a well-known Aegean product. The motivation behind the selection of materials for some of these vessels may have been the thrifty incorporation of lower- into higher-valued materials, but for others the impact of their decoration hinged upon achieving a wide palette of colours, in a technique that has been described as 'Peinture en métal'. The importance of accurate colouration is emphasised by the deliberate 'sacrifice' of high-valued metals to attain the correct effect.

The surface reflectivity and colouration of metals are not fixed; without constant maintenance their visual appearance is altered through the development of corrosion products. Familiarity with this property of metals would have enabled individuals at the time to identify particular artefacts as heirlooms through an attribute far more fundamental than style. The importance of such objects within Mycenaean societies is implied by their frequent appearance in richly furnished tombs. It is also hinted at in later textual sources such as Homer. With the development of artificial surface patinations during this period, did it become possible to manufacture an 'heirloom'?

Colour and light are fundamental to the perception of metals in past and present societies. Yet, with perhaps the single exception of glass, it is this class of material that is most vulnerable to manipulation of these essential characteristics. By drawing upon the decorative techniques for Late Bronze Age metal vessels from mainland Greece, c. 1700–1200 BCE, two case studies will be presented that demonstrate why consideration of colour and light can be so rewarding, even though seemingly rather far removed from traditional approaches to metallurgy.

Introduction

Archaeologists have long been fascinated by ancient technology, metallurgy in particular. Perhaps this is because it is perceived as the most advanced and important technology possessed by past societies, and indeed the continued use of terms such

as 'the Bronze Age' underlines how pervasive this idea has become.[2] Previous archaeological focus on production and more recent approaches favouring consumption, whilst revealing much about ancient metallurgy, have contributed to a narrowing in the range of analyses and interpretations. A holistic stance taking account of all metal properties recognized by past societies may be more beneficial.

Archaeologists studying ancient South and Central America have long been open to this argument, as metalwork from those regions does not fit well with our modern expectations of metallurgy. The primary class of metal artefact was not tools or weaponry but sacred objects and ornaments (Hosler 1995, 113; Saunders 2002, 218). The peoples of this region were not only concerned with the working properties of metals but also their reflectivity, colour, sound and even their odour (Hosler 1995, 100; Saunders 2003, 28). Only more recently have archaeologists working on prehistoric European societies started to incorporate these ideas[3] into their own interpretations: it has led to the realisation that although the latter used metals to produce utilitarian tools and weapons, even the manufacture of functional items may have been guided by consideration of these other properties.

Scholars and the public have long been aware of the aesthetic significance of metal artefacts, so why has it taken so long for systematic study of other facets of metalwork to emerge? Several significant barriers hinder our understanding of the importance of colour and light properties of metal objects in past societies. Colour has often been one of the first elements eliminated to control printing costs, with the majority of published artefacts presented in black and white (Hurcombe 2007, 541). When scholars interact with metal artefacts firsthand they are lit under modern lights: constant, strong and a world away from the natural and artificial sources of sun and flame used in the past.

Of even greater significance are the colour and reflectivity changes wrought by corrosion over time (See Figure 3.1 in colour plates). Notoriously gold, the only untarnishable metal known to prehistoric societies, is the single exception to this, but colour nuances of gold alloys can still be affected. In contrast, some metals like iron survive deposition processes so poorly that little remains of the original object upon excavation. Moreover, familiarity with the often-colourful patina of metals such as bronze makes it difficult to imagine their original appearance. Their present condition becomes an aesthetic reflected back onto the past, creating a lens of distortion affecting interpretations: even ancient tools of violent warfare are rendered unthreatening due to their perceived fragility and pretty green colouration.[4]

Removing corrosion products is not the solution, as this risks damage to the object and imposes our own modern sensibilities regarding the aesthetic of metals. We prefer metals to be highly polished, a state which requires constant maintenance. Potentially, assuming the same is applicable to all past societies may be highly misleading, and this subject is explored more fully as part of the second case study.

It is also necessary to acknowledge that past societies held multiple interpretations of light and colour. This stems from differentiation in the nature and intensity of the interaction between individuals and metals, varying according to social status (Knappett 2008, 125) and activity. For example, during prehistoric crafting processes, careful observation of the changing colour and light properties as a proxy for temperature was utterly essential to the successful production of metal artefacts, but irrelevant to users of finished artefacts. Furthermore, metals were encountered within daily life in

so many ways, as tools, weapons, objects of wealth and so on, that even the same metal could elicit different responses according to context.

Decorating Mycenaean metal vessels

Metal vessels used on Late Bronze Age mainland Greece came in a multitude of shapes and sizes. Approximately one-third of those studied were decorated, and excepting the handful of examples with plastic ornament, they fell under two paradigms of technique. Repoussé work can be characterised as decoration through light. Selective hammering created a three-dimensional low-relief effect, creating images through the play of light and shadow. Flickering light sources like lamps would have helped produce the illusion of movement. Inlays, patinations[5] and coverings such as gilding can be characterised in opposition to repoussé as decoration through colour. They could be combined, for example by incorporating incised lines on inlays for minor detailing, or gilding over a repoussé design. The following case studies look at decorative techniques on Mycenaean metal vessels from different angles, highlighting the depth and meaning of the roles played by colour and light.

The value of colour

The first case study concerns polychrome vessels manufactured through coverings and inlays. The production of two-tone gold and silver vessels in the Aegean region was so widely known, they appear as presentation gifts to the Pharaoh in contemporary Egyptian tomb paintings (Strong 1966, 45–6). Clearly, this practice was intended to enhance the aesthetic appeal of the vessel and thus its overall value; is it possible to argue that polychrome vessels were desirable precisely because of their colouration, or were other factors at play?

Details of the relationships between metals involved in coverings are set out in Figure 3.2. It is particularly striking that these relationships are all uni-directional and reflect the hierarchy of metal-valuation in use during the Mycenaean Period within the domain of metal vessels (Aulsebrook 2012, 137).[6] Initially, this seems to imply purely economic motivations: a lesser-valued metal used for the basic form, masked with a small quantity of a higher-valued metal, with prominent features such as handles or rims singled out for this treatment to achieve maximum impact. Thus aesthetic value would derive primarily from the bullion value of the vessel, not its polychrome appearance. However, examples present in this dataset challenge this interpretation.

Taking this bull-head cultic vessel as an example (See Figure 3.3 in colour plates), it can be argued that colouration was certainly taken into account. The main body was produced in silver, with other features in gold or an unknown non-metal inlay (Karo 1930, 93; Davis 1977, 187–90). Intriguingly the ears, separately cast from copper, were gilded on the front but silvered on the back. The established metal-valuation hierarchy was not violated, yet gold was deliberately eschewed in favour of silver. Perhaps the back of the vessel was regarded as less important, possibly because of the method of vessel usage or the presumed audience viewpoint. However, the great care taken to convey details of a bull's head, including intricate modelling of hair and veins, would imply the selection of silver was made to ensure the closest match with the animal's natural colour variation.

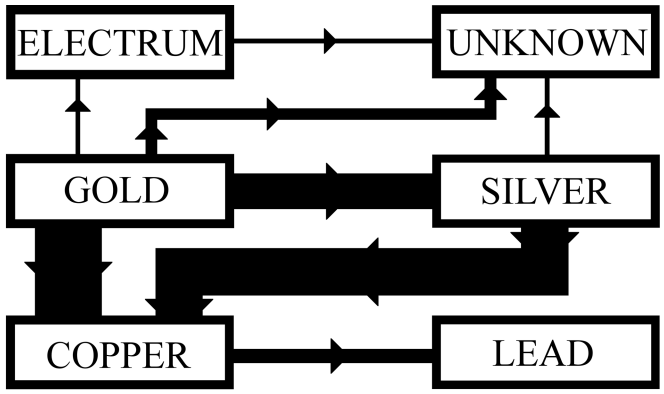

Figure 3.2 Diagrammatic representation of the relationships between metals used for decorative coverings on vessels, where the underlying material was completely obscured. The width of each arrow denotes frequency; the direction of each arrow points from the upper metal towards the lower metal. Due to a lack of secure differentiation based upon scientific analyses, the term 'copper' here includes all instances of the usage of copper and copper alloys, including bronze.

The employment of inlay demonstrates far less respect for this metal-valuation hierarchy. Multi-layered inlay techniques, introduced partway through the period under study,[7] used multiple metal pieces fitted together in a way that often resulted in gold and silver becoming obscured below other materials. Thus the visibility of highly valued metals was sacrificed to create colour contrast.

There is another way in which higher-valued materials can be understood as 'sacrifices' in the quest for the correct colour effect. Metal colouration is linked to composition, although the final appearance can be altered through surface enrichment[8] or patination. The metallurgical colour palette can thus be widened through alloying. A clear example is found on a handle from Mycenae. Formed from silver, it has gold and black 'niello' inlays and two bands of a brownish metal. Scientific analysis of the latter demonstrated they were of an artificial 85 per cent silver-15 per cent copper alloy (Demakopoulou et al. 1995, 148). The position of the bands rules out the addition of copper as a strengthening agent for structural reasons; their inclusion is decorative. Thus the silver has been deliberately debased to provide a specific colour effect.

This is far from the only example of this practice. Several bronze vessels from the Unexplored Mansion at Knossos on Crete had a very high tin content, above that required to enhance the working properties[9] of the copper: balance pans contained 16 per cent tin, and a dish handle contained 20 per cent tin (Catling and Jones 1977). Bronzes with approximately 18 per cent tin have a similar hue to gold (Fang and McDonnell 2011, 56). Moreover, analyses conducted on some Aegean metal vessels decorated with black 'niello' found it to in fact be an alloy of copper, gold and silver, patinated to create this dark colouration (Demakopoulou et al. 1995, 146). [10] This technique forms the foundation for the decorative style termed 'Peinture en métal' (Xenaki-Sakellariou and Chatziliou 1989) also found on some contemporary Mycenaean bronze daggers (See Figure 3.4 in colour plates). Careful alloying created different shades to achieve a high degree of subtlety in the colourscape.

Therefore, polychrome metal vessels were manufactured for several different reasons. In many cases the intention was the thrifty incorporation of higher-valued materials to achieve maximum visual impact; the importance of colour was derived from its indication of material. However, artisans manipulated colour to produce image and, in the course of this, were prepared to break these rules of metal-valuation through multi-layered inlays and special alloys. Although in modern societies we are rather *au fait* with the debasement of precious metals to produce what are regarded as cheap substitution alloys such as nine-carat gold, in the past such techniques, which effectively reduce the bullion value, have been viewed with great suspicion.[11] Thus the deliberate decision to violate this valuation hierarchy should not be viewed lightly, and it demonstrates how important colouration was to the society's perception of these objects.

The value of age

The second case study examines the relationship between the reflectivity and colour of metal, and its age. Living alongside metals teaches us that their appearance alters over time, due to the production of corrosion products on their surface creating tarnish and patinas. Excavating ancient metalwork confronts archaeologists with the significant visual impact that corrosion can have. Without constant maintenance, even short-term atmospheric exposure can cause noticeable differences, especially where handling is frequent. See Figure 3.5 in colour plates shows the visual effects of age on metal: the brightness of the metal has reduced, making it darker and duller until visible corrosion products appear. By combining an examination of metal colour and reflectivity with good knowledge of these tarnishing processes, it would therefore be possible to estimate their age. Would this have been of interest to people in past societies?

Unfortunately, this issue has been neglected due to scholars assuming the surface appearance of metal artefacts was constantly maintained to preserve high surface reflectivity. I was inspired to reconsider the validity of this by some rather controversial work on the colour of silver in Classical Greece by Michael Vickers and David Gill. Using a combination of textual and archaeological evidence, they suggested that during this era silver was preferred in its tarnished state (Vickers and Gill 1996, 126–28; Vickers 1985, 109). This would leave the silver with a dark and glossy surface, which was then emulated in pottery, including the famous Attic red and black figure vases (Vickers and Gill 1996, 128; Vickers 1985). Especially because this hypothesis challenged the aesthetic primacy of the ceramic traditions of Classical Greece in favour of metal vessels, several prominent specialists of the period have disagreed quite vehemently with this view (for example Boardman 1987). This paper does not seek to establish the veracity of this theory for Classical Greece, but through applying the concept to Bronze Age examples, I hope to shed light on a trio of rather problematical vessels from Shaft Grave IV in Grave Circle A at Mycenae, dated to the beginning of the Mycenaean Period: a goblet (See Figure 3.6, left in colour plates), a krater (see Davis 1977, Fig. 176), and a cultic conical rhyton (See Figure 3.6, right in colour plates).

It is, however, first necessary to discuss whether the age of an object was considered important within Mycenaean cultures. Several artefacts from Shaft Grave IV and other Mycenaean graves can be positively identified as antiques at the time of burial.

A silver stag vessel from grave IV is an Anatolian import that matches Early Bronze Age forms (Reeves 2003, 170), indicating it was over half a millennium old when deposited.[12] The stone vases from the same grave were also all at least a couple of centuries old when buried (Bevan 2007, 129).[13] Seals, which can be accurately dated stylistically through their motif and material, often occur in contexts up to a couple of centuries after their manufacture (Krzyszkowska 2005). Such objects were passed between generations, meaning they are not simply antiques but heirlooms, with a long life history of ownership attached to each one. Homer gives us a useful insight into this way of thinking (Bennet 2004, 93), in this conversation between Telemachus and Menelaus discussing gift giving as an element of hospitality.

> Telemachus:
>
> > As for the gift it pleases you to give me, let it be an heirloom:[14] for to Ithaca I cannot take horses . . .
> >
> > Menelaus:
> >
> > . . . Of course I will exchange my gifts. . . . See, out of the store of treasures ranged in my house I give you the fairest and costliest item: a wrought mixing-bowl of silver doubled with gold about the rim. Work of Hephaestus. Hero Phaedimus, King of Sidon, endowed me with it when I found shelter in his house on my way back here.
> >
> > (Homer *Odyssey* 4.600–601, 4.612–614 [trans. T.E. Shaw])

The chosen object, in this case rather aptly a vessel, was made by a god and has had another distinguished owner, apart from Menelaus himself. The persistence of these ideas through from the Late Bronze Age right into the 8th-century Iron Age of Homer is implied by sites of intermediate date, such as Lefkandi. Here a male cremation was found inside an antique bronze cauldron alongside other rich grave goods and sacrificed horses (Dickinson 2006, 187). Therefore, the evidence indicates very strongly that the age of an object was of great importance within Mycenaean culture, perhaps not just in terms of the quantification of age, but through the remembrance of its origins and past owners.

Returning to these three vessels, the goblet (See Figure 3.6, left in colour plates) is the only example from this dataset to have unequivocally undergone artificial surface patination (Davis 1977, 208–13). Its highly unusual techniques of manufacture naturally raise the suspicion that it was imported from outside the Aegean. However, the Aegean-centric decoration and shape, and lack of parallels within other contemporary metal vessel-producing areas, undermines this argument. Its material is electrum, the only example of this metal[15] being used for an entire vessel, and probably chosen for its superior casting qualities over silver. Decoration consists of gold and black copper-gold alloy inlays (Demakopoulou et al. 1995, 147).

Why would this vessel have been singled out for artificial patination? The many unusual aspects to this goblet prevent arrival at a definitive answer. It had been previously suggested that the patination enhanced the colour contrast between the electrum body and 'niello' bands (Davis 1977, 347), but the darker surface in fact achieves the precise opposite. However, the procedure may have been connected to the material.

The gold content in the electrum would ensure the tarnishing of the vessel was significantly slowed. Its appearance would not match that of a silver version unless such a patination process was carried out. Thus the patination prematurely ages the metal.[16]

The other two vessels of interest may also show signs of patination (See Figure 3.6, right in colour plates). The Battle Krater and the Siege Rhyton are unique in terms of their appearance in metal on the Greek mainland during this period. They both show scenes of warfare, are manufactured from silver and are suggested to be products of Crete.[17]

They have now been cleaned and extensively restored. However, further examination of small fragments revealed what was described as a 'brilliant black surface' just beneath the surface oxidation (Sakellariou 1974, 10–11), and their appearance was linked to the dark colouration of the electrum goblet, which was incorrectly identified as coated with 'niello'.[18] Since the colour of the goblet stemmed from patination, it would seem these two silver vessels also underwent the same procedure. What would the underlying motivation for this be, given that the krater and rhyton would have tarnished naturally?

It is possible the dark colouration itself was, through its rarity, desirable and the other similarities between the vessels simply coincidental. Yet the obvious link between age and tarnish, as well as the deep interest of Mycenaean elite individuals in acquiring objects with lengthy life biographies, does imply this conclusion may be inadequate. If we consider this hypothesis, there are evidently clear advantages for individuals on Crete to obtain access to heirlooms to supply this newly emerged centre of demand, but their very nature renders them scarce and highly valued; they most likely moved within a ritualised sphere of gift-exchange, restricting them to a small group of elite personages. Creating a source of heirlooms available 'on demand' would be of great benefit, effectively manufacturing ready-made antiques to be equipped with a suitable biography and sent to mainland individuals eager to incorporate such items into their competitive mortuary displays.

It is highly unlikely in contemporary Crete that the commissioning of luxury vessels could have fallen outside the remit of local rulers. Therefore, they were not intended for ordinary trade, but to replace authentic heirlooms within the gift-exchange sphere. Such actions would require careful control to avoid diluting the potency of ritualised gift-exchange. These two silver vessels were already of considerable value in terms of bullion and crafting excellence, but their transformation into heirlooms may have been calculated to attract a more favourable response from mainland elites, particularly if several Cretan rulers were vying for their attention.

We can only ever enjoy speculating about the exact motivations that lay behind such actions in the past. However, we know it was within the technical capabilities of Aegean craftsmen to manipulate the light and colour properties of metals to produce this effect if so desired. Nevertheless, it is unlikely all metal objects were left to tarnish or corrode as a surety of their age or an aesthetic preference. Study of repair patterns for gold and silver vessels demonstrate that despite their obvious intention for practical use[19] they received repairs when broken far less often than vessels of copper and bronze, suggesting re-manufacture was preferred (Aulsebrook 2012, 269).

Conclusion

By slipping off the straitjacket created by technology-focused approaches and looking at decorative techniques within their wider social context, we have advanced our

understanding of the *range* of intentions behind vessel production. This emphasises the importance of considering multiple possible responses to light and colour in ancient societies. It is clear these properties were essential components of the meanings of these artefacts in the Aegean Late Bronze Age, and study can reveal the emic system of their categorisation. Their sophisticated manipulation was used to obtain certain aesthetic ideals that went far beyond the notion of merely raising the bullion value of metal vessels.

Notes

1 I would like to thank Dr Anne Sassin and Dr Chloë Duckworth for organising this inspiring session and to the AAH for staging the conference. This paper was based upon work completed for my PhD, which was supported by the AHRC and a Leslie Wilson scholarship from Magdalene College, Cambridge. Improvements to this paper were kindly suggested by Prof. Michael Vickers, Dr Elizabeth French, Dr Yannis Galanakis, Dr Nicholas Soderberg and two anonymous reviewers. All remaining errors are my own.

2 Budd and Taylor observed that archaeologists treat metallurgy as qualitatively different to other technologies (Budd and Taylor 1995, 134).

3 Recent examples include Keates (2002) and Gillis (2004).

4 This may explain the persistent interpretation of weaponry, particularly swords, as only intended for display rather than practical usage (for example Harding 1999, 166), prompting thorough studies of use-wear and other evidence to overturn this assumption (Kristiansen 2002, 319; Molloy 2010, 415 note 108).

5 The artificial inducement of tarnish on a metal surface (Giumlia-Mair 2001, 221).

6 This emic valuation-hierarchy was reconstructed based on direct evidence from Mycenaean metal vessels (Aulsebrook 2012, 103–139). Its accordance with the ranking utilised by many modern societies is coincidental.

7 The first usage of this technique may date to as far back as 1500 BCE (Aulsebrook 2012, 125; Wace 1953, 9).

8 Other metals present in an alloy are selectively removed so the surface appears purer (Hodges 1989, 96).

9 The addition of arsenic or tin to copper creates the alloy bronze, which is harder than pure copper and thus more suitable for certain objects such as tools. However, it also increases brittleness so a balance must be struck depending upon its intended usage. The optimum proportion of tin is c. 10 per cent; high-tin bronzes are difficult to produce and have poor mechanical properties (Fang and McDonnell 2011, 52).

10 True niello consists of metal sulphides used as a liquid or paste over metalwork to create a dark black glossy surface (Davis 1977, 213; Demakopoulou et al. 1995, 137 footnote 3). For a long time many scholars were convinced that any black material on a metal must be niello (Giumlia-Mair 2001, 222). Scientific analyses have thus far not supported this conclusion, and 'niello' across the Bronze Age East Mediterranean has been found instead to consist of patinated alloys (Demakopoulou et al. 1995; Photos et al. 1994; Giumlia-Mair and Quirke 1997; Giumlia-Mair 2012; but see Xenaki-Sakellariou and Chatziliou 1989; Thomas 2005; Thomas 2011, 160).

11 Generally this issue has been linked to coinage, but within this pre-currency society metals were used as a form of liquidity for trade (Sherratt and Sherratt 1991, 360).

12 Or, at any rate, intended to imitate an ancient form.

13 It is interesting to note that they are also all manufactured from white stone (Bevan 2007, 130), indicating selection for colour.

14 The Ancient Greek term 'κειμήλιον' translates as any object stored as a valuable or treasure.

15 Electrum is a natural or artificial alloy of gold and silver (Muhly 1980, 28), visibly paler than gold. Its exact composition is not consistently defined, ranging from 20 per cent (Ogden 1993, 39) to 50 per cent (Clark 1986, 50) silver.

16 XRF analysis of this vessel showed a higher proportion of silver than expected in electrum (Demakopoulou et al. 1995, 147). However, this technique only examines the surface (Demakopoulou et al. 1995, 144); its patination means these results are unlikely to be

representative of the original alloy. It is worthwhile noting that even if this vessel originally contained a high quantity of silver, the observation that this process prematurely ages the metal would not be invalidated. Only the exact reason for choosing this goblet over other silver vessels would remain obscure.

17 The Aegean-based martial iconography on both vessels is more at home on the Greek mainland than Crete (Immerwahr 1989, 109). However, the conical rhyton is a familiar Cretan shape. The krater lacks exact parallels in form although it may be related to later mainland shapes (Sakellariou 1974, 9). However, its production within the environment of a fledging metal vessel industry on the mainland seems improbable, given the level of technical skill demanded by its size and shape, making Crete the most likely point of origin. Other vessels from the same grave group have been positively identified as Cretan imports (cf Matthäus 1980). Later mainland texts specify certain metal vessels that seem to be antiques as 'of Cretan manufacture' (Palaima 2003).

18 This investigation took place before the first major synthesis on Mycenaean gold- and silverware (Davis 1977) was published.

19 Many gold and silver vessels incorporated hidden reinforcements, especially in rims and handles, to protect them from use-related damage (Aulsebrook 2012, 272).

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4 By the dawn's early light: Colour, light and liminality in the throne room at Knossos[1]

Katy Soar

Wall paintings first appear in the Final Neolithic and Early Minoan periods on Crete, developing into more abstract designs and technological complexity in the Middle Minoan period, and reaching their highpoint with the introduction of pictorial painting in MM IIA (the beginning of the Neopalatial period). These Neopalatial pictorial frescoes seem to have been restricted to specific buildings, most notably elite buildings such as the famous 'palaces', Knossos in particular, as well as larger houses in towns such as those from Akrotiri on the island of Thera. The use of natural light, either sunlight or moonlight via windows, doorways and partitions or firelight, would emphasise specific aspects of these paintings, suggesting that the experience of viewing them would not have been a static activity, but one that was temporally mutable. This paper will consider the location of these frescoes and the effect of forms of lighting on the perception of the viewer, as well as the interplay between colour and light and the changing relationship between the two depending on light source and time of day.

In February 2015, a photo was posted to the blogging website Tumblr, captioned with the seemingly innocuous question 'what colour is this dress?' The result was surprising – and overwhelming. Within 48 hours the post had gained over 400,000 comments, and rapidly spread to other social media sites, as well as beyond the Internet to print media and news broadcasts. The basis of this phenomenon was the divide between those people who saw the dress as white and gold and those who saw it as blue and black. An online poll suggested that the majority of people (nearly two thirds of the 2.2 million respondents) saw a white and gold dress (Glenza 2015). In fact, the dress was black and blue; it was the background lighting which had altered the viewers' perceptions of the colour.

This anecdote serves to highlight the importance of light in relation to the experience of colour. Lighting sources can vary dramatically, through both natural and artificial means, and all of these sources can produce varying effects on both perception in general and perception of colours in particular. Yet despite the fact that colour and light are mentally indivisible in our experience of the world around us (Fridell Anter et al. 2012, 264), they tend to be treated separately in academic discussion, with few attempts made to combine the two. While there have been recent considerations on the interaction of colour and light in contemporary architectural practice (see below), similar approaches for the ancient world still remain under discussed.

A brief history of colour and light in Minoan research

This paper focuses on one example of the lack of discussion of the interaction of colour and light: the Bronze Age, or Minoan, civilisation on the island of Crete. This period

covers approximately 1,800 years, from c. 3000–1200 BCE. In particular, I wish to focus on the Late Bronze Age of Crete (the periods also known as the Neopalatial and Final Palatial, c. 1700–1200 BCE).

The subject of colour in Minoan art has been widely discussed, with the majority of scholarship focused on the technicalities of colour production, or on the symbolic value of colour. In the first instance, for example, Tite et al. (2009) explored the chemical composition of samples of faience (an artificial, highly coloured glazed material) from Neopalatial Crete in order to infer their original colour, showing that weathering affected the colouring and that Minoan faience actually exhibited a much wider range of colours than previously believed. Similarly, Polly Westlake et al. (2012) employed multiple techniques to analyse Cretan wall paintings from over two millennia, in order to ascertain the painting materials and colour pigments.

Moving onto the symbolic role of colour, Mark Peters has considered colour symbolism in relation to the mineral composition of pigments (Peters 2008). He has also considered the symbolic role of colour in Minoan and Mycenaean architecture, arguing, for example, that colour has a significant semiotic role in both the structuring of space and in the communication of political concerns (Peters 2015, forthcoming). Colour symbolism of dress has been explored by Helene Whittaker (2012), and Paul Rehak (2004) has examined the possibility that specific colours (in this case yellow) are symbolically related to only one gender. Finally, the role of red and white colour representation in the articulation of gender has been widely explored (Alberti 2002; Hitchcock 2000; Lee 2000).

Similarly, the issue of light has been considered by several scholars. The majority of these studies take the form of computer-based virtual reconstructions of lighting practices, such as those which may have occurred at the cemetery of Phourni, Archanes (Papadopoulos and Earl 2009; Papadopoulos 2010) as well as the ceramic workshop at Zominthos (Papadopoulos and Sakellarakis 2013), and the Throne Room at Knossos (Roussos and Chalmers, 2003), to be discussed below. These studies are undertaken primarily to ascertain the functional role of light in specific architectural spaces. Non-computer-based considerations of light have been undertaken by Lucy Goodison, who examined the role of sunlight in the position and alignment of the tholos tombs of the Early Minoan period with regard to cyclical rituals (Goodison 2001; 2004). Her work on the lighting of the Throne Room will also be discussed below.

Very little work has been undertaken which considers the two elements of light and colour in the Minoan world together. Several scholars have focused upon the topic of shine and brilliance. Karen Foster (2008) has argued that the luminosity and brilliance of faience and other vitreous materials contribute to their status as both prized artefacts and items of religious significance. Lucia Nixon (2007) has argued that brilliance – lustre and sparkle – is an important factor in the symbolic significance of specific lithic materials, such as obsidian and quartz, from Sphakia. The closest consideration of the relationship between colour and light in art is Karen Foster's discussion of wall paintings (Foster 2014), which highlights the use of colour contrast or refraction in relation to animal pelage and light. This suggests that Minoan artists were aware of the interaction of light with objects (Erin McGowan 2015, pers. comm.).

Despite these works, little has been said about the experiential or sensorial utilisation of light and colour in Minoan art. This combination is important, however, as it can influence the way a person reacts to and experiences the world. For example, it is known that the architectural application of colour creates a specific atmosphere

that influences people's behaviour (Jekot 2010, 74), and that the colour and light of an interior space affects an individual's arousal level and perception (Manav et al. 2010, 177). Thus we should be more aware of colour, especially when considering that colours are intrinsically linked to the lightscapes in which they perform (Bille and Sørensen 2007, 270). After all, these colour and light interactions are what make us perceive space visually.

This paper offers a preliminary study which combines several of the approaches discussed above – including the symbolic role of colour within Minoan architectural space and the visual properties of Minoan materials in relation to light, and wider approaches which consider experiential or emotional responses – to examine the interplay of colour and light as an experiential category. In particular, I focus my discussion here on the so-called Throne Room in the Palace of Knossos. This is partly for reasons of space, and partly due to work already undertaken on the role of light in this architectural setting. This paper offers further preliminary consideration about how light affects the colour and perception of frescoes within this space, and how this in turn affects viewers and participants in their experience of the architectural space. In particular, I wish to examine the possibility of using this material to address the notion of 'spectator response' – perhaps the least developed area in the history of colour (Gage 1999, 54). By this I mean how spectators react to and engage with art as a result of the interaction of light and colour. Ultimately this could help shed more light (pun intended) on the function of the Throne Room.

The Throne Room

The Throne Room at the Palace of Knossos is part of a complex of rooms on the western side of the palace's Central Court.[2] The complex consists of an anteroom which was accessed from the Central Court and separated from the Throne Room by a pier-and-door partition, the Throne Room itself and a so-called 'Inner Shrine'. Behind the complex were a number of service rooms. The layout of the actual 'Throne Room' consisted of four gypsum benches which ran along the north and south walls. On the north wall, the benches flanked the eponymous stone chair; benches also ran along the west wall up to a door leading to the 'Inner Shrine'. In the southern section of the room was a lustral basin or adyton (a small room, sunken below the floor level and entered via a short flight of steps) – this may have been the original principal element of the room, with the benches and thrones added later (Mirié 1979, 54; Marinatos 1993, 107). The lustral basin was separated from the Throne Room by a parapet, along which the gypsum benches continued, and which is flanked by three Minoan-style columns.[3]

The date of the construction of the complex is debated, but important if we are to discern whether or not the actions which occurred within it constitute Minoan or Mycenaean practice. Conventional chronology suggests a series of destructions at the palatial sites of Crete at the end of the Neopalatial period in LM IA-IB (c. 1600 BCE), with the exception of Knossos, which continues in use into the Final Palatial period (see Table 1). It has been argued, based on material and symbolic evidence from Knossos such as changes in script and burial practices, that Mycenaeans from the mainland may have controlled the site, whether literally or through cultural dominance (see Preston 2008 for a fuller discussion).

The original excavator of the Palace, Sir Arthur Evans, dated the construction of the Throne Room to the Late Minoan (LM) II period (c. 1350 BCE) and believed it to

Table 4.1 Convergence of dating chronologies for Minoan Bronze Age (absolute dates from Manning 1995).

Cultural Period	*Relative Date*	*Absolute Date*
Prepalatial	EM I	3100–3000 to 2700–2650 BCE
	EM II	2700–2650 to 2200–2150 BCE
	EM III	2200–2150 to 2050–2000 BCE
	MM IA	2050–2000 to 1925–1900 BCE
Protopalatial	MM IB	1925–1900 to 1900–1875 BCE
	MM II	1900–1875 to 1750–1720 BCE
	MM IIIA	1750–1720 to 1700–1680 BCE
Neopalatial	MM IIIB	1700–1680 to 1675–1650 BCE
	LM IA	1675–1650 to 1600–1550 BCE
	LM IB	1600–1550 to 1497–1470 BCE
Final Palatial (Knossos only)	LM II	1490–1470 to 1435–1405 BCE
	LM IIIA	1435–1405 to 1390–1370 BCE
	LM IIIB	1390–1370 to 1360–1325 BCE
	LM IIIC	1360–1325 to 1200/1190 BCE

be a 'revolutionary intrusion, effacing all previous remains' (Evans 1935, 902) – i.e. that it was added to the Palace during the Final Palatial period, when it is thought that Knossos came under the power of Mycenaeans from mainland Greece. In this view, the Throne Room complex would represent a Mycenaean architectural innovation, and not an indigenous Minoan one. More recent examinations, however, suggest an earlier date for its construction.

Sieglinde Mirié argued, on the basis of stratigraphic relations between the magazines and cists to the south of the Throne Room, that the origins of the Throne Room date back to the Middle Minoan (MM) I–II period, ascribing the Lustral Basin and the Inner Sanctuary, amongst other architectural features in the vicinity, to this phase (Mirié 1979, 39–44). The main period of construction appears to have been in MM IIIB, with the addition of gypsum slab floors and dadoes, and dated based on the use of a tank and drain north of the Throne Room (MacDonald 2002, 42). Further elaboration continued in LM II, when the Central Court was raised and two steps leading down to the Anteroom were added, and in LM IIIA2 additional stairs were added to the Anteroom (Gulizio 2011, 158).

That the Throne Room served a ritual purpose has been proposed based on several criteria. Evans's original hypothesis of its ritual nature was based on the discovery of overturned pithoi and alabastra in the room (Evans 1935, 938–40; and See Figure 4.1 in colour plates). He saw this as indicative of an anointing ceremony – the final event which occurred in the Throne Room before the destruction of the palace in LM IIIA, a theory echoed by John Pendlebury, who suggested that, 'the king had been hurried here to undergo too late some last ceremony in the hopes of saving the people' (Pendlebury 1939, 231). The idea of an anointing ceremony is no longer valid: both Robin Hägg (1988) and Helen Waterhouse (1988) noted that stone alabastra would make poor pouring vessels based on the lack of a spout and the weight of the stone. Even if the Throne Room was not used for anointing ceremonies, however, alabastra have a ritual function, similar to that of rhyta (Warren 1969, 167), and other ritual performances and events have been put forward for the Throne Room.

Helga Reusch (1958) was the first to suggest that the Throne Room Complex was a place for the epiphany of the goddess. In this thesis, the goddess appears before the people who have summoned her via prayer, chanting, ritual dancing or some other activity. Epiphany is considered to be a common feature of Minoan religion in general, based on iconographical evidence from signet rings and their impressions in particular, and may occur through various methods and in various locations.[4] In the epiphany of the Throne Room, the role of the deity is performed by a human representative, a priestess, who sits on the throne and thus becomes the goddess. Reusch's basis for a ritual interpretation was the iconography of the wall paintings on the north wall, in particular the griffins flanking the throne, and the incurving altars painted on the wall on either side of the throne (Reusch 1958, 345–57). The composition of the elements together recalled a series of seals which depicted a frontal goddess. This argument was taken up by W-D. Niemeier, who interpreted the complex of rooms as the setting for a ritual of performed epiphany in which the high priestess moved from the Inner Shrine through to the Throne Room doorway, and finally sat on the throne (Niemeier 1987, 165). This same opinion regarding the Throne Room as the site for epiphanies was also argued by Nanno Marinatos, who suggested that such a ritual performance would be experienced by an immediate group of people seated on the benches in the Throne Room and Anteroom, and indirectly by a crowd assembled in the Central Court (Marinatos 1993, 109). Thus the complex had a long history of ritual use before the arrival of the Mycenaeans.

As mentioned above, the iconography of the Throne Room is one of the key elements in a ritual interpretation of its function. Although the room and its probable function may well date back to the Neopalatial period, its decoration is harder to date due to difficulties in distinguishing decoration from as early as LM I to that added in LM II-IIIA (Immerwahr 1990, 84, 96). A LM II date is now generally accepted for the fresco (Hood 2005, 65). The Throne Room itself is elaborately decorated, and the decorations have been subject to several reconstructions since the excavation of the Throne Room in 1900. They share the same general layout; it is the details which differ.

In general, the room is decorated as a Nilotic setting with papyrus, a sandy-looking ground and undulating red and white horizontal bands. Above this are two pairs of thin bands of white against a red background. Above the benches, there is a narrow section of dado that imitates marble. The walls are decorated with four couchant, wingless griffins, two of which occupy the north wall flanking the throne, while two others flank the doorway to the Inner Shrine on the west wall. Flowering blue papyrus reeds (Immerwhar 1990, 96) are positioned between the griffins and the throne on the north wall and between the griffins and the doorway on the west wall. Mark Cameron noted the presence of a palm tree to the right of the throne in the excavation photos which was omitted from Gillieron and Lambert's reconstructions in Evans's fourth volume of *The Palace of Minos at Knossos* (Evans 1935, Pl. 32 and 33) and instead substituted by three small reeds. The palm tree was reinstated in his reconstruction and sprouts from behind the throne, between the throne and the griffins. Thus the LM II-IIA Throne Room fresco with its Nilotic elements, reeds, papyrus, palms and griffins is not a landscape natural to Crete and, like other Minoan landscape frescoes which include exotic or fantastical elements, or the totality of seasons in one painting, is meant to evoke an idealised and timeless landscape (Hitchcock 2007, 96; also Chapin 2004).

Lighting the Throne Room

The act of viewing these frescoes and the impact of these decorative schemes would be dependent on the prevalent lighting sources available. However, the architecture of the room suggests a lack of light sources. Architecturally, it is approached by an antechamber set below the level of the central court, and the room itself is windowless and low-ceilinged. While light from the central court could penetrate the room via the polythyron which separates the court from the antechamber, these doors – and the light they allowed in – could be kept part-open or part-closed, depending on the situation. There is also evidence that two wooden doors, which were later removed, separated the Throne Room from the anteroom (Gesell 1985, 89), meaning that it was possible that no light could reach the room. Thus the Throne Room itself was an unlit interior space, in semi-darkness for most of the day (Goodison 2004, 345), and described by Gerald Cadogan as 'dark and mysterious' (Cadogan 1976, 63) – not ideal conditions in which to view these images fully.

Given that the room would have been lit by clay lamps, presumably with fuel of olive oil or animal fat (Parisinou 1998, 331), or alternatively sesame oil or beeswax candles (Roussos and Chalmers 2003, 196), interior vision would have been dim and flickering. Roussos and Chalmers have conducted computer simulation of different lighting sources in the Throne Room in which the flame of candles and small lamps was modelled, as well as modern lighting techniques and daylight as it would have occurred at midday on 18th August 1400 BCE. The results showed a considerable perceptual difference between the room lit by electrical lighting (a modern 32 watt fluorescent lamp) and the reconstructions of the room based on natural or candle light (Roussos and Chalmers 2003).

One possible explanation for this considerable darkness may be borne of the architectural setting and location for the Throne Room as well as its ritual function, and is related to the significance of light. Goodison (2001, 2004) conducted experiments and analyses of the architectural design of the Throne Room in relation to natural light and shadows at various times of year, capturing images of sunlight entering the Throne Room as it rose over the top of Profitis Elias hill to the east of the Palace (Goodison 2001, 82). These analyses showed that certain locations and areas within the Throne Room are highlighted and illuminated at specific times of year. In particular, during the dawn of the midwinter solstice, light comes through the pier and door partition from the Anteroom and illuminates whomever is seated on the gypsum seat. At midsummer sunrise, the lustral basin is illuminated, while the doorway to the Inner Shrine is highlighted by the rising sun around the spring and autumn equinoxes (Goodison 2004, Fig. 29.4; see also Figure 4.2). All of these effects are temporary and short lived, occurring only for a few moments at dawn before the sun rises too high to enter the Throne Room (Goodison 2001, 43). In particular, the locations highlighted by the beams of light are those in which it is reckoned the 'epiphany' would occur – according to Niemeier (1986, 76–83), the door leading to the Inner Shrine is where the priestess enacting the epiphany of the goddess would have made her first appearance, before appearing on the throne. Thus the sunlight highlights these specific areas, adding to the impressive impact of the event (Goodison 2004, 343). With regard to the throne, Goodison suggests that opening specific doors of the pier and door partition of the Anteroom would provide the element of surprise and impact and allows the priestess the time to appear 'suddenly' on the throne (Goodison 2001, 83).

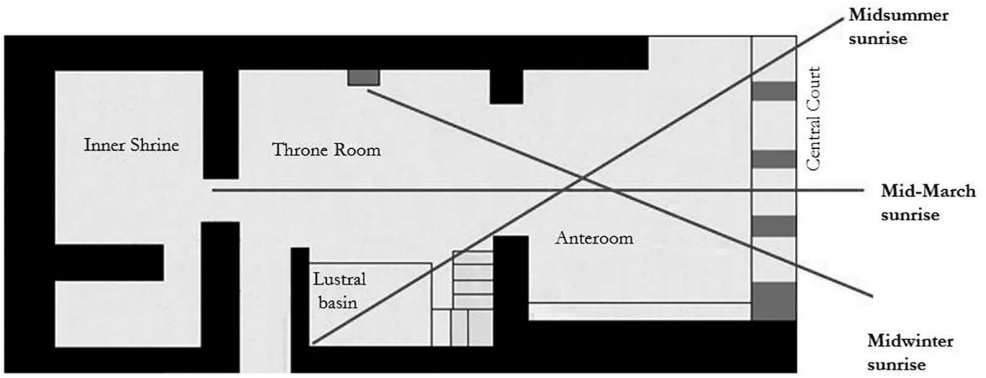

Figure 4.2 Simplified plan of the Throne Room showing dawn alignments. After Goodison 2004, Fig. 29.3.

These lighting effects were clearly deliberate and intended to have an impact on spectators. As such, it is worth considering how these effects interact with the *imagery* of the Throne Room. The interaction of light with colour can be utilised by image makers. In particular, it has been argued that the Purkinje effect was used by artists in the ancient world to create visual impact and even engineer illusions (Underhill 2014).

The Purkinje effect

Colour perception is affected by the intensity of illumination. This is at the heart of the phenomenon known as the Purkinje effect, which was named after the Bohemian anatomist and physiologist Jan Evangelista Purkyn (1787–1869). The effect describes how colour contrast varies under different levels of illumination. When the intensity of the light is high, the objects appear lighted with a warmer spectrum, that is, displaced towards yellow and red; when the intensity is low, the object will appear lighted with a colder light, i.e. blue. This is caused by the different responses of parts of the retina to specific wavelengths. The human retina has two types of cells called cones and rods, which are maximally receptive to different wavelengths and thus different colours. The dim light receptors, the rods, are most responsive to the blue wavelength and are maximally active in dim lighting conditions, whereas the bright light receptors, the cones, are most responsive to the red wavelength and thus work best in bright light, allowing us to see a wide range of colours (Baxandall 1985, 90). What this means in practice is that in dim light, short wavelengths prevail over long ones, and as a result our ability to detect red hues declines. Conversely, the intensity of greens and blues becomes more apparent at the expense of other colours. This is particularly relevant for different times of day:

> Take some colours before daybreak, when it begins slowly to get lighter. Initially one sees only black and grey. Particularly the brightest colours, red and green, appear darkest . . . blue becomes noticeable to me first. Nuances of red, which otherwise burn brightest in daylight . . . show themselves as darkest for quite a

> while, in contrast to their average brightness. Green appears more bluish to me, and its yellow tint develops with increasing daylight only.
>
> (Purkinje 1825, 109–10)

This effect may have been used deliberately in other places in the ancient world, for example at the Palace of the Jaguars at Teotihuacan, Mexico, where it was utilised to animate murals of jaguars to appear as if they were leaping off the wall (Underhill 2014, 165). Similarly, at the Temple of Aphaia on Aegina, the same effect dramatized sculptures which depicted an episode from the Trojan War (Underhill 2014, 165). Thus – given the ritual elements of its function, which include aspects of performativity, embodiment and luminosity – I propose to consider these approaches in regard to the Throne Room.

Colour and light in the Throne Room: A hypothetical reconstruction

As noted by Goodison, at dawn on the midwinter solstice the throne itself is highlighted, while at the spring and autumn equinoxes the door to the Inner Shrine is illuminated. Both of these specific 'light traps' are flanked by decorations of griffins within a Nilotic landscape. A closer look at these decorations may help us envision the effect of light on these images.

As shown in Figure 4.3 in colour plates, the griffins have downward curving crests, with red and blue feathers outlined in dark red paint, and the feathers are further delineated by short dark red, curving lines (Shank 2007). The creatures' necks and breasts are elaborately decorated. This decoration, as reconstructed by Evans, consists of a single large pendant black spiral that is interlocked with a smaller white spiral, with a large blue and red rosette in its centre (Immerwahr 1990, 98). The griffins themselves are set in a conventionalised landscape of alternating red and white wavy horizontal bands with tall blue papyrus plants (Immerwahr 1990, 96).

During the daytime, the Throne Room would have been in shadow with low levels of illumination. As such, visual perception would have been largely achromatic, meaning colours would be viewed with a lack of hue; only black, grey and white would be distinguishable. However, as illumination increased – in this example, as the dawn light penetrated the Throne Room and began to illuminate specific aspects and zones of the wall paintings – short wavelengths prevailed and blue stimuli were evoked, meaning blue colours would become visible first. As illumination increased and reached its height, longer wavelengths would prevail and red colours become more visible. If we apply this to the wall paintings in the Throne Room, specific images emerge in a specific order.

Taking the example of the throne at the midwinter sunrise, at first the throne and surrounding area are hidden in darkness. As the dawn light grows, the blue elements of the fresco will be picked out first; in this case, the blue papyri and the griffins' decorations. As the light continues to increase, the white elements of the griffin and the background become more prominent. Finally these blue and white elements recede and the red elements – the generic background and possibly the palm trees if this reconstruction is correct – dominate the scene. This effect is only temporary, as the light soon rises too high to enter the Throne Room, which once again returns to semi-darkness.

As such, the viewer of the ritual – presumably seated on the benches around the room, or, at one remove, watching from the Central Court – would first notice the appearance of an otherworldly landscape and mythical and monstrous creatures, as the light would accentuate the blue hues of the papyri and the griffins' decorations. These blue-hued elements would appear first, creating a sense of animation and unreality as they emerged from the darkness and both heralded the arrival of the divine, and symbolised the liminal zone between the worlds before the epiphany of the goddess herself. As these fade and the red background emerges, so does the goddess herself, her otherworldly companions receding into the netherworld. As the brightness increases, the otherworldly elements disappear to be replaced by the goddess herself. Finally, the rays of light climb too high to lighten this area further, and the goddess and her divine companions vanish from view again. This may well be the reason the room lies in semi-darkness for the majority of the time: only at specific, significant moments may all these elements come together to 'activate' this ritual.

What the interaction of light and colour could do in this particular situation, then, is to animate the decorations of the Throne Room, moving them beyond simply the aesthetic and into what Chris Pinney (2001) has referred to as 'corpothetic'. Whereas aesthetics is primarily mental in operation, corpothetics is visceral and embodied. Corpothetics allows one to discuss the efficacy of an image, and to explore 'not how images "look", but what they can "do" ' (Pinney 2001, 8). Experiencing these depictions was therefore not a passive activity, but rather one which involved corporeal engagement and performance (Firnhaber 2007, 201),[5] and brought the spectator directly into the 'divine' world. Clairy Palyvou has argued that the images in the Throne Room belong to a type of imagery activated by rituals and/or by the viewing process itself, which transformed the physical space into a 'new dimension of perception' wherein living people and still images worked together to create this virtual space (Palyvou 2012, 74). I would further argue that the elements of light and colour also worked together with the still images and actors to create a truly three-dimensional space, one in which visual 'trickery' is employed so that even before the priestess appears as the goddess in epiphany, the otherworldly and supernatural elements of the room come alive and take on a quasi-cinematic quality (Underhill 2014, 165), creating a truly liminal experience. As such, the Throne Room becomes a heterotopia, a space of performance and liminality which is a simultaneously mythic and real contestation of lived space (Foucault 1986, 24); a real space with a mythic dimension (Von Stackelberg 2009, 52).

Liminality is a key element in this interpretation of the Throne Room. The 'activation' of animated elements in the fresco which highlight the liminal landscape of the epiphany is accentuated by several factors. Firstly, it should be noted that dawn can be considered a liminal period in the day; as the sun rises, it is neither day nor night. And the activation happens at liminal times – at equinoxes when day and night have the same length, or solstices when the increase of day or night shifts over to its decrease; liminal marks which divide the year into seasons (Olwig 2005, 262). Cosmically, the function of the griffin was to stand guard at 'doorways' where different aspects of the world of the Minoans met (Zouzoula 2007, 276). They reside in liminal zones which protect and serve those who cross between the realms, and facilitate communication between these different spheres (Zouzoula 2007, 276). As such, their appearance is a direct confirmation that such a liminal sphere is approaching.

The colour blue is important because it is not only the first colour to be seen as light increases at dawn, but it also had a symbolic dimension which again is associated with transition or liminality. Peters has argued that in Minoan colour symbolism, blue is associated with transformation, the realm of the other, journeying and renewal, and its location is thus contextual and deliberate (Peters, forthcoming). Indeed, the colour blue had similar symbolic and meaningful association in other cultures. In Egypt, where the 'recipe' for blue pigment used in Minoan frescoes originated, blue was not only the most prestigious colour (at least in the New Kingdom period) and visually associated with luxury, status and elite display but symbolically was associated with fertility, birth and regeneration (Duckworth 2012). As such, all the iconographic elements come together to accentuate the liminality of this architectural space.

Conclusion

While this hypothesis requires further testing and investigation, it hopefully demonstrates the importance of viewing light and colour together. The possible effects of this lighting and colour interaction would emphasise the liminal nature of the Throne Room. That such effects could be utilised is within the realms of possibility – we already know, in the light of Foster's paper (2014), that Minoan artists were aware of the relationship between light and objects, and attempted to depict this in their art. There are also attempts in Aegean art to create cross-overs between the real space of a room and its illusionary space. In particular, Palyvou points to the fresco on the Upper North Panel of Xeste 3, Room 3a at Akrotiri on Thera, where elements in the picture intrude into the real room; in this case, a leash in the artwork is tied to a representation of the real column of the room's window, suggesting the illusionary space depicted on the wall is meant to be read in connection with the real space of Xeste 3 (Palyvou 2012, 22). What is most striking in this depiction is that the leashed animal is a griffin, which appears in the service of the goddess – scenic elements familiar to those acquainted with the Throne Room.

Similar architectural features including the adyton, and pier and door partition are also found in Xeste 3. The colours used to depict the goddess and her attendants – a griffin and a monkey – are the same as those used in the Throne Room. The repetition of architectural and chromatic elements suggests a similar function here to the Throne Room. Line of sight calculations and visibility analysis show that the figure of the goddess is the focal point in the upper room of 3a, positioned in the most visually exposed part of the wall (Paliou et al. 2010). Like the Throne Room, this room is also dimly lit. However, there is no such open space as the Central Court from which light could penetrate through the pier and door partitions at specific times. Light here could certainly by controlled via pier and door partitions and other horizontal and vertical wooden elements, but would be more likely to penetrate the room as a series of alternating strips of light and shadow (Palyvou 2005, 169). While this would not create the same type of visual effect as that seen in the Throne Room, it no doubt had its own specific purpose – perhaps to create the sensation of constant movement, which, combined with the only partial views of the frescoes through the partitions, would act almost like a zoetrope and creating the sense of 'surroundness' the prehistoric artist strove to achieve here (Palyvou 2012, 24). This hypothesis too would need to be tested, but again it suggests that the Aegean artist strove to combine light and colour to create sensorial effects on the viewer.

Overall, this suggests that both artist and architect were capable of harnessing light, colour and space as a mechanism to distort, focus and heighten the viewer's sensory perception and experience and, as such, turn the physical setting into part of the ritual landscape. The architectural space of the Throne Room is transformed into a liminal space to further emphasise the meeting with the divine which occurs within. Through the interplay of art, actor, colour and light, spectators and worshippers in the Throne Room were able to traverse two worlds simultaneously, the interaction of colour and light causing an overlap of the phenomenal and the representational (Henderson 2015, 27). The interaction of colour and light to 'activate' the frescoes within clearly specified spatial and temporal locations does much to help us understand how these features came together to produce religious experience at Knossos.

Notes

1 I would like to thank the editors of this volume for their invitation to contribute and their patience in waiting for my paper. I would also like to thank Mark Peters for letting me reference his forthcoming work, and to Erin McGowan for allowing me to read some of her PhD work in progress.

2 The term 'palace' is used for convenience's sake in this paper to refer to the monumental court-centred complexes found across the island. This term (coined by Arthur Evans) is problematic, as it implies a specific political function (i.e. domestic space for a royal family), and is by no means universally accepted by Minoan scholars (for example, Driessen (2002) has proposed 'Court-centred buildings' and 'court-centred compounds' as alternative terms). More recent studies have drawn attention to the possible ceremonial function of the palaces due to the presence of courtyards in the central and western parts of the building, as well as cult rooms and frescoes which depict ceremonies or rituals (see Driessen 2002). For summaries on the problems with terminology, see Rehak and Younger (1998: 102–3); McEnroe (2010: 54–6).

3 Columns which taper from top to bottom (the opposite of contemporary Egyptian or later Greek columns) and are surmounted with a large cushioned capital.

4 For a fuller discussion of Minoan epiphany, see Marinatos 1993; Hägg 1983; Morris and Peatfield 2001.

5 Although beyond the theme of this volume, and thus this paper, other sensory perceptions may also have been engaged in these rituals – for example, the use of incense, or chanting could have combined with the visual effects to make the ritual even more vivid.

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5 Tripping on the fantastic light
Reclaiming the Parthenon Marbles

James Beresford

For more than two centuries, the unique qualities of the natural light of Athens have been referenced by those seeking the return of the marbles taken from the Parthenon by Lord Elgin. Nineteenth-century poets and writers, critical of the manner in which the Scottish aristocrat had removed the sculptures from the Classical temple, contrasted the bright sunlight and clear blue skies of Athens with the overcast conditions frequently experienced in their new home in London. Over recent years there has been a steady stream of academics and museum professionals, as well as politicians and international repatriation campaigners, who have argued that the Parthenon Marbles cannot be truly appreciated under lighting conditions other than those found in the Greek capital. However, this paper suggests that attempts to directly equate the light conditions of the present with those of the ancient past are likely to be erroneous. These factors should be taken into account by those campaigning for the repatriation of the marbles.

An appreciation of light is crucial in furthering our understanding of ancient artworks, but it has also become a powerful weapon in disputes concerning cultural heritage, most notably the long-standing controversy regarding ownership of the sculptures removed from the Parthenon (See Figure 5.1 in colour plates). Under the orders of Lord Elgin, these 'Elgin Marbles' – or now, more commonly, the 'Parthenon Marbles' – were removed from the ancient temple at the start of the nineteenth century and subsequently shipped to London, eventually to be purchased by the British Government and placed on display in the British Museum. Alongside the disputed legality of Elgin's purchase from the Ottoman rulers of Greece, campaigners have asserted the ethical right that Greeks have to the Marbles, which, it is claimed, are "the symbol and the blood and the soul of the Greek people" (Melina Mercouri, quoted in Merryman 1985, 1883). The focus of this paper, however, is on the claims made by restitutionists who assert that the sculptures can only be properly appreciated and understood as works of art and decorative architecture when viewed in their original context, illuminated by the natural light of Athens. The following pages will argue that such assertions are overly simplistic and should be treated with considerably greater caution than has hitherto been the case. This paper will explore the profound seasonal variations that affect the weather and thus the light of Athens over the course of the year, as well as the implications of shifting meteorological conditions for the intensity of the city's natural light. Changes to the Greek climate over the past 2,500 years have also potentially affected the conditions under which the Parthenon and its sculptures were created and subsequently viewed.

There will also be an examination of the manner in which pollution in Athens has caused significant change to the quality of light illuminating the Acropolis and the rest of the Greek capital.

Emphasising the light

For campaigners seeking the repatriation of the Elgin/Parthenon Marbles (hereafter the 'Marbles') to the Greek capital, reference to the "unique Attic light" (Rutten 2009, 141), or variations on this phrase, have become a common refrain. The natural light of Athens has become a key factor in the restitutionist argument with those marbles displayed in the British Museum frequently described as inhabiting a "cold and dark prison" and longing for the "light of Attica" (Hamilakis 2007, 279). Such appeals to the natural light of Athens are not new, however: and as the earliest and most vocal of the critics of Elgin's removal of the Marbles from Athens, Lord Byron would also make clear his appreciation for the sunlight of Greece. At the start of his poem, the *Curse of Minerva* (1811), penned as a personal attack on his fellow Scottish aristocrat, Byron wrote: "Not, as in northern climes, obscurely bright/But one unclouded blaze of living light." Soon afterwards, the founder of French Romanticism, François-René de Chateaubriand, would also lay emphasis on the necessity of Attic light in order to bring out the beauty of the ancient marbles:

> "The monuments of Athens, torn from places to which they were adapted, will not only lose part of their relative beauty, but their intrinsic beauty will be materially diminished. It is nothing but the light that sets off the delicacy of certain lines and certain colours: consequently, as this light is not to be found beneath an English sky, these lines and these colours will disappear or become invisible."
>
> (Chateaubriand 1814, 149; see also Webb 2002, 69)

The claim that the Marbles could only truly be appreciated when under the caress of the natural light of Greece has now become a central argument in favour of their restitution. Melina Mercouri, the charismatic actress-turned-politician, frequently referenced the distinctive Athenian light to bolster Greek claims for the repatriation of the sculptures during her tenure as Greek Minister of Culture (1981–1989, 1993–1994). Indeed, the world-wide prominence of the dispute regarding possession of the Marbles is primarily a consequence of the political pressure applied by Mercouri in the 1980s, and it has been noted that "it is to her credit that the subject enjoys the enormous international attention that it has, for perhaps the first time, attained" (Hitchens 2008, 81). It was in her address to the World Conference on Cultural Policies, staged in Mexico City in the summer of 1982, that Mercouri put forward the case for repatriation of the Marbles, beginning her speech: "As I left Greece, looking down at the Attic sun through the window of my plane at the remains of the Parthenon." Mercouri continued her address by quoting the Greek poet Yannis Ritsos, who "expressed the sentiment of all of our people when he wrote: 'These stones cannot make do with less sky.' I think that the time has come for these marbles to come back to the blue sky of Attica, to their natural space, to the place where they will be a structural and functional part of a unique whole" (Mercouri 1982).

Mercouri's repatriation campaign turned possession of the Marbles into the most famous case of disputed cultural heritage. Indeed, the international prominence of

the dispute regarding ownership of the Marbles eclipses all similar controversies being waged over possession of cultural property, and the Parthenon sculptures "have become the *cause célèbre* amongst the cultural return cases" (Greenfield 2007, 41). Since Mercouri initiated her attempts to reclaim the sculptures from London, the campaign has assumed an important and high-profile role in domestic Greek politics. It has thus been noted:

> "Since then, it has remained a central issue in the discourse of Greece and it has become one of the so-called 'national issues' . . . All political parties, from the ultra-nationalist to the Communist, participate in the national crusade for the restitution of the sculptures. Since the affair has become a 'national issue' it has been sacralized and is beyond any serious criticism . . . The crusade also confers authority on the Minister for Culture, who is seen as advancing one of the most important national issues of her/his time."
>
> (Hamilakis 2007, 256–59)

By the early 1980s it had, however, become clear that the polluted atmosphere of Athens, in which aerosols and acid rain were eating away at the Pentelic marble of those sculptures that remained on the Parthenon, could never allow the Marbles to be reattached to the ancient temple and become the "structural and functional" part of the monument that Mercouri had originally envisaged. Nevertheless, the emotive assertion that the sculptures could only be truly appreciated when displayed in the natural light of Athens had become too powerful to be set aside. Thus the New Acropolis Museum – the design of which was finally accepted in 2001 following three earlier architectural competitions stretching back to the mid-1970s – had to abide by this need for natural Greek light (See Figures 5.2 and 5.3 in colour plates). Although the sculptures would no longer be part of the ancient temple, the claim could still be made that they were illuminated by the same light that streamed onto the Acropolis and across the rest of the Greek capital. It is thus clear that natural light lies at the very centre of the restitution debate and was a crucial factor behind the construction of the New Acropolis Museum.

Bernard Tschumi, the Swiss-French architect who designed the New Acropolis Museum, which officially opened to the public in the summer of 2009, was eager to stress that "the use of daylight is fundamental to this museum" (*Economist* 2009). Tschumi would also emphasise that the natural light of Athens provided the key to his design for the Parthenon Gallery that, situated on the top floor of the Museum, was specifically intended to house the display of the Marbles remaining in Athens alongside casts of those currently in the British Museum (See Figure 5.4 in colour plates). The architect thus stated his "desire to replicate, as far as possible, the outdoor conditions under which the Parthenon Frieze and the Acropolis sculptures were originally seen" (Tschumi 2009, 84). Tschumi would also emphasise that the light in Athens "differs from light in London, Berlin or New York" (Bernard Tschumi Architects 2009). Similarly, the President of the New Acropolis Museum, Dimitrios Pandermalis, has stressed the importance of the sunlight flooding into the museum, going so far as to claim that "this is the Museum's most thrilling asset: The light. So much so, that I've been thinking of having it managed, of having someone keep track of the light all day long! What I mean is that I've been thinking of putting a staff member in charge of the light" (Pandermalis 2010, 485–86; see also Pandermalis 2009, 44).

With one of the principal design aims of the New Acropolis Museum to reference the natural light of Athens, the building therefore had to be predominantly glass-walled and the windows constructed from glass of "maximum transparency in order to provide natural light for the sculptures and a direct view to the Acropolis" (Rutten 2009, 141). With the completion of the Museum in 2009, leading architects and writers certainly emphasised the "airy and light-filled" galleries (Kimmelman 2010), and the "spacious, daylight-filled interior" (*Economist* 2009). Marbles restitutionists, such as the author Christopher Hitchens, would also describe the Parthenon Gallery as "drenched in Greek light" (2008, xv). By contrast, the windowless Room 18 of the British Museum, in which are displayed the marbles of the Parthenon removed by Lord Elgin, with the sculptures illuminated by large skylights and artificial spotlights, has been condemned by Greek culture officials who have argued: "These marbles were sculpted for the Parthenon, designed to be on the Acropolis, under the natural light of the Attica sky, not a dimly lit gallery off Tottenham Court Road" (Elena Korka, quoted in Kanelis 2002). Other restitutionists point to the "imperceptible shadows" created by the skylights (Taylor 2004; Lending 2009, 580). Nonetheless, despite the considerable acclaim with which the New Acropolis Museum was initially greeted, it has recently been pointed out that the sculptures of the frieze on display in the Museum are poorly served by the over-provision of natural light which is utterly at odds with the "poorly lit space" (Valavanis 2010, 189), located at the very top of the cella, in which these sculptures were originally displayed on the Parthenon. Enthusiastic use of the mesh window blinds in the Parthenon Gallery also diffuses the natural Attic sunlight attempting to enter the room, especially from the south. As such, the light environment created for the Marbles in the New Acropolis Museum differs radically from that which the sculptures experienced when they adorned the Parthenon during the classical era.[1]

Despite the frequent references to the natural light of Athens, there is also a curious lack of any scientific definition of the components of the inimitable light found in the Greek capital. It is a distinct presence, yet one that has rarely been quantified.[2] Instead, claims that the Greek capital of the twenty-first century is illuminated by natural light identical to that found during the Golden Age of Periclean Athens often appear intended to generate a sense of nationalistic pride. Dimitris Plantzos therefore regarded the emphasis laid on the "natural light of Attica" at the New Acropolis Museum as one of several factors designed to function as an "improvised retrospective of German romanticism", which he felt was promoted in order to "serve the national narrative for the construction of a single, indigenous and continuous Hellenism" (Plantzos 2011, 620).

The "unique Attic light" has also become imbued with a semi-religious quality that has permeated repatriationist rhetoric regarding the Marbles and the natural light of Athens. Over the last two decades there has been a growing discussion of how the monuments and the archaeological 'relics' of the ancient past – and especially those created during the Classical period – have assumed a spiritual dimension in modern Greek society: "As early as the beginning of the nineteenth century classical antiquities became sacred symbols of the Greek nation. Official rhetoric often describes them as 'sacred heirlooms of antiquity', and the Athenian Acropolis, the ultimate specimen of classical antiquity, is today known in Greece as the 'sacred rock' " (Yalouri 2001, 137). Following the establishment of the independent Greek state, "Christian Orthodox worship merged with the sacralization of the classical material past, encountered

in both the western and national imagination, and resulted in the national semi-religious worship of classical antiquities" (Hamilakis 2008, 181). Antiquities, and especially those which originated from the Athenian Acropolis, were thus regarded as "signs and icons of the new religion" (Hamilakis and Yalouri 1999, 131). This quasi-religious adoration of the Parthenon and its marble adornments partly explains the frequent appeals made by restitutionists to the "unique Attic light". It has thus been pointed out that "perceptions of purity and pollution . . . dominate behaviour towards antiquities and the past in general. Practices or things which violate the social order defined and structured by antiquities are considered impure, and should be erased" (Hamilakis and Yalouri 1999, 118). Natural light has become part of this semi-religious notion of purity and pollution. Those seeking the repatriation of the Parthenon Marbles argue that the unique illumination on offer in Attica provides the sculptures with the "unclouded blaze of living light" emphasised by Byron. By contrast, London's overcast skies and the windowless galleries of the British Museum offer conditions deemed to be utterly alien to the Marbles with the dull, non-Greek illumination that the Romantic poet dismissed as the "obscurely bright" light of "northern climes", polluting the sculptures.

The persistence of the arguments relating to the uniqueness of the light of Athens even forced a response from the (then) director of the British Museum, Neil MacGregor, when interviewed by Peter Aspden for the *Financial Times* in 2003:

> "What about the aesthetic argument, the sentimental argument, what about taking the Marbles back to the place of their conception, back to the unique light of Attica?
>
> MacGregor's response borders on the scathing. 'Well, every place has got its own light. They were never meant to be white sculptures under the unique light of Attica. They were never meant to look the way they do now. The unique light of Attica was shining on polychrome sculptures, but nobody is saying we should repaint them in their original colours.' "
>
> (Aspden, 2003)

The reply provided by Neil MacGregor also emphasises why the issue of polychromy has had a minimal impact on the debate regarding the restitution of the sculptures. The curatorial staff at both the New Acropolis Museum and the British Museum are, of course, not prepared to begin liberally applying paint to the ancient sculptures in their stewardship in an effort to achieve a more 'authentic' manner of display. Nonetheless, there should be no doubting the importance of the effect of the ancient paint to the Marbles when they adorned the Parthenon during the fifth century BCE. At both the New Acropolis Museum and the British Museum, recent exhibitions and research have emphasised the vibrancy of the colours that originally decorated the sculptures of the Parthenon (see Eleftheratou 2012; Marchant 2009; Jenkins and Middleton 1988; Brinkmann 2008, 31).

The application of paint to the sculptures of the Parthenon would certainly have affected the clarity with which ancient Athenians could observe the scenes carved into the Pentelic marble. This was especially true of the sculptures of the temple's frieze which were hidden in the shadows at the top of the cella, where they could not be illuminated by direct sunlight, at least until the roof above the frieze was destroyed towards the end of antiquity (see, for example, Korres 1994, 143; King 2006, 143ff.).

As such, polychromy appears to have been crucial in allowing ancient observers to pick out details carved into the frieze. Recent research by Bonna Wescoat has thus led to the conclusion that "color was the most critical factor in the visibility of the frieze" (Wescoat 2012). The heavily shadowed location of the Parthenon frieze, and the importance of paint in increasing the visibility of these sculptures, has also been emphasised in the digital renderings of the Parthenon produced by Paul Debevec at the University of Southern California (Debevec et al. 2001; Debevec 2005). However, despite the interest that art historians and archaeologists have taken in the polychromy of the Parthenon, the application of colour to the marbles of the temple has had little impact on the long-running debate concerning ownership of those sculptures removed by Lord Elgin.

The modern climate and light of Athens

It is rather stating the obvious to note that Athens, located at latitude 37° 54' North and able to dip its toes in the waters of the Eastern Mediterranean, is a considerably less cloudy and drier city than is London, located on the opposite side of the European continent and, at 51° 30' North, almost 14° degrees farther north than the Greek capital. As well as the intensity of the sun's rays, this variation in latitude affects the length of daylight over the course of the year.

The changing seasons also bring considerable variation in the intensity of sunlight and the length of the day. Thus, on 21 June about 14:48 hours of daylight are expected on a cloudless day in Athens; by contrast, on 21 December only about 9:31 hours of daylight are experienced on clear days. Quite apart from the very different levels of brightness and heat that natural light supplies to the Greek capital during the summer months as opposed to those of winter (see Tukianen 2014; New et al. 2002), there are also well over five hours of additional sunlight expected at the summer solstice compared to that of the winter (data derived from U.S. Naval Observatory; see also Beresford 2013, 322).

The brightness and heat derived from sunlight is also determined by a region's climate. Across the Mediterranean as a whole there is a pronounced seasonal pattern in which summers are dominated by warm, dry conditions; by contrast winters are generally mild and wet (e.g. Admiralty 1987, 56; Beresford 2013, 54). In Athens, records reveal that for six months of the year, November–April, cloud cover is 4–5 oktas, but only two months in the heart of the summer, July–August, record skies of less that 1 okta (Mediterranean Pilot 2009, 37).[3] Even scattered clouds will dim and diffuse light (Florin et al. 2010, 129), and the cloudier skies common in Athens from late autumn through to the middle of spring therefore change the nature of the Athenian light compared to that experienced during the usually clear skies of mid-summer. These seasonal variations in cloud conditions are also reflected in amounts of precipitation in Athens (see Mediterranean Pilot 2009, 31). Thus, according to records compiled by NASA, December is usually the wettest month in the Greek capital, with an average of 9.8 days of rain depositing 80 mm of water on the city. By contrast, in July, the driest month, there are usually only 1.4 days of rain, producing just 6 mm of precipitation (Tukiainen 2014). The distinctive seasonal cycle of Athens should encourage the rejection of the belief that the skies above the Greek capital are invariably cloudless and blue, or that the sunlight is consistently bright and warm. Meteorological records

instead emphasise that while such conditions usually generally prevail during the summer months, in the wintertime the situation is very different.

The claims concerning the unique light of Attica which were promoted by Melina Mercouri in Mexico City in 1982, and which have been eagerly referenced in the following three decades by campaigners lobbying for the return of the Marbles to Athens, also frequently appear to be directed towards foreign audiences whose seasonally restricted visits to Greece have helped to shape a highly distorted picture of the country's climate and natural light. The vast majority of tourists visit Greece during the summertime, and in recent years the four-month period stretching from June to September has accounted for between 67–70 percent of annual overseas visitors (SETE 2011, 5; 2012, 5; 2013, 5). Reference to the natural light of Athens as offering the only suitable home for the Marbles will therefore resonate with those who tend to limit their visits to Athens to the summertime, or have been offered images of the Acropolis bathed in bright sunlight as it is always depicted on postcards, chocolate boxes, and travel documentaries (Figure 5.1). As might be expected, it is an impossible challenge to locate a postcard featuring a rain-sodden Parthenon cowering beneath a leaden sky, yet those of us who have lived in Athens year-round can attest that such weather is frequently experienced during the wintertime (See Figure 5.4 in colour plates). Similarly, even foreign archaeologists and historians are constrained by the teaching calendar and generally limit fieldwork in Greece to the summertime.

Climate change in Athenian history

In recent years it has been claimed that the sculptures displayed in the Parthenon Gallery of the New Acropolis Museum "are lit by the same natural light and receive the same shadow in an installation that approximates its antique predecessor" (Aesopos 2009, 62), while the Museum's president has also asserted that the natural light that streams into his museum is "the same Athenian light widely praised by many of antiquity's poets" (Labropoulou 2011, 13). Restitutionist literature has also frequently promoted the assumption that the Acropolis is illuminated by "eternal, unchangeable light", a belief that, although unsupported by any scientific data, nonetheless adds to the "significance of the effort to bring back the Parthenon marbles where they belong" (Vernicos 2012, 9). Such claims of eternal and unchanging light conditions in Athens throughout the ages are, however, open to serious question. Instead, fluctuations in the Greek climate have undoubtedly created changes in the brightness and heat of the sunlight of Attica from one historical era to another.

Just prior to c. 850 BCE, most of Europe was at its post-glacial climatic optimum, with temperatures averaging as much as 2–3°C higher than those of the present (Goudie 1992, 158). Around this time, however, there appears to have been a fairly abrupt shift towards a cooler European climate, which saw an advancement of glaciers in the Alps and mountains of Anatolia (Bintliff 1982, 148; Goudie 1992, 162; Lamb 1995, 147), and a corresponding retreat of the treeline (Brice 1978, 142; Erinc 1978). This so-called 'Iron Age Cold Epoch' can possibly be glimpsed in the writings of ancient philosophers such as the Greek polymath, Theophrastus of Eresos (c. 372–287 BCE; see his works, *On Winds*, 13; *On the Causes of Plants*, 5.14). However, by at least the Late Roman Republican period, and possibly earlier, the climate of the Mediterranean appears to have grown warmer, and there is evidence of glacial retreat

in both the Alps and Asia Minor (e.g. Lamb 1995, 125, 142, 166), with the fluctuating climate drawing comments from Roman writers such as Lucius Columella (CE 4–c.70; see his *De Re Rustica*, 1.1.4–5). This climatic phase is known as the 'Roman Warm Period' for which "historical records suggest that climate conditions might have been similar to today" (Chen et al. 2011), although it has been argued that Mediterranean summers at this time may have been slightly more humid than is presently the case (e.g. Büntgen et al. 2011, 578).

How greatly the Mediterranean region was affected by these climatic fluctuations, or when the shift from the relatively cold conditions of the Iron Age Cold Epoch to the Roman Warm Period took place, is unclear. Some scholars argue that the shift to the warmer climatic regime commenced as early as 550 BCE, although the majority of researchers regard the onset of the period about 450 or 400 BCE, while other academics have evidence that points to about 200 BCE, and yet other scholars have argued that warmer conditions did not begin until the turn of the millennium (see Grauel et al. 2013, 1441, Table 1). To further complicate matters, climatic change appears to have affected different parts of the Mediterranean at different times (e.g. Dermody et al. 2012). The nature of the Athenian climate, and the light conditions it influenced, at the time the Parthenon was constructed between 447 and 432, is therefore currently uncertain. Although the majority of climatologists would tend to locate at least the early decades of the Classical period of Greek history in the conditions associated with the Iron Age Cold Epoch (see Grauel et al. 2013, 1441), research into the past climate of Crete suggests that "[f]rom ca. 600 to 300 BCE . . . the climate was rather warm and dry" (Chartzoulakis et al. 2001, 196). It has also recently been suggested that the organisation and staging of theatrical performances in Athens during the winter months of the fifth century BCE indicates that the city was experiencing warmer and drier conditions than present (Chronopoulou and Mavrakis 2014).

What the current disagreements regarding the past climate of Greece most clearly highlight is that we should be wary of assuming modern meteorological data from Athens can be directly superimposed on to the city of the Classical era. At the very least, it is highly likely that Athenians who witnessed the Parthenon take shape observed the temple under rather different climatic conditions to those of the present. The climate has certainly fluctuated throughout the period in which the Parthenon has stood, and Athenians of the Classical, Roman, Byzantine, Frankish, Ottoman, and modern eras will have gazed on the Parthenon under a range of different climatic and light conditions.

Even as recently as the early nineteenth century, when Byron emphasised the "unclouded blaze of living light" he experienced in Athens, the sunlight and climatic conditions were rather different to those of the present. The Romantic poet was, after all, living through the 'Little Ice Age', an era spanning roughly 1550 to 1850, during which Europe experienced conditions that were generally cooler and more unstable than those of the present (e.g. Mann 2002, 504). The narrow growth rings found in trees during much of this period indicate less propitious growing conditions, probably as a result of cooler summertime temperatures, while Alpine glaciers advanced further down the mountainsides. Travellers accounts, sketches, paintings, and, from the mid-nineteenth century, photographic evidence, also provide evidence for the cooler conditions (Lamb 1995, 211f.; Mann 2002). Furthermore, from 1790 through until 1830, fluctuations in the magnetic field of the Sun led to reduced levels of solar radiation, resulting in a decrease in the levels of heat and the intensity of sunlight reaching

the surface of the Earth (Eddy 1976; 1977, 173; Solanki and Fligge 1999, 2465). This period also coincided with extremely active volcanism around the world in which vast amounts of debris were discharged into the atmosphere, veiling the sun's rays (Wagner and Zorita 2005, 205). According to early scientific records, these events brought about a dramatic decrease in temperature during the second decade of the nineteenth century, and it has been pointed out that, across northern Europe, "1809 brought the first of a long series of colder summers, and the decade of 1810–19 produced mostly cold seasons, for which the volcanic dust in the atmosphere has been blamed" (Lamb 1995, 249). With the cooler climate, decrease in levels of solar radiation, and an atmosphere filled with volcanic debris, it is perhaps little surprise that European landscape paintings composed in the early decades of the nineteenth century are more likely to depict cloud-covered skies than are works from the following century (Brimblecombe and Ogden 1977; Lamb 1995, 249–51; Brimblecombe 2000). A move towards cooler temperatures in Athens at this time can perhaps also be glimpsed in the writings of Sir Henry Holland, who arrived in Athens on the first day of 1813. The British traveller noted, "In 1812, the year preceding my arrival, the general temperature had been rather low than otherwise. On the 28th of April snow was lying on Parnes and Hymettus." Holland would go on to write that soon after he left the town in January 1813, "the cold became more severe; and what is very uncommon, the snow lay three or four days within the city" (Holland 1819, 184).

In 1809, at the beginning of Europe's succession of cold summers, Elgin was still shipping the last of his marble prizes from Greece to Britain and exhibiting those already in London under the "obscurely bright" light of the British capital. That same year, Byron was embarking on his two-year Grand Tour through the lands of the Mediterranean which would provide the basis for his epic poem, *Childe Harold's Pilgrimage*, as well as his highly personal attack on Elgin's removal of the Marbles contained in *The Curse of Minerva*, composed in March 1811. Yet at the very moment Byron was making poetic reference to the light conditions he experienced in Athens, Greece, and the rest of Europe, was experiencing unusually high levels of cloud cover, and the skies were filled with volcanic dust.

Writing in the early twentieth century, Charles Heald Weller drew on more than half-a-century of meteorological observations taken in Athens and, comparing them with indications of climatic and environmental conditions prevailing in the city surviving in the ancient literature, reached the conclusion that, despite the passage of two millennia, "on the whole the climatic conditions [of Athens] seem not to have undergone material change" (Weller 1913, 19). However, the comparison of meteorological records taken in Athens near the start of the nineteenth with those of the following two centuries makes it clear that Weller's claims can no longer be considered credible; instead there appears to have been a quite substantial decrease in average annual precipitation, together with a corresponding increase in temperature, recorded in the city over the course of the last two hundred years (Beresford, forthcoming).

Despite evidence to the contrary, the belief in the constancy of the climate of Attica, and the qualities of the natural light that is largely dictated by the annual meteorological conditions experienced in the Greek capital, still appear to be held by many Marbles restitutionists who, as has already been seen, continue to make casual reference to the "eternal, unchangeable" and "unique" light of Athens. Scientific advances in our understanding of climatic fluctuations throughout history, together with international public acceptance of the effects of climate change on the world of the present,

are, however, making such claims increasingly untenable. Indeed, given the climatic changes that have taken place across Europe, Greece, and Athens over the course of merely the last two centuries, and the close relationship of meteorology to the intensity of sunlight, it would thus appear highly likely that the natural light of Athens at the time when Elgin removed many of the Marbles from Greek soil at the beginning of the nineteenth century was very different to that which they would experience were they returned to the Greek capital of the twenty-first century.

Air quality of Athens

Direct human action, in the form of urbanisation and associated air pollution, have also affected the light of Athens. One appreciable change over recent decades has been an intensification in heat hazes as the rays of the sun shimmer and dance in the currents of warm air that rise from the concrete city. Rapid urbanisation over the last two centuries – which has seen the city grow from about 12,000 inhabitants at the start of the nineteenth century (Desyllas 1999, 35), to over 3.5 million at present and with more than 4 million in the Larger Urban Zone (Demographia 2014, 22, 56, 113) – has greatly exacerbated the problem. Furthermore, Athens has a paucity of green spaces; while other European capitals have an average of 7m^2 of parkland or other green areas for each inhabitant there are just 2.7m^2 of green space per Athenian resident, dropping to 0.4 m^2 per person in the most densely built central areas (Point Supreme Architects 2011). The concrete buildings and asphalt roads, together with the lack of green spaces, creates an 'urban heat island' effect in which air temperatures in Athens are considerably warmer than in the surrounding rural environment: up to and above 4°C warmer in both summer and winter (Livada et al. 2002; Stathopoulou and Cartalis 2007). With the population of Classical Athens perhaps numbering in the region of 250–300,000 (Thorley 2005, 74), and with no concrete or glass construction to contribute to the albedo effect, we can be fairly confident that modern urbanisation has changed the localised climate as well as the nature of Athenian light, with a far greater incidence of heat haze in the modern city than would have occurred in antiquity. Summer heat hazes, and their effect on the visibility of the Parthenon and other monuments on the Acropolis, have even been unwittingly acknowledged by those seeking the repatriation of the Marbles to Athens, one restitutionist noting in a newsletter of the campaign group 'Marbles Reunited', "The Acropolis is discernible, even in the haze of sweltering heat, from the roof of my grandparents' apartment in Korydallos, Piraeus" (Borg 2009, 1).

In addition to heat hazes, Athens has been infamous in recent decades for its poor air quality and heavily polluted atmosphere, which have transformed the 'natural' light received by the city. Atmospheric pollution is crucial to understanding variations in the intensity of light and heat imparted by the sun. Pollutant particles, in liquid or solid form, are suspended in the air and can greatly affect the solar radiation that enters the Earth's atmosphere: aerosols containing sulphur and nitrates reflect light away from the surface of the Earth, while particles such as black carbon will absorb radiation, shading the surface and warming the atmosphere (CAICE n.d.).

The high levels of pollution in Athens in the second half of the twentieth century have therefore had a direct impact on the amount of solar radiation reaching the city, affecting both the brightness and heat of the natural light. Unfortunately, it is exceptionally difficult to monitor and quantify the effect of a city's aerosols on the scattering

or absorption of sunlight because the mass and number of particles within aerosol concentrations varies greatly depending on the time of year, prevailing meteorological conditions, topographical conditions, industrial output, etc. (e.g. Penner et al. 2001, 293). Furthermore, there have been recent concerns relating to the official mechanisms in place for the monitoring and reporting of emissions in Greece (Doyle and Wynn 2008). It is, nonetheless, clear that air pollution in Athens reached its nadir during the 1970s and remained extremely poor throughout the following decade. In 1981 – the same year that Melina Mercouri became Greek Minister of Culture – the international press was therefore featuring articles describing the problem facing the Greek capital throughout much of that summer: "A dark gray cloud of pollution, described by experts as worse than those of Los Angeles and Tokyo, has become an almost permanent feature of the sky over Athens . . . Known here simply as 'the cloud', the gray mass [is] caused by the industrial plants and heavy vehicular traffic of the capital" (*New York Times* 1981).

With Athens located on a flat coastal plain, hemmed in by mountains and with approximately 70 percent of all Greek heavy industry located in or around the perimeter of the city (Heikell and Heikell 2014, 39), pollution in the Greek capital would remain a major concern throughout Mercouri's tenure at the Greek Culture Ministry. Summertime Athens usually experienced less pollution, primarily as a result of the reduction in traffic in the city during the Greek vacation period of July–August, while from late May or early June the meltemi winds (the etesians of antiquity) also blow strongly from the north and help dissipate the aerosols that might otherwise linger in the skies above the city (Melas et al. 1998; Kalabokas et al. 1999, 161; Mediterranean Pilot 2009, 31). However, pollution was a major problem in Athens during the winter months of the 1980s and remains a cause of health concerns to this day (e.g. *Ekathimerini* 2013). At the start of October 1991, even the international press was reporting on the difficult atmospheric conditions in Athens:

> "Air pollution reached a record level in Athens Tuesday . . . The official PERPA environmental agency reported that nitrogen dioxide had reached a record level and other pollutants such as carbon monoxide and ozone also were at high levels. A brown pollution cloud, known in Athens as the 'Nefos', forms when vehicle and industrial emissions combine with warm, still weather in this mountain-ringed capital of about four million people . . . The independent PAKOE environmental agency reported that 647 people sought medical treatment for heart and breathing problems exacerbated by the pollution."
>
> (*Associated Press* 1991)

The polluted atmospheric conditions have not only been hazardous for the health of Athenians (e.g. Katsouyanni et al. 1990; Touloumi et al. 1994), but airborne pollutants have also eaten away at the Pentelic marble of the monuments on the Acropolis for much of the second half of the twentieth century. The damage caused to the Parthenon, and those sculptures that remained attached to the temple, has been highlighted by the historian William St. Clair:

> "In the 1960s, with the rapid, largely uncontrolled, industrialization of Greece, the air in the Athens basin became seriously polluted. Previously unusually moistureless, it was now humid. Recently clean and clear, it was now full of sulphur

> and other impurities. The days when visitors could count the columns of the Parthenon from ships at sea or from the quayside at Piraeus had gone forever. Highly acidic when previously it had been neutral, the now polluted air bit into the exposed patina of the marble, destroyed the surface detail, and continued to bite."
> (St. Clair 1998, 329)

It was the erosion of the Parthenon sculptures by particles in the air of Attica that led to the removal of its remaining decorative architecture. The pollutants attacking the Classical artworks of Athens also led to the construction of the New Acropolis Museum, within the galleries of which the ancient sculptures could be preserved, and exhibited away from the corrosive atmosphere of the Greek capital (e.g. Papakonstantinou-Zioti 2010).

Research carried out by the United Nations Environment Programme (UNEP) across regions of Asia, where aerosols create clouds not unlike those regularly witnessed over the Greek capital in the later decades of the twentieth century demonstrate that these 'Atmospheric Brown Clouds' (ABCs) can have a profound effect on light conditions: "Aerosols in ABCs intercept solar energy before it reaches the surface . . . Absorption enhances the solar heating of the atmosphere. On the other hand, both absorption and reflection of solar radiation lead to dimming at the surface, that is, they reduce the amount of solar energy absorbed at the surface" (UNEP 2008, 13). Less sunlight reaches the Earth's surface, with some Asian cities registering a loss of 10–25 percent of solar light and heat as a result of the polluted clouds (UNEP 2008, 11). It was in fact during the period when Melina Mercouri was referencing the distinctive Attic light as part of her campaign to repatriate the Marbles that the light of the Greek capital was most gravely affected by aerosols in the air above the city. Indeed, the "unique Attic light" of this period possibly owed much of its distinctive character to the pollutants that laced the Athenian atmosphere. Despite the frequent presence of nefos clouds and other aerosols in the skies above Athens, when the Greek government launched its third architectural competition to inspire designs for a New Acropolis Museum in 1989, it nevertheless claimed that the "Attic sky, famous for its clarity of crystal-clear 'Attic Light', complemented the natural harmony of the area" (quoted in Lending 2009, 579).

The 1982 restrictions designed to limit the use of private cars in Athens city centre and, most importantly, the later (1990–94) restrictions on the sulphur content of diesel fuel, promotion of catalytic convertors and of unleaded gasoline, reduced the emission of pollutants and significantly improved air quality in Athens (Kalabokas et al. 1999, 157–8). Nonetheless, pollution can still be a problem in the city, especially during the wintertime. In the first two months of 2013, for example, it was reported in the Greek press: "Athens air pollution found at 15 times above EU alert level" (*Ekathimerini* 2013). In the winter of 2014–5, it was also noted: "The Environment Ministry has called on Athenians to avoid burning wood and other organic materials in fireplaces and boilers as air pollution in the city has reached dangerous levels" (*Ekathimerini* 2014).

In 1891, Roger Casement's poem "Give Back the Elgin Marbles", sought to contrast the polluted nature of London's atmosphere with the purity of the skies over Athens:

> Give back the Elgin Marbles; let them lie
> Unsullied, pure beneath an Attic sky.

> The smoky fingers of our northern clime
> More ruin work than all the ancient time.

The "smoky fingers" of London smogs had vanished by the time Athens was experiencing its own pollution problems (e.g. Brimblecombe 1987; 2004). Nonetheless, Casement's poem was reproduced in its entirety by Christopher Hitchens when the essayist argued for the repatriation of the sculptures removed by Elgin that were set out in his polemic book, *The Parthenon Marbles* (Hitchens 2008, 66). Yet at the time Hitchens released the first edition of the book in 1987 (then entitled *The Elgin Marbles*), the sky of Attica was at its most polluted; aerosols were not only eroding the delicate Pentelic marble of those sculptures that remained on the Parthenon, but the airborne particles were also altering the intensity of sunlight reaching the Acropolis.

Casement's poem was also used to preface an article from 1999 in which the Greek-American lawyer, Michael J. Reppas – who is also the founder and president of the restitutionist lobby group, the 'American Committee for the Reunification of the Parthenon Sculptures' – marshalled legal and ethical arguments in favour of the return of the Parthenon sculptures to Athens (Reppas 1999, 911). In the same year as the lawyer published this article, data collected by the European Commission from 258 cities across Europe highlighted the "major divide in terms of air quality is between Southern European cities on the one hand and Northern on the other, as well as between east and west. Most cities with a substantial number of days with bad air quality are in southern Europe. Athens and Thessaloniki and to a lesser extent Iraklion in Greece are the most problematic cities in this respect" (European Commission 2007, 117). During the most recent investigations into the state of European cities carried out by the European Commission in 2004, the Greek capital recorded 174 days of poor air quality across the course of the year, gaining Athens the rank of ninth worst city in Europe in terms of air quality (European Commission 2010, 127, 189).

Conclusion

The references to the natural light of Attica have acted as a powerful emotive argument for campaigners seeking the return of the Parthenon Marbles to Athens. Mention of the "unique Attic light" is, of course, also intended to beg comparison with the notoriously overcast skies commonly (and often justifiably) associated with London. There can be no question that, throughout the entire Holocene, Attica has enjoyed brighter sunlight streaming through clear skies far more frequently than has south-eastern England. However, the commonly held perception of the Parthenon basking in warm sunlight under cloudless skies is primarily limited to the summer half-year. Greater appreciation of the fluctuating nature of the climate and air quality of Athens throughout the centuries also indicate that the levels of solar radiation passing through the atmosphere, and the brightness and warmth of the sunlight that reaches the Acropolis and rest of the city, has fluctuated quite dramatically from one period to another. While there is no question that the light of Attica is unique – as is the light of every location in the world – it has not been constant and has been greatly affected by climatic fluctuations and airborne pollution. As such, the attempts to equate the light of the fifth century BCE with that prevailing in Athens during recent decades have consistently failed to take adequate account of the manner in which changes to the climate and air quality of the city have influenced the intensity and qualities of

the natural light. Is the "unique Attic light", to which so many restitutionists refer, specific to the heavily polluted and hazy atmosphere of late twentieth-century Athens? Or are repatriationists instead referencing the light created by the climate of the Little Ice Age, when Elgin removed the Marbles from Greece and which Byron praised at a time when the intensity of natural light in Athens was further affected by volcanic dust in the atmosphere? Or do those seeking the return of the Marbles point to the light conditions unique to the fifth century BCE, when the sunlight of Attica may have been affected by cooler climatic conditions, or, alternatively, may have been a period when Greece was experiencing warmer and wetter conditions than is currently the case? In attempting to demonstrate that the natural light of Athens has constantly changed throughout the entire two-and-a-half millennia since the erection of the Parthenon, this paper has therefore endeavoured to highlight some of the major problems inherent in the claims of restitutionists who have argued that the Marbles must be returned to the "unique Attic light" and placed on display in the New Acropolis Museum where the sculptures will be illuminated by "eternal, unchangeable light". Furthermore, it is worth bearing in mind that the light of Athens will continue to be affected by a combination of natural and man-made factors long into the future. Indeed, if the Marbles of the Elgin collection are returned to the city of their creation they will experience further changes to the quality of the Athenian light with climatic projections indicating increases in summertime temperatures of 2–5°C across Greece by the last quarter of this century, while precipitation is set to decrease (IPCC 2000; see also Xoplaki et al. 2003, 538). Should such climatic changes come to pass, then the natural light of Attica will be further affected by heat hazes and a reduction in summertime cloud cover, while Greece as a whole will experience increasingly arid conditions with some areas of the country facing the possibility of desertification.

Notes

1 For a recent analysis of the light conditions within the New Acropolis Museum, and the illumination of the sculptures when they adorned the Parthenon during antiquity, see Beresford (2015).
2 For attempts to measure the variations in light intensity on the monuments and sculptures of the Acropolis, see, Debevec et al. (2001); Debevec (2005); Zambas (2010, 390–5).
3 Cloud cover is measured in eighths, referred to by meteorologists as 'oktas': clear skies register as 0 oktas; scattered cloud between 1–4 oktas; broken cloud 5–7 oktas; completely overcast conditions as 8 oktas.

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6 Divine light through earthly colours: Mediating perception in Late Antique churches

Vladimir Ivanovici

Individual understanding of the ritual performances displayed in Late Antique cultic spaces was mediated through a number of perceptual filters. Typology was used to present the sacraments as re-enactments of moments from the divinity's life (baptism) or enactments of heavenly actions (the Eucharistic liturgy). The revelatory dimension of the rituals was rendered credible by the creation of an atmosphere reminiscent of heaven. The present paper argues that the luminosity of ritual settings, a key element in their recognition as divine, was consciously created through a careful use of architecture and decoration. Appealing to both sight and gaze, the luminous dimension requires the settings to be analysed through Late Antique, rather than modern, eyes.

> "All of these elements, marvellously fitted together in mid-air, suspended from one another and reposing only on the parts adjacent to them, produce a unified and most remarkable harmony in the work, and yet do not allow the spectators to rest their gaze upon any one of them for a length of time, but each detail readily draws and attracts the eye to itself. Thus the vision constantly shifts round, and the beholders are quite unable to select any particular element which they might admire more than all the others. No matter how much they concentrate their attention on this side and that, and examine everything with contracted eyebrows, they are unable to understand the craftsmanship and always depart from there amazed by the perplexing spectacle."
>
> (Procopius of Caesarea *On Buildings*. 1.1.23ff [trans. Mango 2000, 75])

Procopius's ekphrasis of the Church of Hagia Sophia in Constantinople offers an insight into the Late Antique awareness of the complex character of visual perception, and the conscious design of cultic spaces as "perplexing spectacles".[1] Visceral reactions such as the one described by Procopius were deliberately planned into the design of the church. A complex interior interplay of architectural structure, decorative elements, and lighting reproduced the luminous atmosphere of Heaven, supporting the bishops' claim that the religious ritual collapsed Heaven and Earth. In the design, the materials' hues and textures formed a conscious rhetoric aimed at altering the perception of the spaces' materiality.[2] Pertaining to the same luminous dimension that legitimised the spaces as reflections of heaven, the rhetoric of the materials evinces the degree to which gaze-—the subjective part of perception that is moulded by society—influenced the perception of these spaces and the rituals they hosted.

In a cultural context in which perceptions of the world were moulded by art (Elsner 1995, 4–5; 1996, 518) the capacity to substantiate the divine through artistic

media inside cultic buildings was a powerful instrument, bishops using the theophanic dimension of the space to legitimise various aspects of the cult. In this paper, I argue that the perception of ritual performances was altered through the use of an aesthetic of light that characterised early Byzantine cultic spaces. The amassing of bright and exotic elements confounded one's sensual perception by creating an "aesthetic saturation" (Bradley 2009, 90) which catalysed the acceptance of the scene as revelatory. After briefly discussing the conceptual context in which these spaces functioned, the paper uses the interior of the Church of San Vitale in Ravenna as case study, evincing how the luminous discourse relied on both sight and gaze.

Christianity and the material turn

The favouring of Christianity by Roman emperors beginning with Constantine the Great (306–37) allowed the Church to acquire and display riches (Brown 2012). Impressive cultic buildings rose in conspicuous areas and were decorated in the latest fashion. The adoption of the 'jewelled style' popular in the period had implications that went beyond the social sphere.[3] Indeed, in favouring the amassing of decorative elements that were considered luminous, the particular aesthetic had an inherent theophanic dimension in virtue of light being the main vehicle of revelation in the ancient world.[4] Embedded in the decorative programme of Late Ancient churches there is thus a theophanic discourse that relied on the capacity of the space to produce an otherworldly luminosity. The possibility of reproducing heaven, of offering God's immanence to the senses, lent prominence to Christianity by comparison with competing cults. Reflecting important processes at work in Late Antique society, the phenomenon reveals the dynamic existing between the cult and surrounding culture, indicating the dependency of the former on the latter.

In the context of a general material turn that popularised the belief that "the sensible world, including human sense-perception, the body, and objects in the material realm, could be viewed not as distractions but as theophanic vehicles" (Cox Miller 2009, 41; see also Frank 2000, 103; Walker 1990, 81), Christianity had to develop a sensuous approach to the divine in order to respond to the expectations of its participants. The orchestration of synaesthetic rituals in which sight, taste, hearing, and touch were allowed to interact with things divine appears as an organic development.[5] Consecrated through the Incarnation, the created world had to be Christianised, along with the senses of the believers.[6] Under the rule of the Emperor Justinian (527–65), the promotion of rituals as experiences that offered a genuine theophanic experience reached its apex.[7] As testified by Ps.-Dionysius the Areopagite (early 6th century), the Church designed the sacraments as revelations for those who, "lacking in reason have a limitless appetite for the material, a thrust originating in that chronic urge to dwell with the ephemeral, that living, mastering longing to remain with whatever is applauded by the senses" (Ps.-Dionysius *Cael. Hier.* 2.4, ed. PG 3.141D-4A, trans. Luibheid and Rorem 1987, 151). Unlike these, the mystagogues "do not gaze after that glory so stupidly praised by the mob [. . .] they have no time to return to the counterfeits which beguile the mob" (*Eccl. Hier*. 4.3.1, ed. PG 3.476AB, trans. Luibheid and Rorem 1987, 226). Among these counterfeits was the luminous dimension of the space:

> "We allow even material adornment in the sanctuaries [. . .] because we permit each order of the faithful to be guided and led up to the divine being in a manner

> appropriate to it [the order] because we think that some people are guided even by these [material decorations] towards intelligible beauty and from the abundant light in the sanctuaries to the intelligible and immaterial light."
>
> (Hypatius of Ephesus [531–8] *Epistle to Julian of Atramytium*, trans. Alexander 1952, 180)[8]

The light of which Justinian's counsellor speaks was not solely that entering the windows. Rather, a complex design drawing on the assimilation of light with everything positive in the period was employed to render credible the *mise-en-scène*. In Late Antiquity colours were perceived as degrees of light, textures were judged according to their reflectivity, and certain materials were held to emit light. Light thus offers a *fil rouge* that reunites theology and ritual with the architecture, decoration, and iconography of cultic spaces.[9] While the use of natural and artificial illumination to create a hierarchy of spaces was noted fairly early by researchers, the contribution of the decorative materials to the luminous scheme came only recently to the attention of scholars. Focusing on the latter aspect, I argue that these spaces reproduced the atmosphere of heaven. On the scene, bishops then displayed various discourses of power, of which the most important appears to have been the legitimisation of the clerical hierarchy.[10]

Material rhetoric in Late Antiquity

In Late Antiquity, social structure was made visible through deportment and dress. The regular person was used to 'reading' status in the texture and, especially, colourfulness of a person's attire (see Brown 2012, 27–30). Furthermore, materials were given a role in the rhetoric of the state, their association with specific areas allowing for the construction of visual discourses that stressed the worldwide expansion of the Empire. The recognition of the materials, with their background and various connotations, was promoted as a sign of culture in the period.[11] On a general level, the richness and chromatic palette of the decoration present in churches spoke of the overlapping between Church and Empire.[12] On a more specific level, the decoration referenced heaven, its favouring of reflective elements being self-apparent in the culture of the time.

The interiors of 6th-century churches making use of this decorative concept appealed to both senses and reason. On the one hand, the details asked for proper recognition and interpretation; on the other, their multitude and richness overwhelmed the onlooker.[13] The process is often addressed in contemporary ekphraseis; descriptions that focus on the effect instilled by the spaces rather than on their details. As underlined by Patricia Cox Miller, these ekphraseis "are not innocent poetic figures" but rather "subjective judgements that establish and control perception of a church's interior space, conditioning the human subject's relation with that space in terms of its theological meaning" (Cox Miller 2009, 10).[14] Written by members of the same intelligentsia that designed the churches, these descriptions reveal the dynamic in which the spaces were supposed to be perceived.

While ekphraseis address the intended meaning of the whole setting, encyclopaedias such as Isidore of Seville's *Etymologies* show how the effect was reached through a selection of materials with wondrous properties.[15] Promoted as a sign of culture, the capacity to recognise various materials prompted the writing of manuals that taught their real or imagined biographies. While in the generation of Pliny the Elder (23–75

CE) such activities were elitist, in Late Antiquity they became popularised. The congregations of churches such as San Vitale in Ravenna or Hagia Sophia in Constantinople would have been familiar with the concept, if not with all the stones. Such encyclopaedias reveal the power of the gaze, indicating that apart from what the eye of the modern researcher distinguishes, another world of connotations and meanings was available to the Late Antique onlooker. Regarding the luminous dimension, the texts of Pliny and Isidore indicate that the natural and artificial light was accompanied by another, generated by the materials and colours present in the space.[16]

Most striking to the modern reader is the fluid ontological state of these materials, stones being credited with qualities such as buoyancy, the capacity to corrode or preserve flesh, to protect from magic, or to prevent drunkenness. Bearing social, political, religious, and even magical connotations, the rhetoric of the materials was a visual discourse in its own right. Due to the centrality of light in the period's aesthetics and theology, reflectivity was particularly important. The lack of distinction between reflected and emitted light meant that reflective materials were credited with the capacity to produce light (Borsook 2000). Our study takes us to the top of the luminous hierarchy, where the most reflective textures overlap with the brightest hues. Recurrent in the decoration of churches, marble, red porphyry, gold glass mosaic, onyx, and selenite synthesise the alchemic process in which these materials' appearance translated into light which, in turn, rendered church interiors theophanic.[17]

"Symbolizing permanence, demonstrating enormous wealth and communicating power" (Greenhalgh 2009, 34), marble was a symbol of the Empire's universality and one of the most reflective materials available. White marble was particularly appreciated on account of its semi-translucent character. Pliny credited some of it with inherent luminosity, while the anonymous author of the 6th-century hymn on Hagia Sophia in Edessa declared that "from its brightness, polished and white, light gathers in it like the sun" (*Another Sogitha* 9, trans. McVey 1983, 95).[18] Often used in Late Antique churches, Proconnesian marble was cherished for its "gentle shimmer" and delicate veins that created intricate patterns (Paul the Silentiary *Descripto Sanctae Sophiae* 664, trans. Mango 2000, 86).[19]

Red stones and marbles formed a particular category, as red was considered the most luminous colour. Rare, expensive, and difficult to sculpt, red porphyry was held to be the brightest kind of stone, its deep red speckled with white glittering "with a beauty that charms the heart" (Paul. Silen. *Descr. S. Soph.* 647, trans. Mango 2000, 86).[20] Appearing as solidified purple, porphyry linked luminosity with socio-political power and wealth, being in Late Antiquity monopolised by the imperial house.[21] Displaying the luminosity of God, red porphyry was used to stress the sacred character of particular places and characters. Golden glass mosaic using amber glass, which lent to the glow a purple note, was often used for the images of God, the emperors, and the bishops; while porphyry roundels adorned the altar, the bishop's *cathedra*, or the spot in which the emperor was crowned by the patriarch. Perceived as radiating light, porphyry was used to mark the locations in which Heaven and Earth overlapped.

Imagining ideal matter as transparent and pervaded by the light of God, Late Antique theologians created the context for gold glass mosaic to be perceived as reproducing the substance of Heaven. Like the transparent stones making up John's celestial

Jerusalem, the tesserae absorbed the light and recast it towards the onlookers. Often placed at an angle that allowed it to receive the light coming from the windows and reflect it downwards, the golden mosaic was used to increase the luminosity of certain surfaces, conferring a special theophanic character to the spaces in which it was used.

Window panes made of selenite (a form of gypsum, or *lapis specularis*) were held to emit a lunar light.[22] Its luminosity waxing and waning with the moon, selenite was considered a light source in its own right, adorning the interior of churches during the day and illuminating them during the night (Isidore of Seville *Etymologies* 16.4.6 and 10.7). Of the materials frequently employed in churches, it is perhaps the one that best proves the fundamentally conditioned perception of the spaces, its inherent luminosity stressing the cultural gap between us and the audience for which the spaces were designed.

Seen as producing various types of light, these materials were the natural choice for decorating the cultic spaces of a religion that assimilated light with God and promoted its sacraments as revelatory. Apart from their aesthetic appeal and socio-political connotations, the brightness of these materials conferred *enargeia* to the *mise-en-scène*. Meaning 'clear' or 'bright', the term *enargeia* was used in Late Antiquity to denote the capacity of a work of art to appear enlivened and, in the case of cultic art, its participation in the divine (Tsakiridou 2013, 22). The dynamic character of light was thus assimilated to the life-likeness and liveliness of artefacts, *enargeia* best synthesising the belief in what we might consider the magical qualities attributed to these materials in Late Antiquity. The replacement of naturalism with a hieratic manner of representation in this period drew on this capacity of the materials used in the depiction to substantiate the presence of the subject. It was the shimmer of the image's texture and the vibrancy of the colours that actuated the presence, rather than its depiction in an illusionistic manner:

> *Illic expositos fucis animantibus artus*
> *uiuere picturas arte reflante putas.*
> *Sol uagus ut dederit per stagnea tecta colorem,*
> *lactea lux resilit, cum rubor inde ferit.*
> *Ire redire uides radio cristpante figuras*
> *atque lacunar agit quod maris unda solet.*
>
> (Venantius Fortunatus *Carmina* 3.7.35–6, ed. Reydellet 1994, 96; trans. Roberts 2013, 115. See also 1.13.17–8, ed. Reydellet 1994, 33.)[23]

> *Nunc placet aula decens, patulis oculata fenestris,*
> *quo noctis tenebris clauditur arce dies.*
> *Lucidius fabricam picturae pompa perornat,*
> *ductaque qua fucis uiuere membra putes.*
>
> (Venantius Fortunatus *Carmina* 10.6.89–92, ed. and trans. Reydellet 2004, 75; see also 1.13.15–8, ed. Reydellet 1994, 33, "*picta nitent*". On "flashing forth" through colours and texture see Cyril of Alexandria *Ep*. 217 and Venantius Fortunatus *Carm*. 10.6.91–2. See Kessler 1985.)[24]

The real and imagined brightness of the materials used in the decoration conferred life to the interior of churches, an animation that instilled the space with sacred meaning.[25]

San Vitale in Ravenna

San Vitale is part of a group of churches built during the reign of the Emperor Justinian (527–65). The revelatory dimension of these spaces, attested by the theophanic character of their iconographies, was assured through the use of various lighting effects. Of the six churches whose decorative programmes survive, scholars have focused on Hagia Sophia in Constantinople and on St. Catherine's in Sinai, both Justinianic foundations.[26] Less frequently discussed, San Vitale reunites all known techniques, providing the context for their consideration.[27] Found at the geographic and cultural crossroad of East and West, the upper-Adriatic area allows the use of written testimonies preserved in both areas, of both ekphraseis of Hagia Sophia in Constantinople, and Venantius Fortunatus's descriptions of Gallic churches, a luxury other areas do not concede.[28]

The impressive volume of Hagia Sophia produced a powerful effect from the very entrance, the progressive character of the experience losing face to this immediate impression. The range of materials is also less complex than in other churches, the imperial dimension of the space imposing the use of only the richest and most luminous textures.[29] By contrast, in San Vitale the reduced scale put the accent on the details.[30] The space reproduced the experience of ascensions, allowing the believer to access a series of spaces placed in an ever more luminous sequence (Figure 6.1). Natural light, material texture, and hues helped create the progressive effect. While the use of natural light is discernible at a glance, being indicated by the placement, number, and size of the windows, to understand the role played by the materials, we must delve into Late Antique culture.

The polychromy of the stucco decorating areas of the narthex and ambulatory must have reflected onto the bicolour marble facing of the walls. The grey of the

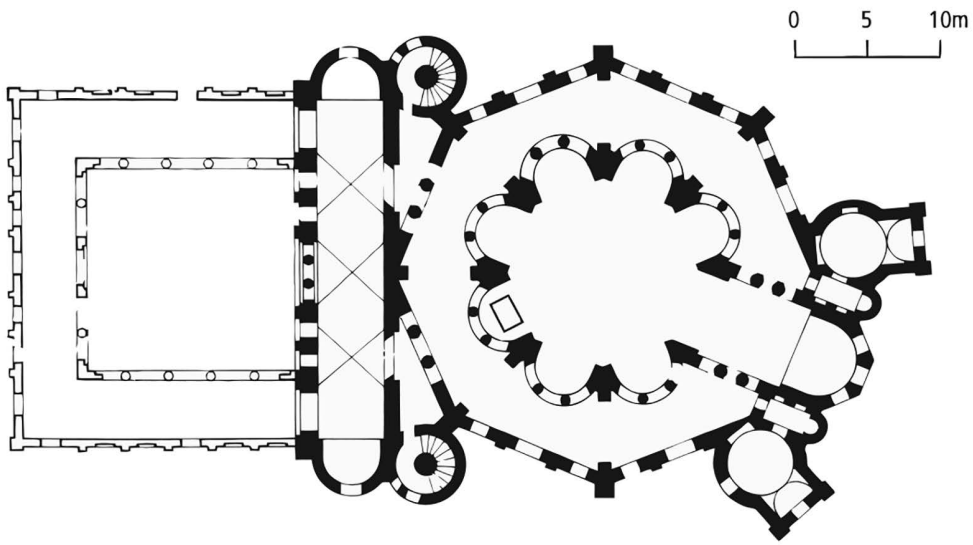

Figure 6.1 Reconstructed ground plan of San Vitale in Ravenna (ca. 548). After Jäggi (2013, 241).

Proconnesian and the deep red of the *cipollino rosso* complemented each other on the walls of the ambulatory and on the pillars, catching one's eye both with the contrast between them and with the intricacy of their patterns. The sober light of the marble in the nave contrasted with the abundant green and golden light coming from the sanctuary (See Figure 6.2 in colour plates). In the presbytery and apse, the intentions of the designers become clearer. One green and one golden, one in stone and one in glass mosaic tesserae, the two spaces represent the created world and Heaven, respectively. The history of salvation synthesised in the iconography of the presbytery precedes the highest celestial sphere shown on the semidome of the apse. On the golden background the characters are depicted in a hieratic manner, opposed to the naturalism of the scenes in the presbytery. In the simultaneously static and light-emitting atmosphere of Heaven the eternal Logos appears flanked by angels and saints. Below, the emperors and their entourage are shown in the same manner floating imponderable between Heaven and Earth. Their weightless bodies are projected forward into the space of the onlooker by the strong contrast between the background and the liveliness of their colours. The effect would have appeared more marked to the Late Antique person, used to perceiving the purple, gold and silver mosaic, and mother-of-pearl as dynamic, light-emitting surfaces.

The hierarchy based on the imagined luminosity of textures and hues is best discernible within the figurative decoration. In the main scene and in the panels showing the emperors with their entourage, a hierarchy based on the rhetoric of the materials is created (See Figure 6.3 in colour plates). Reserved for them alone, purple, porphyry, and mother of pearl adorn the images of Christ and the emperors. The place of the rest of the characters in the heavenly and earthly hierarchies is ascertained through the amount of purple they wear. Living embodiments of Christ, the bishop and the emperor compete with Christ, completely dressed in purple.

Evidence that the scene in San Vitale is not an exception comes from across the Adriatic, where the same techniques are used in the Basilica of Eufrasius (ca. 559). The luminous spatial progression and the hierarchy within the figurative decoration based on the imagined luminosity of the materials is reproduced in Poreč, as recently shown by Ann Terry and Henry Maguire (2007). Preserving also the original decoration of the lower part of the apse, the Eufrasiana brings additional evidence to sustain my contention that materials were selected and displayed on account of their imagined brightness to create a luminous pattern inside the church. The *opus sectile* panels facing the wall and serving as background to the *synthronon* evince the same desire to build a luminous hierarchy. Placed around slabs of green and red porphyry are over thirty types of decorative materials (See Figure 6.4 in colour plates). Containing practically every known type of marble, the area was a discourse on the wealth of the church and the bishop, as well as a testimony of the clergy's luminous and thus sacred nature. The episcopal *cathedra* is a discourse in its own right, the throne's luminosity supporting the iconic dimension of the bishop (on the *cathedra* in Poreč see Terry 1986) (See Figure 6.5 in colour plates).

In dealing with the luminous dimension of Late Antique churches one thus needs to consider both sight and gaze, adding the luminous valence of the textures and hues to the hierarchy of volumes and the increasing amount of natural and artificial light. The recognition of the perception of these details in luminous key enriches our understanding of the spaces' design, revealing the care taken by bishops in creating a luminous sequence. The reason for this staging lies, I argue, in light's capacity to alter

the materiality of those inhabiting the space. As testified by the poetry of Venantius Fortunatus, the luminosity of the decoration endowed the entire *mise-en-scène* with liveliness, animating the iconography, and with it the entire space.

Participants in the ritual were also affected by the space's otherworldliness. As noted by Peter Brown, the spread of the new liturgy coincides with that of the clergy's authority (Brown 1981, 31–49), the new type of ritual and cultic space catalysing "the othering of the clergy" (Brown 2012, 517). While church space was transformed into an ἐμψυχός ναός,[31] members of the clergy came to stand for the angelic beings that populated heaven:

> "the spiritual and immaterial hierarchies of the heavenly host being represented by the material priests on earth who stand by and worship the Lord continuously . . ."
> (Germanus of Constantinople [ca. 634–740] *Hist. Myst.* 1 [trans. Mango 2000, 141–2, 5])

In her recent monograph on the Byzantine aesthetic experience, drawing on a doctoral thesis on the luminous dimension of the space in Hagia Sophia, Nadine Schibille contested the existence of a luminous progression inside Justinianic churches.[32] Basing her analysis on the real amount of light, Schibille argued against the thesis according to which hierarchies of spaces in these churches were created through the amount of natural light. Nevertheless, measurement and perception register different effects. As noted already by Gianni Triantafillide (1964), often a person standing under the dome of a centralised church feels that he is in the most luminous spot, although this is rarely the case. Furthermore, as I hope to have shown, in the case of Late Ancient churches the luminous discourse was composed, apart from natural and artificial light, also by the texture and hue of the materials, judged in terms of brightness by the 6th-century audience.

The amassing of bright elements catalysed an alchemic process as the luminosity of the setting affected how the materiality of the space was perceived. In virtue of light being considered the main vehicle of theophany in the period, the creation of a luminous atmosphere inside cultic spaces functioned as a substantiation of the divine. Consequently, the elements present in the space were spiritualised. As Patricia Cox Miller has shown for the case of relics, the aesthetic of light eased their perception as *relics* instead of just *bones*. The same effect, I argue, was sought in the case of the clergy, who were spiritualised through the setting, seeming to embody divine powers.[33] Through careful interplay of architecture, decoration, and chromatic palette, the designers of churches such as Hagia Sophia and San Vitale created an essentially luminous stage which influenced how the performers and the ritual performance were perceived, affecting both reason and sensual perception.

Conclusion

> *Aut lux hic nata est, aut capta hic libera regnat.*
> *Lux est ante, venit caeli decus unde modernum,*
> *Aut privata diem pepererunt tecta nitentem,*
> *Inclusumque iubar secluso fulget Olimpo.*
> *Marmora cum radiis uernantur, cerne, serenis*

Cunctaque sidereo percussa in mirice saxa
Auctoris pretio splendescunt munera Petri.

(For the continuation of this text see
Agnellus *Liber Pontificalis Ravennatis* 50.157–76, ed.
Deliyannis 2006, 214–5; trans. Deliyannis 2004: 162)[34]

The Late Antique *topos* of praising lavishly decorated interiors for producing their own light was more than empty rhetoric. The Church Fathers had every reason to catalyse the belief in the inherent luminosity of certain materials by placing in cultic spaces texts such as the one from the archbishops' chapel in Ravenna, because their claim that the ritual collapsed Heaven and Earth was supported by the luminous dimension of the decorative programme. Selected on the basis of their capacity to build a luminous setting, the materials used in church decoration helped to create "a phenomenology of enchantment" (Isar 2011, 183) that made the interior of churches bridge Heaven and Earth.[35] Perceiving the decorative programmes as degrees of light, the Late Antique person was presented in churches such as San Vitale with an image of the heavens. One can thus safely state along with Eric Perl that "[i]n the Byzantine liturgy, nothing is left as an abstract idea. All truth is incarnate, made flesh. There is no idea without a concrete, visible, audible, tangible expression. And conversely, all the objects of the senses are filled with meaning, that is, with light" (Perl 1998, 54).

Notes

1 The effect characterised cultic spaces built from the time of Emperor Justinian (527–65) on, being mentioned also by Choricius of Gaza (6th century) *Laudatio Marciani* 1.23–6, and Photios of Constantinople (ca. 810–93) *Homily* 10.4ff.
2 Cox Miller (2009) studied the manner in which the luminosity of the *mise-en-scène* was used to transform the materiality of human remains, to make relics out of bones.
3 Janes (1998, 117–8): "People's visual symbolic language was rooted largely outside the Church. Therefore, Christian propaganda necessitated secular metaphors, or else such arguments would not have been comprehensible to the masses. [. . .] The Church adopted many of the images as well as the ways of that world. This enabled the new sect to communicate effectively and so to bring about the maximum number of conversions." On the jewelled style, see Roberts (1989).
4 In the ancient world, in both myth and ritual practice, light was indicative of divinity. On the use of light in ancient Greek cults, see Christopoulos et al. (2010); Schneider and Wulf-Rheidt (2011).
5 On the senses' involvement in the sacraments, see Ashbrook Harvey (1998; 2006); Caseau (1994; 2013; 2014); James (1996; 2004); Pentcheva (2010); Hunter-Crawley (2013); Williamson (2013).
6 Cox Miller (2009) and Hahn (2010, 304). On the "re-investment of one's sensory appetite", see Biernoff (2002, 122).
7 On the context in which Christianity adopted the concept and the evolution of the phenomenon from the first settings in the 3rd century to the complex *mise-en-scènes* of the 6th, see Ivanovici, forthcoming.
8 The much discussed anagogic quality of these decorative programs was evident only to those whom Ps.-Dionysius called 'the mystagogues', the common believers who conflated the light inside churches with Divine Light cf. Ps.-Dionysius the Areopagite *Ecclesiastical Hierarchies* 4.3 (PG3.473B-5A).
9 For detailed analysis, see Ivanovici, forthcoming.
10 In the 6th century Church, State and Heaven shared a common structure. The hierarchical organisation of Heaven which was made visible during rituals was a visual discourse of

legitimisation of both the clerical and the socio-political structure. The *mise-en-scène* thus was a complex staging meant to transmit a certain social and cosmic order.

11 Bradley (2009, 89) claims that in the time of Pliny the Elder "[m]arble watching was a complex and highly sophisticated process that evoked a wide range of aesthetic, cultural and ethnographic associations." For the perception of marble in Late Antiquity and Byzantium, see Sodini (1994); Barry (2007); Pentcheva (2011); Kiilerich (2012).

12 As pointed out by Brown (2012, 228) for the case of Paulinus of Nola, "[t]o gather together so much precious stone implied not only great wealth but *potential* – the working of patronage networks and the claiming of privileges [. . .] access to government deposits of columns and unused blocks, as well as the use of government means of transport."

13 For a more detailed analysis, see Ivanovici (2015). On the sensation of vertigo these interiors were said to instil, see Isar (2011, 66; 2004, 233).

14 For a detailed analysis of the role of ekphrasis in Late Antique culture, see Webb (2009).

15 I do not share the opinion of Kiilerich (2012, 22), who holds that "what happens in the eyes and in the brain of an attentive twentieth-century beholder may not be all that different from what happened in those of the sixth-century one" but stand with Robert Ousterhout (1998, 81) who pointed out that "[a]ny examination of Byzantine architecture must begin with the 'deprogramming' of the modern viewer."

16 Between the time of Pliny and that of Isidore, the biographies of the materials changed little. What changed was the audience that had access to this kind of knowledge. Isidore drew on previous sources, among which was also Pliny's *Natural History*.

17 The perception of textures and hues as luminous drew partly on observation and partly on social conventions, the period providing one of the best case studies for the cultural conditioning of the gaze. As pointed out by Pastoreau (2004, 122), "C'est la société qui 'fait' la couleur, qui lui donne ses definitions et son sens, qui costruit ses codes et ses valeurs, qui organise ses pratiques et determine ses enjeux". See also Eco (1985).

18 On the luminosity of marble in Late Antique ekphraseis, see Schibille (2004, 134–42; 2014); Barry (2007); Pentcheva (2011); Kiilerich (2012).

19 Pliny the Elder categorised white marble according to its brightness as *candidus*, *candidioribus*, *liuidius*, and *radiatio*, the latter being held to emit light (see Maugan-Chemin 2006, 104–10).

20 See also Pliny *The Natural History* 9.38.135 and 9.36.127.

21 Purple, "the quintessential cultural artefact" (Bradley 2009, 50) symbolises the process. Rare, expensive, and traditionally associated with political power, purple was placed at the top of the luminous hierarchy, although other hues were brighter.

22 The Church of Santa Sabina in Rome (ca. 432) still has window transennae with selenite. Although they may be a 9th-century addition, the effect is indicative.

23 "There colors bring life to limbs on display; you'd think the pictures were living, animated by art. You see the figures come and go in the undulating sunlight; The panelled ceiling behaves like the waves of the sea."

24 "Maintenant le beau vaisseau nous charme, ouvert au jour par de larges baies, là dans les ténèbres de la nuit, le jour est enfermé dans la haute salle. Une suite de peintures orne plus lumineusement l'édifice et leur tracé fait croire que les corps vivent par les couleurs."

25 The crediting of the church building with inherent sacredness, a process studied by MacCormack (1990), thus begins with the *enargeia* of the decoration. Webb (1999, 68–9) discusses the animation of the structure through the architecture and decoration.

26 Elsner (1995); Schibille (2004); Elsner and Wolf (2010); Gavril (2012).

27 Schibille (2014, 88–90) briefly discussed the lighting in San Vitale without taking into consideration the luminous dimension of the decoration.

28 Krautheimer (1986, 303) considered Ravenna and Istria the two gates through which Eastern elements penetrated the early medieval architecture of Western Europe.

29 According to Schibille (2004) in Hagia Sophia fourteen types of marble are present, while Terry (1986) and Fiorentini and Orioli (2003) found in the Eufrasiana and San Vitale, respectively, c. thirty types.

30 Apart from Deichmann (1969, 226–49; 1976, 47ff), there is no systematic study of San Vitale. Rizzardi (1968; 1997) makes interesting, but non-systematic relations. For an introduction, see Deliyannis (2010, 223–50); Jäggi (2013, 238–59).

31 *Enkainia kontakion* 3 (Trypanis 1968, 142).
32 Schibille (2014, 65, 90) on Hagia Sophia and San Vitale, respectively.
33 The *Cherubikon hymn*, composed during the reign of Emperor Justin II (565–74), spoke of the "embodying" (εικονίζειν) of the heavenly orders by the clergy and believers taking part in the ritual. Tsakiridou (2013, 71) pointed out that, "[t]o iconize the Cherubim is to assume or embody their form, to give them a tangible presence, rather than to reflect or replicate them."
34 "Either light was born here, or captured here it reigns free; it is the law, from which source the current glory of heaven excels. Or the deprived roofs have produced gleaming day, and the enclosed radiance gleams forth as if from secluded Olympus. See, the marble flourishes with bright rays, and all the stones struck in starry purple shine in value, the gifts of the founder Peter."
35 At the end of her study on the use of light in Hagia Sophia, Schibille (2004, 239) concluded that churches such as Justinian's masterpiece stood "at the very edge between the phenomenal world and the realm of the intelligible".

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7 The use of colour in Romanesque manuscript illumination

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The objective of this paper is to discuss how colour is used in manuscript illumination produced in the Romanesque period.[1] *The focus of the discussion is on the full-page miniatures in the St. Albans Psalter. In way of orientation, I look at three main strands in colour studies of relevance to this subject. These are: formal analysis, technical analysis with consideration given to documentary sources, and contextual analysis with a discussion of the linguistic codification of colours and colour instructions. In the second part, these methodological approaches are applied to the analysis of the use of colour in the St. Albans Psalter. From the standpoint of style analysis, the focus is on the links with Ottonian illumination, specifically the Liuthar group of manuscripts. This association is explained by the presence of German manuscripts in England. In terms of technical analysis, the recent identification of leaf gold in contrast to powdered gold is discussed. The practice of representing a figure in a gold garment found in the psalter is linked back to earlier insular practice. In terms of contextual analysis, two aspects are discussed: first, the way that certain garments appear to be in imitation of Byzantine silks; and second there is a discussion of colour symbolism with specific reference given to the convention of representing Mary Magdalen in a bright red mantle, which was to become ubiquitous by the late Middle Ages. Consideration is given to the more general impression created by colour, with the emphasis on purple, which suggests a political affiliation with the Holy Roman Empire. The overall impression created by the use of colour is one difficult to reconcile with the traditional view that the psalter was made for Christina of Markyate.*

The objective of this paper is to discuss how colour is used in manuscript illumination produced in the Romanesque period. The focus of the discussion is on the full-page miniatures in the St. Albans Psalter. The psalter, which is seen as the seminal work in the development of English Romanesque manuscript illumination, has recently been the subject of an exhibition at the J. Paul Getty Museum (Collins et al. 2013). One development which has opened up opportunities for the further exploration of issues to do with the study of colour in medieval manuscript illumination is the digitisation of manuscript collections, with high quality coloured illustrations of manuscripts made available on the Internet, as in the case of the St. Albans Psalter (see Geddes 2003).

In way of orientation, I intend first to look at three main strands in colour studies. The first of these is essentially to do with formal and stylistic analysis. It has been referred to by that great scholar of colour, John Gage (1999, 36), as the post-Wölfflinian school of colour studies, though for medieval pictorial art the new Vienna school (Wood 2000), influenced by the writings of Alois Riegl and Fritz Wickhoff, was

also important. Objectives of this approach were first to describe the phenomenon of colour in painting in an accurate and adequately descriptive manner; secondly to establish the underlying principles behind the use of colour – the design principle; and thirdly to trace stylistic developments and sources in relation to the use of colour. An important exponent of this approach was the art historian Otto Pächt, and an exemplary application of its use can be found in his analysis of colour in the miniatures in the St. Albans Psalter (Pächt 1960). This approach has become unfashionable, and its main drawback is the tendency to apply anachronistic assumptions, but through the eyes of as sophisticated a practitioner as Pächt it still retains value.

The second strand is to do with the technical analysis of pigments. There are two main aspects to this: the first is the study of the surprisingly large body of written sources relating to the technique of manuscript illumination which survive from this period, and, the second, the identification of pigments and materials. Mark Clarke (2001) has been able to identify 500 manuscripts containing technical material written before 1500, and this list is growing. It may come as a surprise that attempts to transcribe these medieval texts and recreate the recipes described in them go back to the 18th century.[2] Clarke has gone some way in disentangling the complicated web of technical sources, with manuscripts frequently incorporating elements from earlier closely affiliated texts. The two texts which are most relevant to elucidating the painting practise in the St. Albans Psalter are Theophilus's *De Diversis Artibus* (Dodwell 1961), which was probably written in north Germany in the early 12th century but draws upon earlier sources (Roosen-Runge 1952/3; Kaufmann 1995),[3] and a text to which the name *De Coloribus et Mixtionibus* has been given, which probably originated in England in the late 11th century (Petzold 1995). The standard edition of *De Diversis Artibus* is that by Dodwell (1961). The drawback of the textual model he used for the reconstruction of the text, namely the creation of a standard text by means of the collation of its earliest manuscripts, is that it does not take into account the variants between manuscripts, additions to them, and the use of specialised terminology, which have their origin not in mistakes created in the process of transcription but in workshop practice, and are deserving in themselves of attention (see Kaufmann 1995, especially page 311 and Clarke 2011, 29, who describes Dodwell's edition as 'pseudo-Lachmannian reconstruction'). Other archival resources relating to pigments and artists' materials are inventories, accounts, and information relating to trade routes (on this see Kirby et al. 2010). Most of this archival material only becomes available from the 13th century, though the economic and social conditions which underpin it, with the development of towns and trading centres, especially in northern Italy, were in place by the 11th century, and much of the information deduced from it is relevant to the Romanesque period.

In terms of the technical analysis of pigments in illuminated manuscripts, the pioneering figure was the German art historian Heinz Roosen-Runge, drawing upon the earlier work of A.P. Laurie and D.V. Thompson. His most important study (Roosen-Runge 1967) is that of a group of early medieval English manuscripts, which includes the St. Albans Psalter. His methodology was essentially to prepare pigments, according to the recipes described for them in the medieval sources, and then to compare these prepared samples to the pigments found in the manuscript and, on the basis of this comparison, to make an identification. Therefore, he, only relied on visual examination (under a microscope), and not chemical analysis of the pigments. This comparative method of identifying pigments would not nowadays be regarded as

reliable – this is particularly the case with organic pigments. Pigments may have the same visual appearance, but be chemically different. Nor does the method take into account how the pigment has been applied, or the choice and use of the binding medium, a feature to which considerable importance was attached in the Romanesque period, as reflected in contemporary technical sources such as the late 11th-century text *De Clarea* (Straub 1964) and a note added to a mid-12th-century manuscript from Salzburg which contains German technical terms in the vernacular (Salzburg, Stiftsbibliothek, Cod.A.XI.4, fol. 24 and for text see Swarzenski 1969, 61). Nevertheless, Roosen-Runge's study still retains some value. The most recent analysis of pigmentation in the psalter by Nancy Turner (Kidd and Turner 2013, 73–77) at the J. Paul Getty Museum (which has only been partially published) has confirmed his findings, for the most part, though there are differences, and the techniques employed and the use of mixtures appear to be more complex than he suggested. Modern technical analysis tends not to start with the medieval technical sources, though as such studies have shown, should take a position in relation to them.

The third and most recent strand is contextual and takes an interdisciplinary approach. It aims to look at colour in a more historical and culturally relativistic manner from a medieval perspective, taking into account assumptions, writings, and social practices of the time. Two major exponents of this approach are John Gage and Michel Pastoureau. Gage (1999, 67) has placed particular emphasis on the linguistic codification of colour – the words that are used to identify and describe colours. Colour terms are not fixed but develop over time – the colour term orange, for example, only emerged in the 15th century in Old French. The translation and interpretation of medieval colour terms into modern English can be very difficult, with the emphasis frequently not on the hue of a colour but on another aspect such as its facture or sheen, and colour terms often have more than one meaning. The term "purpura", for example, can refer both to the colour purple and to the fabric shot silk (Dodwell 1982, 145–50; Clarke 2011, 199) – so, did Romanesque artists and their audience when referring to colours think in terms of abstract colours, pigments, or colour terms with concrete referents in the outside world? In attempting to answer this question, the identification of colour instructions (intended to indicate the colour to be used) in a group of English Romanesque manuscripts may be relevant (Petzold 1990). Examples of this practise can be seen in two 12th-century manuscripts from St. Albans closely related to the St. Albans Psalter: a gospel book now in Hereford Cathedral (Ms. O.1.VIII) which contains illumination by a close associate of the Alexis Master, where the annotations "a", "r", and "v" can be seen (See Figure 7.1 in colour plates); and a mid-12th-century manuscript of an encyclopaedic text entitled *De Universo*, compiled by Rabanus Maurus in the 9th century (London, BL, Ms. Royal 12 G XIV), which has chapters in it dealing with colour symbolism, where the letters "a", "r", and "v" refer respectively to blue, red, and green initials. These instructions may refer to either Latin or French colour terms or in certain circumstances Old English. For the most part they appear to refer to general colour words such as "azur" or "azorium", "rouge" or "rubeus" or possibly "read", or "vert" or "viridis", rather than specific pigments (Petzold 1990, 20; Gage 1999, 94).

Pastoureau's (his publications on colour are numerous but in English see Pastoureau 2001) approach is not primarily art historical, but is informed by ideas taken from anthropology and material culture, and he anchors the use of colour in its broadest social context. In his view, the interpretation of colour is conditioned by a complex array of social, ideological, and culturally specific factors. One of the distinguishing

features of his approach is the primacy he assigns to textiles and the dyeing industry, one of the most important industries in the Middle Ages. He demonstrates, for example, that a new technique developed in the 12th century for dyeing fabrics a deeply saturated blue, by means of the repeated dunking of them in vat of woad, resulted in a deeper, more saturated blue colour. Saturated colours appear to have been particularly prized at this time. One development he isolates from the 12th century is the valorisation of the colour blue, which can be seen in art in stained glass and enamels, in the emergent code of heraldry, and its adoption in France for coronation garments and regal dress. This development is reflected in Romanesque manuscript illumination with the emergence of a deep saturated blue as a distinctive colour in the illuminator's palette, to which the name appropriately "royal blue" has been given, leading to the switch from purple to saturated blue as the prestige colour in this period. An early example of its use can be seen in the Bury Bible dated c. 1135 (Cambridge, Corpus Christi College, Ms.2; Thomson 2001) or in the female donor portrait in the late 12th century Fécamp Psalter made in Normandy (The Hague, Koninklijke Bibliotheek, Ms. 76 F 13, fol. 28v.).

Another important contribution to the study of colour in this period has been made by two German medievalists, Christel Meier and Rudolp Suntrup, who have compiled a dictionary of medieval colour symbolism based on the systematic study of exegetical, encyclopaedic, and other sources (Meier and Suntrup 1987; 2011; 2016). They demonstrate that no written source functions as a crib, which would enable us to decode colour symbolism in medieval art of this period, but that a cluster of associations, frequently both positive and negative, may be attached to specific colours. They assume that the colour codes found in literary sources are reflected in visual ones. In this, however, they may have overstated their case, as other extrinsically artistic factors may have played a role, such as the pictorial models available (this appears to be particularly the case with Byzantine sources with earlier pictorial sources having an authority attached to them), local factors, aesthetic considerations, and the availability and affordability of materials. Silver, for example, which was mined in Germany, is extensively used in 12th-century German manuscripts (see Kaufmann 1995, 306 and n. 19), but is rarely found in English illumination of the period.

Case study: The use of colour in the St. Albans Psalter

In the second part, I focus on the use of colour in the miniatures in the St. Albans Psalter, looking at it from the standpoint of the three methodological strands that I have just discussed. From the standpoint of stylistic analysis, Pächt (1960) related the colour scheme to that found in earlier Ottonian illumination in terms of colour choice and preference, treatment of colour, and the principles underlying the use of colour. He observed that the method of painting and colour scheme represented a distinct break with earlier insular practice as exemplified, for example, by the evangelist portraits in a gospel book made at Exeter in the late 11th century (Paris, Bibliothéque Nationale, Ms. Lat.14782; Alexander 1992, 81 and for coloured plate fig. 127). One can go further and identify the colour connection with a specific group of Ottonian manuscripts, namely the so-called Liuthar group, named after the monk Liuthar depicted in the late 10th-century Aachen Gospels. The Liuthar group is generally thought to have been produced at the famous monastery of Reichenau in southern Germany and is exemplified by the early 11th-century Pericopes Book of Henry II (Munich, Bayerische

Staatsbibliothek, Ms. Clm. 4452; Fillitz et al. 1994). This affiliation with Ottonian illumination can be seen in the palette used, especially pastel colours for garments such as light blue for tunics and sandy yellow for mantles, various nuances of purple, and certain changeant (where there is a change of hue between the base colour and the shadow colour or highlight) colour combinations, such as that consisting of sandy yellow combined with green shadows (e.g. p. 52 on St. Peter's middle-garment and See Figure 7.2 in colour plates). Specific colour coding such as that of representing Christ in at least one purple garment (e.g. p. 18), usually the middle one, or St. Peter in a sandy yellow or pale green mantle have their closest analogues in the Liuthar school of Ottonian illumination.[4] Recent research has also identified a similar range of pigments and mixtures (Fuchs and Oltrogge 2010, 73) in another manuscript belonging to the Liuthar group in Wolfenbüttel.[5] The idea of the coloured background must, however, have come from a later Ottonian source such as the nativity scene in an early 12th-century manuscript (London, British Library, Ms. Egerton 809, fol. 1v.) belonging to the Bavarian school.[6]

Pächt did not consider the mechanism which might explain this colour affiliation. The most likely possibility is that the Alexis Master, the name given to the artist of the full-page miniatures (most likely a professional, itinerant artist working closely with an assistant), had seen German manuscripts, including one belonging to the Liuthar group, and emulated their colour scheme. Manuscripts were a frequent form of gift exchange, and it has been suggested that German manuscripts may have circulated in England as gifts in the wake of Matilda's (the daughter of Henry I's) marriage to the German emperor Henry V in 1114, or, on her return to England from Germany, after his death in 1124 (Dodwell 1993, 336).

In terms of the second strand, technical analysis offers opportunities to address art historical questions. The results of Nancy Turner's (Kidd and Turner 2013) recent technical analysis in many cases confirms Roosen-Runge's analysis, but in certain instances differs from it. She confirms, for example, that ultramarine derived from lapis lazuli was used (though in this case a relatively low quality one), having come to be recognised as extensively available by the 11th and 12th centuries in northern Europe. Its use has been identified, for example, in Ottonian manuscript illumination belonging to the Liuthar group (Fuchs and Oltrogge 2010, 74, where it is frequently used mixed with white as is the case of the tunics in the St. Albans Psalter), and in English 11th- and 12th-century wall paintings (Howard 2003, 27). However, in certain cases her results differ or are more complex. An important example of this is her identification of the gold used as leaf gold, as opposed to powdered or shell gold, as this is one of the earliest secure identifications of leaf gold in manuscript illumination and seems to suggest a change in practice in the early 12th century, one that is reflected in Theophilus's *De Diversis Artibus* (Dodwell 1961). This view is reinforced by the recent technical analysis undertaken by Robert Fuchs and Doris Oltrogge (2009 and 2010) of several important earlier Ottonian manuscripts where powdered gold was consistently identified. Oltrogge (2007) also sees gold leaf as only being commonly used in Romanesque manuscript illumination by the mid-12th century.

One feature in the miniatures, which harks back not to Ottonian illumination but to late Anglo-Saxon manuscripts, is the way that Christ is represented in the Entry into Jerusalem (p. 37, See Figure 7.3 in colour plates) in a mantle entirely of gold. For example, it is used for the mantles of the evangelists in a mid-11th-century gospel book,

which some scholars think was made at the monastery of Christ Church, Canterbury, or in the contemporary Mostyn Gospels probably also made at Canterbury, in this case providing an interesting technical connection with painting practise at the most important artistic centre in England in the early decades of the 12th century.[7] A formula for representing a gold garment is specified in *De Coloribus et Mixtionibus* (Petzold 1995). Gold backgrounds, produced from gold leaf, are to become a distinctive feature of late Romanesque manuscript illumination, with the gold frequently raised up by means of the use of a mordant that includes white lead (Petzold 1995, 62), rather than merely having an underlayer of red bole. This practice can be seen, for example, in the late 12th century Ingeborg Psalter (Chantilly, Musée Condé, Ms. 9 Olim 1695) and was probably in direct emulation of the Byzantine mosaics produced in Sicily earlier in the century.

In terms of the third strand, the historical approach to colour studies, there are two aspects I wish to discuss: first, the imitation of fabrics, and secondly, the use of colour symbolism.

In the miniatures, there are certain garments which may be intended to imitate luxurious fabrics, specifically Byzantine patterned silks (e.g. pp. 23 (See Figure 7.4 in colour plates), 36, 43, and 53), and possibly shot silks. Byzantine patterned silks were imported into northern Europe, especially in the 11th and 12th centuries, and highly valued (Muthesius 1997a), being the prerogative of rulers and the wealthy. Christina of Markyate, who may have been the first owner of the psalter, is said to have worn such silks in her early life before becoming a recluse.[8]

These are used in particular in representations to do with Kingship – for example, for King Herod in the scene representing the three kings before Herod (p. 23, Figure 7.4) and for Christ in the Mocking of Christ (p. 43). Here, the use of red, specifically scarlet ("coccinus"), is not only specified in the gospel text (Matthew 27, 28), but also reinforces the idea of mock-kingship, as the coronation garments of kings were frequently red (Munro 1983). Another scene, in which a garment of this type occurs, is in the legend of St. Martin, where it is draped over the body of the sleeping saint (p. 53, St. Albans Psalter) – this would be entirely appropriate as one of the main functions of these silks in the West was to wrap the relics of saints (Muthesius 1997a). Entire pages painted in simulation of Byzantine silks are a feature of 11th-century German manuscripts produced at the famous monastery of Echternach,[9] but representing figures in these silks appears only to have become widespread in art in northern Europe in the 12th century, one aspect of the movement away from illusionism to a greater realism in the representation of detail – a feature of Romanesque art.

Other garments which may possibly imitate actual fabrics are those where there is a change of hue between the medium tone and the shadow convention. An example of this is the colour combination consisting of a sandy yellow base colour combined with green shadows (e.g. p. 52, St. Albans Psalter middle-garment of St. Peter, Figure 7.2). A similar colour combination to this is recommended in *De Diversis Artibus* (Dodwell 1961, 10). It may be that there is a perceptual rationale behind this usage rooted in earlier classical illusionistic colour practice (Petzold 1986, 155–56), but they may also be intended to simulate the appearance of shot silks. Although these are recorded in documentary sources none survive from the early medieval period.[10]

Finally, I want to consider whether colour may play a specific iconographic function, and to do so in connection with the convention of representing Mary Magdalen in a bright red mantle (the pigment here is probably identifiable as vermilion). This

may be seen in the scene representing Mary Magdalen announcing Christ's resurrection (p. 51, St. Albans Psalter and See Figure 7.5 in colour plates). In later art, this convention is to become very common. It may, for example, be seen in the series of wall paintings to do with the life of Mary Magdalen at Assisi by Giotto and his workshop.

Its use in the St. Albans Psalter may be one of the earliest in the history of art, though precedents may be found in 11th-century manuscripts from Echternach,[11] and later conspicuous examples can be seen in the late 12th century Ingeborg Psalter (Chantilly, Musée Condé, Ms. 9 Olim 1695, fol. 29r. and 30 v., where she is dressed in a bright red undergarment and a light grey mantle). In the 11th century the cult of Mary Magdalen developed to an unprecedented degree (Jansen 1999), as is reflected in an important sermon attributed to Odo of Cluny. No text elucidates this practice, but in Meier and Suntrup's (2011) list there is one association attached to the colour red which would fit in with the characterisation of Mary Magdalen at this period, namely "caritas" – divine love. Her unlimited capacity for love is emphasised in the 11th-century sermon attributed to Odo of Cluny.[12] Various texts by such scholars as Rabanus Maurus, Bruno of Segni, and Honorius of Autun associated red with "caritas" (Meier and Suntrup 2011, 674–79). In representations of the three theological virtues, the allegorical figure, Caritas, is usually represented bright red as in Ambrogio Lorenzetti's Massa Marittima Maesta,[13] while green is reserved for hope, and white for faith. The same colour triad can be seen in Piero della Francesco's representation of Mary Magdalen in the cathedral at Arezzo.[14] The persistence of colour conventions such as this to which artists drew over long periods is surprising. Garments dyed bright red at this period (either by madder or, more expensively, kermes) were highly prized and were the prerogative of royalty and the wealthy (Munro 1983) – this would have reinforced the characterisation of Mary in the exegetical literature at this period as of aristocratic parentage (Jansen 1999). It has been pointed out that the right-hand gesture of Mary Magdalen in the miniature representing her announcing the resurrection (p. 51, Figure 7.5) is one of preaching, and that she is represented in the active rather than contemplative life (Jansen 1999, 265). Charitable acts as expressions of divine love were seen as part of the active life that could also bear witness to Christian faith, as much as contemplative prayer reinforcing the link between "caritas" and the colour red.

Colour may also be used to create an overall impression. In the miniatures, the general impression created is one of sumptuousness and prestige, an effect achieved especially by the extensive use of purple. This use of purple may have had imperial associations redolent of the Holy Roman Empire, as purple is a conspicuous feature of Ottonian manuscripts and imperial ideology. The German Emperor Otto III, for example, is recorded as having worn purple silks in direct emulation of the Byzantine emperor.[15] By the 12th century, this use of purple as the prestige colour had become conservative. The significance of the purple and the more general colour affiliation with Ottonian illumination, combined with other features derived from Ottonian illumination, may suggest a political affiliation or sympathy with the Holy Roman Empire. This would not be surprising in the 1120s given Empress Mathilda's association with St. Albans (Dodwell 1993, 336). Combined with other features such as garments in imitation of Byzantine silks, the unusual imagery for this time of the maidservants (e.g. p. 11 and 28), and the extensive use of the characteristic German gabled imperial crown with knobs at the angles,[16] a courtly ambience is suggested. This is difficult to reconcile with the traditional view that the intended recipient for the cycle of painted miniatures was a recluse living a Spartan life in a hermitage near St. Albans, namely Christina of Markyate, and

commissioned for her by her close friend, Geoffrey, abbot of St. Albans – a view which has recently been challenged by several scholars.[17]

Conclusion

The field of colour studies in Romanesque manuscript illumination has been transformed since the publication of Pächt's account in 1960 by the greater availability of high quality reproductions, the increasing availability of technical analyses with reliable identifications of materials and techniques, and by the more systematic study and interpretation of primary sources from the period. The study of colour in the art of the period needs to engage with issues to do with methodology and take into account different approaches. Illustrations in manuscripts at this period, such as those in the St. Albans Psalter discussed here, appear to have functioned as complex, multi-layered texts, which assisted in personal devotion, and it is unlikely that colour was not brought into play in their reading. Colour, an all pervasive feature, can at the same time be a difficult one to analyze, as is reflected in the speculative nature of much of what has been said here, but I hope that I have demonstrated that the study of colour is deserving of attention and have provided potential lines of enquiry to do so.

Notes

1 This article is substantially based on my PhD (Petzold 1986) but takes into account more recent approaches.
2 See, for example, the work of Gotthold Lessing.
3 This is especially the case for Book 1, which is concerned with painting.
4 Compare this with, for example, the illustration of Christ handing the keys to St. Peter in the Pericopes Book of Henry II (fol. 152v.), and for coloured illustration see Bavarian State Collections, Digital Collections (http://daten.digitale-sammlungen.de/~db/0008/bsb00087481/images/index.html?id=00087481&groesser=&fip=eayayztssdasyztswwyztseayaewqen&no=14&seite=308).
5 Wolfenbüttel, Herzog August Bibliothek, Guelf. 84.5 Aug 2°. As with the St. Albans Psalter, Fuchs and Oltrogge demonstrate that a small number of pigments are used and that mixtures are used to increase the range of colours. Pigments shared in common with the psalter include: ultramarine, yellow and brown ochre, red and white lead, copper green, and organic purple pigments, which are similarly difficult to securely identify even using modern techniques.
6 For description and coloured illustration see *British Library, Digital Catalogue of Illuminated Manuscripts*.
7 Cambridge, Pembroke College, Ms. 302, fol. 9r., fol. 38r., fol. 60v. and fol. 88v. On this see Morgan and Panyotova 2013, vol. 1, no. 51, p. 151, with a discussion of its place of origin and coloured illustrations. For the Mostyn Gospels (New York, Pierpont Morgan Library, Ms M. 777, e.g. fol. 24v.), and for coloured illustration see http://corsair.themorgan.org/cgi-bin/Pwebrecon.cgi?v1=2&ti=1,2&Search_Arg=%22ms%20m%2E777%22%20ica&Search_Code=GKEY%5E&CNT=50&PID=Cqelv0_6JwXo1vhGlGCvg881c&SEQ=20160821181626&SID=1.
8 See Talbot 1959, 93, 'she who been accustomed to wearing silk dresses and luxurious furs'.
9 For an example see the carpet pages in a mid-11th century manuscript from Echternach in the British Library (Ms.Harley 2821, fol. lr. or fol. 198v.) For coloured illustrations see: *British Library, Digital Catalogue of Illuminated manuscripts*.
10 On changeant colour combinations relating to shot silk see Clarke and Vandivere 2011.
11 See, for example, the Pericopes Book of Henry III (Bremen, Universitätsbibliothek, Ms. 21, fol. 62v. (the Noli me Tangere scene where Mary Magdalen is represented in a bright red mantle).

12 For text see *Patrologia Latina*, vol. 133, col. 713.
13 For coloured plate, see Norman 1995, Vol. 1, 37.
14 See Lavin 2002, 190.
15 See Muthesius 1997, 314: 'Otto III customarily appeared on Easter Monday at St. Appolinarius in Classe, in purple silk embroidered with gold'.
16 This is an un-French type. On German crowns and how they are represented in German 11th-century art see Schapiro 1964, 23 and n. 70.
17 The opposing viewpoints are given in Bepler and Heitzmann 2013. See especially Thomson 2013, who persuasively argues that it was made for Abbot Geoffrey and neither owned by or intended for the use of Christina of Markyate. He concludes: 'It is simply not credible that it was created for a hermit or for the abbess of a small community'. He notes, however, that 'the book was originally sewn in a single operation' (2013, 59), which might go against the idea that it was assembled over a period of time.

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8 Light and colour in Portuguese Romanesque churches: The shaping of space

Jorge Rodrigues[1]

Colour and light – inner or outer, natural or artificial – change the way we perceive Romanesque architecture and sculpture, whether because they enhance the dramatic effect desired by the patrons of the Church and the artists, or that they mark different paths and significances inside the buildings, with clear hierarchies and distinct functions existing for the different parts of the church. Such differences are more obviously apparent in the large, rich and erudite constructions of the French Romanesque than it is in the poor and rural churches of the peripheral Kingdom of Portugal in the 12th century.

Colour was often present on the outside sculpture, as in Conques or Moissac, or spreading through the inside, as in Chauvigny or Paray-le-Monial. Unfortunately, the little traces that are documented and/or still apparent in Portugal are not enough to reach any conclusions without further research. In terms of lighting solutions, similar to those found in Conques or Vézelay, they are also present at a smaller scale in some of the more developed architectural and sculptural programmes in Portugal: the definition of inner light and paths in São Pedro de/St. Peter of Rates, and the outer lighting over the western façade of the church of the Salvador de/Saviour of Bravães.

Light and colour in Romanesque architecture and sculpture

The study of Romanesque architecture throughout Europe, including the many 11th- and 12th-century churches which are still standing in Portugal (mainly from former monasteries but also cathedrals and parish churches), has certainly warranted scholarly attention in the last century, though mainly with concern for the models behind the buildings and their origins, usually French or Spanish. This has often overshadowed other important questions that scholars have been trying to clarify in recent years – namely the use of colour which is still apparent on many of these churches, but also the crucial question of lighting both inside and outside the buildings, which is of paramount importance to understanding not only some of the main architectural options of their programmes (for example the placement, size and orientation of the windows and other sources of natural lighting), but also the distribution of symbolic narratives. Such narratives are mainly present in the sculpture on the tympanum, portals and capitals, placed and sometimes lighted according to the way the route or path inside the temple was conducted and controlled, and showing some angles and hiding others, so that the 'lessons' (catechesis) depicted were fully understood (with figurative painting and mosaic virtually absent in Portugal in this period).

The presence of colour in Romanesque architecture and sculpture has been documented particularly in France, where a number of churches still preserve a certain

degree of their original pigments, predominantly on the tympanums and capitals, as seen on the monumental tympanums of the west façades of St. Foy de Conques (Midi-Pyrénées) and Anzy-le-Duc (Burgundy), to mention just two.[2] In these cases, the colouring of the sculpture at the main entrance of the church – symbolically the Gate of Heaven – was part of a strategy designed to first reach the believers on a sensorial level, often pilgrims who sought the church for enlightenment and comfort. Impressed by the massive figures of Christ, the Apostles, the Saints or the visions of Heaven and Hell – all painted in vivid colours – the illiterate crowds were directly exposed to a message to which they would otherwise have been denied, with the images used both figuratively and textually, and as a complement to the oral messages conveyed by the priests or monks. Indeed, it is not hard to imagine the *figurative* effect of a sculpture showing Christ Pantocrator, three metres tall, painted in bright pigments and staring at people who were conditioned to a fear of God with little or no access to depictions of the Sacred (or 'special effects' in today's terms); the sensorial appeal would be the first one to be summoned, an immediate reaction to the images. However, their subsequent identification would follow, in some cases from the writing surrounding them, or by the simple acknowledgment of the iconography of Christ, the Holy Saints or any other common religious theme, reinforcing the *textual* quality of many of these depictions (Lyotard 1985, 163–89).

Returning to the central question of the use of colour – and leaving aside the fresco and/or mural painting to concentrate on the painted architecture and/or *architectonic* sculpture – it must be stressed that the use of painting in Romanesque churches was not limited to the figurative sculpture of portals or capitals; as Raoul Glaber stated, by the end of the first half of the 11th century Christendom was covered by a 'white mantle of churches' – not stone-coloured, *white*:

> As the third year after the year One Thousand approached, we saw almost all over the earth, but mainly in Italy and Gaul, the refurbishment of the basilicas of the churches [. . .] It was as if the world itself was shaken and, despoiling its old age, covered in all parts by a white mantle of churches.
>
> (Duby 1967, 197)

Not only were the temples made of plastered masonry covered in paint, but also those made of regular stonework, as seen in the examples of Chauvigny (Poitou-Charentes) and Paray-le-Monial (Burgundy), both remarkably restored. In Paray-le-Monial the restoration followed a thorough archaeological analysis of both pavement and inside walls that took place between 1998 and 2005 (Rollier 2006). Here the church was *conceptually* perfect, in the way the project and proportions were laid out, although remaining *materially* imperfect, as was often the case, since the actual construction work never perfectly matched the idea behind it. The end result, in both cases, were interiors entirely plastered and covered in paint, so that the blocks of stone and building in general could regain its original conceptual perfection.[3]

Colour in Portuguese Romanesque

Compared to the fine examples of the French Romanesque, the Portuguese Romanesque is a poor and distant relative, in architectural and sculptural quality as much as in scale, formed mainly by small rural monastic or parish churches, frequently with

a single nave and having only the choir vaulted. The reasons for this relative poverty and downsizing are not singular, but may be closely related to the goals pursued by the first Portuguese kings: the delivery of the formerly Christian territory from occupation by the Moorish 'infidels', with concentration of most of their efforts and existing resources on that task. After the victory at the Battle of Ourique around 1139, which marked the acclaim of Portugal's first king Afonso Henriques (Mattoso 1992–1994, II, 62), and following the successes in the fight for the reconquest of the Iberian Peninsula, Afonso moved the capital first to Coimbra,[4] and later Lisbon, following its conquest in 1147 (Torres 1971, II, 756). Here, a new – and definitive – capital was established, leaving behind the northern territories where the majority of the Romanesque monasteries and churches lay, tokens of the 'old' nobility and the 'concelhos' (small territorial councils where power was shared by the most prominent), and progressing south with the vanguard of Christian troops, where new cathedrals were built in Braga, Porto, Coimbra and Lisbon. Though the Portuguese Romanesque never achieved the scale or grandeur of its Spanish or French counterparts, there is still residual traces of pigment on the exterior and interior of several of the churches, as in the cases of the church of the former Cistercian monastery of Ermelo, near Arcos de Valdevez; the Parish church of Senancelhe, near Viseu; and the only relevant remains of figurative painting from the Romanesque period in Portugal preserved on the former Templar church of Nossa Senhora da Fresta (Our Lady of the Slit) in Trancoso.[5]

The main problem concerning these remains, frequently mentioned but never studied in depth, is the absence of proper scientific analysis of the pigments or their traces, rendering it virtually impossible to state whether it is a genuine Romanesque colouring, if it has been retouched or repainted or even if the painting occurred at a much later period. Only thorough research may tell if the remains identified, both thus far and in the course of future work, match what they appear to be. As the question of colour will require further research, this chapter will now concentrate on the question of light, both inside and outside the temples.

The theory and sources of light in Romanesque

Most Romanesque churches in France, Spain, Germany and England still preserve their original lantern towers, placed over the crossing between the nave and the transept, in order to light the 'heart' of the temple, as well as the place where the High Altar stood and the *Theophany* took place.[6] It is an intentionally directed light that mainly bathes the nave, leaving the collateral aisles in the shadow. Examples from churches, large and small, can be sought in St. Sernin of Toulouse, on the Cluniac Burgundian churches of St. Martin of Chapaize and of St. Hilaire of Sémur-en-Brionnais (the 'home' of the Cluniac Abbot Hugh of Sémur), and again at the pilgrimage Abbey of St. Foy de Conques, with all following the models put into practice in Cluny (Vingtain 1998, 53).[7] In some cases though, this interior lighting, both on the main nave and side aisles, is provided mainly by a combination of the clerestory and lateral windows or slits, with the frontal slits or windowpanes (as is the case on the heavily restored and modified church of the Madeleine of Vézelay, in Burgundy), which in late Romanesque constructions are usually replaced by a frontal rosette, 'announcing' the eminent arrival of the Gothic.

Either way, one purpose becomes very clear: the will to clearly mark, confine and constrain, through the discerning use of light, the paths to be followed within the

church, according to the needs and objectives of the believers. The central path that went from the Gate of Heaven to the High Altar was the *path of salvation*, beginning with the lesson shown around the western portal. This continued in a straight line to the area of contemplation at the chancel, the head (*capitis*) of the church and its most sacred space, which was physically inaccessible to the faithful, as they could only perceive the work of God but never His essence (Duby 1978, 45–53, 141–51; Iogna-Prat 1998, 28).[8] On this path there were no distractions, as usually provided by the historiated capitals,[9] relegated to the side aisles where they could be contemplated both by the pilgrims and believers seeking a *path of knowledge* (and often doubling as support and illustration for the sermons of the priests or monks who were delivering the service).

The liturgical importance of the spoken word in the act of the Mess fully integrates and gives meaning to the visual messages relayed by the figured sculpture, and is vital in the transmission of exemplary religious messages. Although not often regarded as having the same significance, we cannot discard the relevance of the sensorial appeal – almost primal – of the massive, coloured and omnipresent images and liturgical implements. This is especially so when viewed in a ritual context, with flickering lights from candles and torches 'dancing' over the figures and scenes, gems and gilded goblets and crosses, and even falling on the sumptuous canonicals of the celebrants, sometimes turned into the likes of 'moving gems' – an appeal that was directed mainly at the masses of poorly educated attendants of the Church, impressed by the almost 'magical' performance of the ritual associated with the fantastic guise and sheen of sculpture, painting or goldsmithing.

The internal routes or paths mentioned above are yet to be fully identified in other Romanesque churches around Europe.[10] However, an apparent similar contrast might be seen in the absence (or rarity) of figurative capitals on the central naves of churches such as Conques, Vézelay or the Portuguese monastic church of St. Peter of Rates,[11] versus the abundance of these capitals on the lateral aisles (99 in the case of the long church of Vézelay),[12] suggesting an intentional separation and ranking of functions of the two spaces.

Light in the interior of a Portuguese Romanesque church: The case of Rates

Built in the region of the 'póvoas', the inshore area north of Oporto and south of the main political and religious centres of the Kingdom of Portugal in the first half of the 12th century – Guimarães and Braga – the church of St. Peter of Rates lies on the site of a former three-aisled pre-Romanesque church, which showed some similitudes with the later art of the Early Middle Age in Asturias (Gomes and Carneiro 2003, 237–38, 240–42). This church would be succeeded by an 11th-century structure, possibly dating from the reign of Fernando I of Léon (1037–1065; Real 1982, 7–12). The current Romanesque church of the late 11th and early 12th century was built as a combined effort from Count Henrique [Henry] of Portucale (1066–1112)[13] and the Cluniac monks of La Charité-sur-Loire, the latter who came from Burgundy to dwell in the renewed monastery and whose presence is directly linked to their influence in the Iberian Peninsula, first under Alphonse VI and later Alphonse VII of Castile and León, two of the main benefactors of the order (Riche 2000, 40, 89; Iogna-Prat 1998, 69, 247).[14]

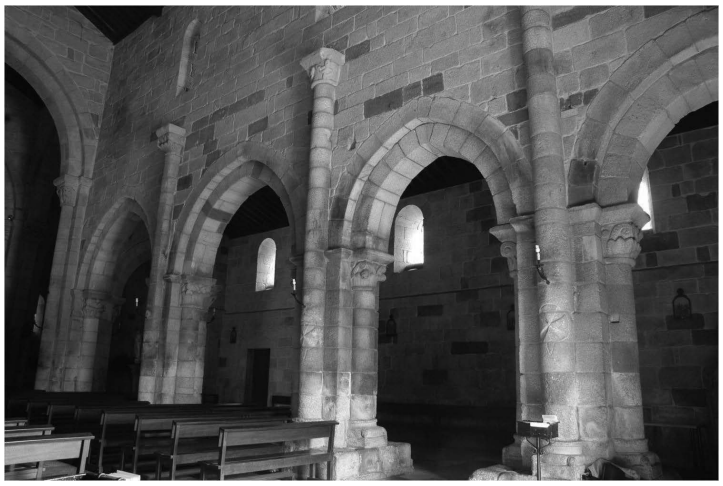

Figure 8.2 Church of St. Peter of Rates, engaged half-columns and capitals on the side walls of the nave.

The church at Rates, which was successively reconstructed at three different periods between approximately 1096 and 1250, is of three aisles, the central of which is taller than the side ones, with a clear lack of historiated capitals in the central nave, as one approaches the chancel. The Romanesque clustered piers, made up of several engaged columns and half-columns dividing the aisles, help to create a visual curtain that also focuses on the 'path to salvation' (moving along the nave towards the chancel), reinforcing the aforementioned hierarchization within the church (See Figure 8.1 in colour plates). Furthermore, the lighting on the side aisles is confined to the lateral capitals, leaving a certain cloak of mystery, which invites the pilgrims and all the faithful to a journey of discovery by walking along these paths of knowledge.

Today, St. Peter of Rates clearly shows the unfinished programme of a building that was originally meant to be vaulted, through the engaged half-columns and capitals alongside the central nave walls, though it was finally covered with a more modest wooden roof. This was often the case with the Portuguese Romanesque churches, where architectural downsizing was quite common, given the historical and economical circumstances of the County of Portucale and of the Kingdom of Portugal that would follow it,[15] by the time of the foundation of the church and throughout the 12th century.

The sources of natural light that bathe the interior of the building appear to have been arranged in order to shed a more direct light on the side aisles – served by low-placed slits – rather than on the central one, where the slits are higher and more narrow (Figure 8.2). Here, the intention of avoiding any distractions on what was the main path inside the church – towards salvation – whilst allowing a closer look at the sculpted images on the capitals of the side aisles, placed at a much lower level and depicting exemplary themes such as 'Daniel with the lions', is obvious.

Light in the exterior: The example of Bravães

On the outside, the lighting was also important. In the rare cases of the Portuguese Romanesque in which a figurative tympanum was present on the western façade, the constructors played with the light, depth and thickness of the church walls, in order to obtain the best scenographic effects from the solar lighting. A similar purpose and effect can be found in the Saviour of Anciães, in Carrazeda de Anciães; the monastic church of the Saviour of Paço de Sousa, near Penafiel; St. Peter of Rates, as mentioned above; or Bravães, whose case study will best illustrate this.

Founded between 1080 and 1125, the small rural, monastic church of the Saviour of Bravães would not be completed until 1187, as stated on an epigraph carved on one of the granite blocks beside the southern portal (Barreiros 1926, 53; Almeida 2001, 93–94).[16] It is the main portal, however, with its complex iconographic programme – the most complete preserved in Portuguese Romanesque – that will best illustrate the way exterior lighting favours a symbolic effect.[17]

The figurative programme of this western portal encompasses three different areas: the eight small columns or colonnettes that flank the main entrance, the five archivolts that top it, and the tympanum at the centre. Both the side colonnettes and the archivolts work as a frame for the subject depicted at the focal centre of the observer's attention – the tympanum – and they do it in a very specific way. The outermost part has peripheral representations of a wild and violent nature,[18] in this case depictions on the two outermost archivolts of jackals and monkeys, animals known for their symbolic treachery and perfidy.[19] In contrast, the two innermost archivolts show mainly geometric motifs, neutral from the symbolic point of view but somehow associated with the idea of the search for perfection. The one farthest from the door rests on two columns with ophidian motifs – three serpents entwined on the left and one helical body stretching out on the right[20] – whilst the one closest to the door evolves from two columns with the apocalyptical/eschatological theme of the punishment of the sinners, depicting birds of prey devouring their meat:

> Then I saw an angel standing in the sun, and he cried out with a loud voice, saying to all the birds which fly in midheaven, 'Come, assemble for the great supper of God, so that you may eat the flesh of kings and the flesh of commanders and the flesh of mighty men and the flesh of horses and of those who sit on them and the flesh of all men, both free men and slaves, and small and great.'
>
> (Revelation 19:17–18)

Only on the middle archivolt are there mere anthropomorphic representations, likely of Prophets or Apostles (they are too coarse and eroded to be absolutely sure) sitting over, and symbolically linking, the two figures carved in the colonnettes below (Figure 8.4). This follows models that were certainly inspired by the Portal of Glory, the work of Master Matthew, on the not-so-far-away cathedral of St. James of Compostela (Rodrigues 1995, 228).[21] Although this theme is usually interpreted as a depiction of the Annunciation (Barreiros 1926, 55; Almeida 2001, 96) – the Virgin on the left (to the right of Christ as portrayed on the tympanum), her right hand over her heart and the left hand over her belly/womb, signalling acceptance of the will of her Lord; the Archangel Gabriel on the right side, with both hands held high (Figure 8.3) – an entirely different scene might be implied. The pseudo-Archangel appears more akin to a character from the Old Testament than an angel; bearded and mature (if not old),

Figure 8.3 Church of the Saviour of Bravães, (a) columns on the right side of the western portal, including the depiction of Isaiah; (b) columns on the left side of the western portal, including the depiction of the Virgin.

with his hair arranged in an intricate pattern, the character portrayed seems to be no other than the Prophet Isaiah, who prophesized the Annunciation:

> Therefore the Lord himself will give you a sign: a virgin will conceive and give birth to a son, and she will call him Immanuel.
>
> (Isaiah 7:14)

The programme is completed by the presence of the *Maiestas Domini* in the centre of the tympanum, flanked by two acolytes that physically hold the supposedly immaterial Mandorle (Figure 8.4). Once again, there is a difficulty in understanding the

Figure 8.4 Church of the Saviour of Bravães, archivolts around the western portal and tympanum with the Christ Pantocrator.

theme depicted by the local and relatively poorly educated artists; the fact that they hold the Mandorle – originally just the irradiating light emanating from Christ – and the lack of naturalism and proportions of the bodies of the acolytes is consistent with this peripheral region of the Kingdom of Portugal at the time of the church's building. The scene relates to another quotation from the Book of Isaiah, whose vision gave way to the iconographic tradition of the Pantocrator, or the Christ in Majesty: 'So says the Lord: Heaven is my throne, and the Earth is my footstool [Isaiah 66:1]'.

The question that remains is not only the way in which the architecture was transformed in order to accommodate the depth of this rather complex programme (from the Portuguese Romanesque point of view), but the way it relates to the progression of the solar exposure in the course of the day. At first, the entire façade is immersed in shadow (See Figure 8.5(a) in colour plates); the orientation of the church means that sunlight will only fall upon it in the afternoon. Then it starts to be lit slowly from the ground up (See Figure 8.5(b) in colour plates), gradually revealing the message sculpted on the columns and on the archivolts – the prophecy of the Annunciation and the aforementioned Prophets, Apostles or Saints, amongst all threats that menace humanity since the Expulsion from Paradise, depicted on the 'frame' formed by the outer archivolts. Finally, the light concentrates on the focal point of the whole composition: the Christ Pantocrator emerging from the sacralisation of the Mandorle that 'insulates' Him from the world of the living, on His way to glory (See Figure 8.5(c) in colour plates).[22]

For this clear purpose of light manipulation on the church's exterior, despite being a modest single nave, its builders did not hesitate to add the massive – and structurally

unnecessary – stonemasonry structure that was needed to accommodate the extra depth of the western façade's sculptural programme (See Figure 8.6 in colour plates). The result was a thickening of the front wall in an otherwise apparently functionless arrangement,[23] whilst giving it a significance nevertheless.

Conclusion

Clearly, the use of both colour and light were present in Romanesque architecture and sculpture, as they were previously in the Greek and Roman. Faded away with the course of time, or ideologically 'cleaned' by a vision of a more 'pure' and 'spiritual' art developed mainly in the 19th century, many examples still show the remains of pigments or the result of a studied theory of lighting, which multidisciplinary teams of archaeologists, art historians and restorers have been able to identify, study and recover from the misdeeds of an unkind – and often ignorant – past.

As in French, Spanish, Italian, German or English Romanesque, some of these monumental remnants also survive in the Kingdom of Portugal, mainly from the 12th century. Traces of original dyes or pigments wait for proper identification and treatment – both analytic and scholarly – in several churches around the country, though there is also an enormous array of religious buildings that were never considered from the point of view of their lighting. Amongst them are the two examples stated above: the interior lighting of St. Peter of Rates, with a proposed definition of symbolic paths through light sources, as planned by the constructors of the building, and the exterior lighting of the western façade of the Saviour of Bravães, a clear example of the way in which light could be symbolically used at the service of the Christian idea of revelation.

Notes

1 IHA, DHA (Art History Institute and Department)/FCSH-Universidade NOVA de Lisboa and Calouste Gulbenkian Museum jrodrigues@gulbenkian.pt.
2 Some capitals, as in Chauvigny, near Poitiers, St. Nectaire or Issoire, both on the Auvergne region, are also painted, though there are still some doubts as to their origin, as some seem to have been repainted (restored, in the case of Chauvigny).
3 The clear irregularity of the plans of both churches – the 'old' one, enshrined in 1004, and the 'new' one, built from the second half of the 11th century up to around 1150 – is thoroughly described in Rollier 2006, 4–7.
4 Here he would patronize the construction of the Augustinian monastery of Santa Cruz (Holy Cross) as an alternative to the Cluniacs' excessive influence (Gonçalves 1980, 161).
5 Originally known as Our Lady of the Holy Sepulcher and finished around 1162. On the question of the few traces of painting in Portuguese Romanesque, see Rodrigues 1995, 316–18, and on Portuguese Romanesque in general see Graf 1986–1987; Monteiro 1980; Real 1990; Santos 1955 and Vasconcelos 1992.
6 The lighting of the High Altar at the crossing – or the area in front of the choir, on single nave churches – is solved, in most Portuguese Romanesque churches that usually lack a lantern tower, by the addition of a rosette opened over the choir arch (as in the church of the Saviour of Bravães) that replaced the simpler windows or slits of earlier constructions.
7 First with the construction of Cluny II, and later enlarged to the massive 180 metres of Cluny III, built under the ruling of Hugh of Sémur and sacralised in 1088 by Urban the second (Vingtain 1998, 53).
8 With Gregory VII, laymen could no longer directly access the consecration/salvation, being dependent on the intermediation of the clergy, and as such limited to the *visible* side of God's work.

9 Some historiated capitals can sometimes be seen crowning the engaged columns on the side walls, but placed on a very high level and mixed with others carved with strictly ornamental motifs.
10 As opposed to the liturgical paths clearly marked on the original pavement of Paray-Monial, identified in Rollier 2006, 9.
11 São Pedro de Rates in Portuguese (Real 1982, note 1, 8; Azevedo 1958, vol. I, tome I, doc. 6:10), founded by monks from La-Charité-sur-Loire between 1096 and 1100. The original act of donation dates from 1096 but it was only formally confirmed in March 1100.
12 Most of them on the side aisles, with eight re-made on the restoration (Salet 1995, 93).
13 A crusader and adventurer, Count Henry of Burgundy (1066–1112) came to the north of the Iberian Peninsula as part of the effort of Alphonse VI of León and Castile to win the war against the Muslim occupation of the Peninsula at that time, in what would be known as the *reconquest*, and which ended only after the Christian victory at the Battle of Salado in 1340. He was the fourth son of the Duc Henry of Burgundy, great-grandson of Robert I of France, nephew of Queen Constance of Leon and great-nephew of St. Hugo de Sémur, abbot of the monastery of Cluny when it was at its peak (Rodrigues 2001, 133).
14 The father of Alphonse VII, Raymond of Burgundy was – like Henry, the father of Afonso Henriques – part of the crusader movement which staged, from both sides of the border, the conflict over the independence of the Kingdom of Portugal, admitted *de facto* by the Castile-Leonese monarch at the Conference of Zamora in 1143, although the independence *de jure* was only granted under Pope Alexander III by the Bula *Manifestis probatum* in 1179 (Mattoso 1992–1994, II, 62; Fernandes 2005, 338, 340).
15 See notes 13 and 14.
16 Salvador (São Salvador) de Bravães in Portuguese.
17 See also Almeida (1985, 127–135; 1987, 323–341) on this subject.
18 Men of the period obviously feared a nature populated by real or fantastic creatures, out of the writings of Pliny the Elder or Isidore of Seville.
19 The jackal was also considered an animal of bad omens, whilst the monkey was 'often the image of the degraded man by its vices [. . .] mainly lust and malice' (Chevalier and Gheerbrant 1983, 199, 887)
20 The serpent has an obvious symbolic meaning, being closely related to the idea of temptation and the Expulsion from Paradise following the Original Sin; its depiction in such a controlled way, with bodies restrained by the tight entwined pattern, almost as a braided rope, has the clear intention of asserting the power of the church (as a metaphor of the Church) – to which the serpents are physically bound, and somehow imprisoned – over Evil.
21 The use of statues that double as columns seems to be directly inspired by the work of Master Matthew, finished around 1211 in the renewed Cathedral of Santiago de Compostela, an influence that subsequently spread across northern Spain and can be found in the Cathedral of Orense (in Galicia) and the church of Puebla de Sanabria (in the Zamora region), as well as reaching Avila and northern Portugal, with examples in Bravães and the nearby churches of St. Peter of Rubiães or St. John the Baptist of Távora.
22 A similar effect of the light can be found on the upper and deep Mandorle crowning the western façade of the church of Notre-Dame-la-Grande of Poitiers, where Christ, surrounded by the Tetramorphous, seems to 'emerge' from the depths of the Mandorle, shining on the afternoon light thanks to its gilded background, as in a revelation.
23 Several French Romanesque churches use the same scenographic resource, the best known being St. Peter of Moissac, in Burgundy, and the later the church of St. Trophime d'Arles, in Provence, from around 1180.

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9 Gold, glass and light

The Franciscan vision in representations of the stigmata

Éowyn Kerr-DiCarlo

The Stigmatization *is easily considered the quintessential Franciscan image. In a single picture it captures the visionary experience of St. Francis of Assisi receiving the miraculous wounds of Christ's Passion on his own body. Communicating the event in word and image has perhaps been one of the most important objectives of the Franciscan Order, and one that has occupied numerous artists from the time of the saint's death and canonization in 1228. Visual representations of Francis's life were illustrated using authorized biographies such as the Legenda Maior of St Bonaventure. These formed the basis for images found in early Franciscan altarpieces and in the rich decoration of San Francesco at Assisi, where artists' materials were carefully selected to support the tenets of the Franciscan vision.*

This paper explores the symbolism of light in relationship to images of the Stigmatization *represented in paint, gold and glass. Emphasis is placed on Bonaventure's writings and interpretation of Neoplatonic metaphysics used to support Franciscan iconography. Variations in meaning within late medieval Franciscan paintings, and the artists' struggle to represent the spiritual light of the stigmata scene through opaque or reflective materials, are also discussed. The influences of other media are considered, as is the duality between spiritual richness and material poverty. Case studies concentrate on the medium of gilded and painted glass and evaluate their function as artistic devices designed to disseminate devotional imagery and spiritual philosophy to a wider audience.*

This paper contributes to the discussion on colour and light by addressing the symbolism of light interpreted as a metaphor for spiritual enrichment and as a physical presence in the material choices of late medieval artists. The study focuses on representations of light in images of the *Stigmatization*, drawing upon an existing body of research from art historical and theological sources. A revision of current scholarship assists in placing the imagery within the wider discourse on Franciscan artwork, beginning with an overview of the subject and early representations. The paper focuses on St. Bonaventure's interpretations of Neoplatonic metaphysics used as iconographic source material.

The extraordinary *Stigmata of St. Francis* is a study of light and spirit as retold through history and conveyed to us by means of word and image. Visual representations of Francis's life were deliberately crafted from authorized biographies with the intention of promoting the political and spiritual beliefs of the Franciscan Order. This study reviews variations of the *Stigmatization* scene in the context of contemporary medieval scholarship and artistic interpretation. A selection of images and materials

will be considered, but attention is given in part to several early 14th century objects in gilded and painted glass. These examples are evaluated as devices for Franciscan devotion. The intention of the paper is to present observations that expand our perception of these objects and reassess how they were conceived and used in the late-medieval world for which they were created.

The production of gilded and painted glass is considered to be predominantly Franciscan in both technique and subject (Gordon 1994, 33–42; Di Benedictis 2000, 107–109).[1] Images were formed on small glass plaques backed with gold leaf and incised to create delicate designs in black line against the gold background. Some were further embellished with glazes to bring out compositional elements. The decorated gilded-glass plaques were then integrated into portable reliquaries (Di Benedictis 2010, 9–12).[2] These objects combined the transparency of glass with the reflectance and brilliance of gold, thus creating an effect similar to mosaic but with the finesse of painted miniatures.[3] Furthermore, their function as reliquary containers indicates their importance as devotional objects, which is emphasized by their small size and portability.

Medieval gilded glass is thought to have been a revival of an early-Christian technique associated with the Roman catacombs.[4] Research by Hueck (1991), Gordon (1994) and De Benedictis (2010) discusses the connection between gilded glass production and the Franciscan Houses of Umbria. Their work identified the presence of Pietro Teutonico, a friar working at Assisi in the last decade of the 13th century (Hueck 1991, 183–188; Gordon 1994, 37–40).[5] Fra Pietro is documented as the author of a number of the gilded-glass reliquaries indicating a relationship between a friar artist, the production of devotional objects and the use of specific materials (De Benedictis 2000, 107–134; also Bolgia 2012, 154).[6] Most of the extant examples of the gilded-glass reliquaries include narrative iconography based on the frescos of the Basilica of San Francesco, the mother church of the Order of Friars Minor. Nearly all of the reliquaries originally housed relics of Franciscan saints or saints of notable import to the Order (see De Benedictis 2010).[7]

Like many 'decorative' objects the gilded-glass reliquaries have been largely overlooked or relegated to a secondary significance in comparison to paintings from the same period. To date there are 61 catalogued works of medieval gilded glass, and of those only four include variations of the stigmata scene.[8] One of these is particularly significant as it was likely produced to display the relic of St. Francis's robe.[9] It also contains a small roundel of one of the most detailed representations of the *Stigmatization* in the gilded-glass medium (See Figure 9.1 in colour plates). This and several other unique examples will be discussed later in the paper.

The stigmata as image

For nearly 800 years the significance of the stigmata of St. Francis has been debated as a point of esoteric meditation and as an ideal of theological philosophy (see Dalarun et al. 2006; Benfatti 2011). No other image states as clearly the unique concepts of the Franciscan faith associated with Francis as *alter Christus*, and visual representations of this idea were carefully crafted. The transformational experience itself is thought to have occurred in 1224 when Francis travelled to the hermitage at Mount La Verna to celebrate the feast of the Holy Cross.[10] Francis never spoke of the vision, and as the stigmatization was only recorded in a circular letter, presumably written two years later to announce his death, we cannot be sure of the facts (Dalarun et al. 2006,

9–11).[11] This lack of a contemporary account meant that it was open for textual and visual embellishment. Particulars of the *Stigmatization* imagery that define its meaning such as the presence of a side wound, or the depiction of the stigmata as dots or as radial lines connecting Francis to the Seraph and the representation of the Seraph as a celestial figure or as Christ on the cross are important considerations in the reading of the iconography. In some of the earliest paintings these details have been used to understand which version of the official legend the artist may have illustrated.[12]

By necessity the images created to represent St. Francis were interpretations of authorized texts.[13] Though there were a number of life accounts, the first official biography was Thomas of Celano's *Vita beati Francisci* written between 1228 and 1229.[14] This record was likely commissioned by Gregory IX to substantiate the canonization process, differing from the earlier circular letter by suggesting the location at La Verna, the presence of the Seraph and witnesses of the stigmata wounds (Brooke 2006, 31–32; Benfatti 2011, 41–42).[15] As discussed by Vauchez (2012), the difference between hagiography and written history was evident to the medieval reader. Legends were composed for the sanctified, and Francis was considered a saint even while he was alive. The principal textual sources on his life are in the form of *vitae* or *legendae*, intended to be read aloud with the liturgy and on feast days (Brooke 2006, 103–104; Vauchez 2012, 186). These forms of hagiographical text are distinguishable from pure biography in that they were not written to narrate realistic stories but rather to present their subjects as models of 'Christian perfection' (Vauchez 2012, 186). Celano's *Vita* contains elements of both biography and hagiography to construct an account of Francis's life. Of the stigmatization Celano writes, 'he saw standing over him in a vision of God a man like a Seraph, having six wings, hands extended and feet joined, affixed to a cross. Two of his wings were raised over his head, two were stretched for flight, and two covered his whole body' and continues 'While he [Francis] was unable to perceive anything clearly understandable from the vision . . . the marks of the nails began to appear on his hands and feet, just as he had seen them a little while earlier on the crucified man hovering over him' (Armstrong et al. 1999–2001, 263–264).[16] Celano's narration thus defines the vision of the Seraph as a separate event from the physical miracle of the stigmata wounds.[17]

The earliest surviving devotional panel depicting St. Francis is by Bonaventura Berlinghieri, dated 1235 (See Figure 9.2 in colour plates). The image presents Francis as a full-length figure surrounded by six scenes of his life and miracles, closely following the stories from Celano's *Vita* (see Brooke 2006, 168–172). Similarly, the large altar panel from Santa Croce in Florence, dated ca. 1263–1266, presents a number of key moments from Celano's text (See Figure 9.3 in colour plates).[18] Visual developments and variations in the scenes indicate the assimilation of additional hagiographies (see Brooke 2006, 176–92; Chatterjee 2014, 168–184). In both panels, as in most of the early images, we are presented with didactic representations. The *Stigmatization* scene is presented as just one of many stories of Francis's life. It is given equal weight in the composition, following an established Byzantine format of illustrative scenes surrounding a large-scale central figure (see Chatterjee 2014, 86–90).[19]

Though present in both images the spiritual magnitude of the stigmata is suppressed within the overall compositional arrangements. This is particularly evident in the Santa Croce panel, where the Franciscan themes of obedience and poverty, and the work of the friars as preachers, are emphasized in the collective narratives (Chatterjee 2014,

184–198). The Seraph is shown in the *Stigmatization* image as connected to Francis by three golden rays (Figure 9.3). Though the composition is simple, their presence indicates consideration for the visionary element of the story. Here the static golden rays are symbolic of the transcendental glory of God's presence and the communication of spiritual transmission from the Divine to a chosen individual. This is a difficult concept to paint, and artists constructed different ways in which to communicate the idea.

In an example of the *Stigmatization* from a 13th century gradual one can see that the illuminator followed Celano's text but also tried to indicate the rays through the use of thin white lines (See Figure 9.4, *left* in colour plates). Similarly a panel from the same period, now in the Uffizi Gallery, presents a more clearly developed variant through the application of gold leaf (See Figure 9.4, *right* in colour plates). The painter exhibits less control in this material than the illuminator does, but the choice of gold further reinforces the purpose of the rays as a visionary connection. In some ways it is more effective as the material shimmers and changes with the lighting conditions and the viewer's angle. Unlike their use in later imagery, these rays indicate the symbolic transference of light as a spiritual gaze or meditation, rather than a direct connection between the Seraph actively impressing the wounds of the passion onto Francis's body.

The use of golden rays as a visual symbol, representing the transmission of spiritual knowledge, has precedence in earlier images such as the 6th-century apse mosaic of the *Transfiguration* at Mount Sinai (Figure 9.5). This demonstrates a popular medieval

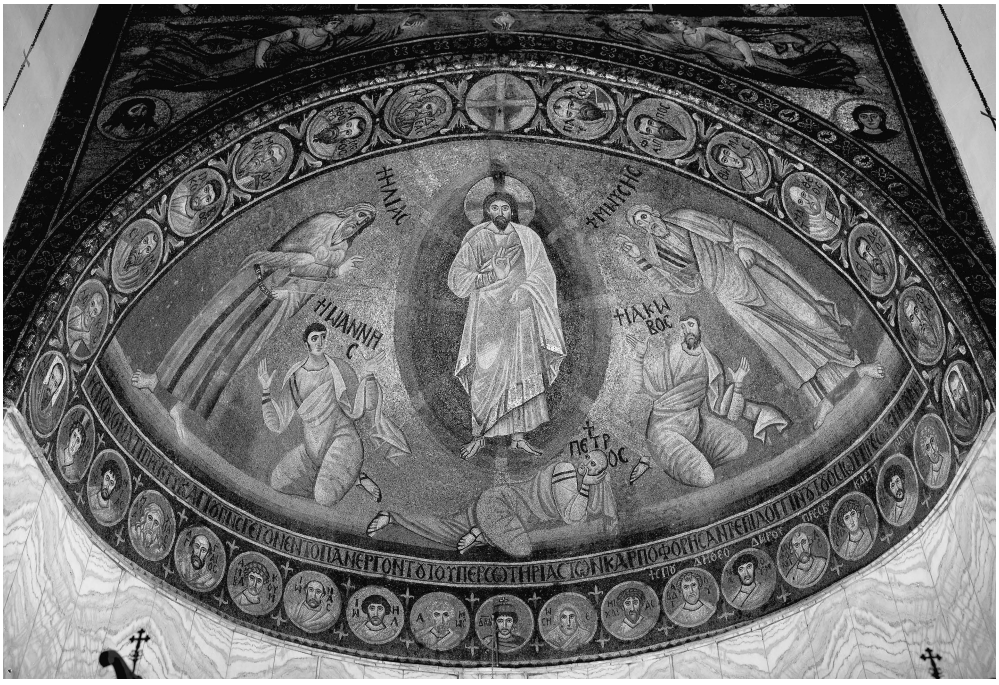

Figure 9.5 *The Transfiguration*, unknown artist, 570 × 1120 cm, mosaic, mid 6th century, Monastery of Saint Catherine, Mount Sinai.

Courtesy of the Alexandria-Michigan-Princeton Archaeological Expedition to Mount Sinai.

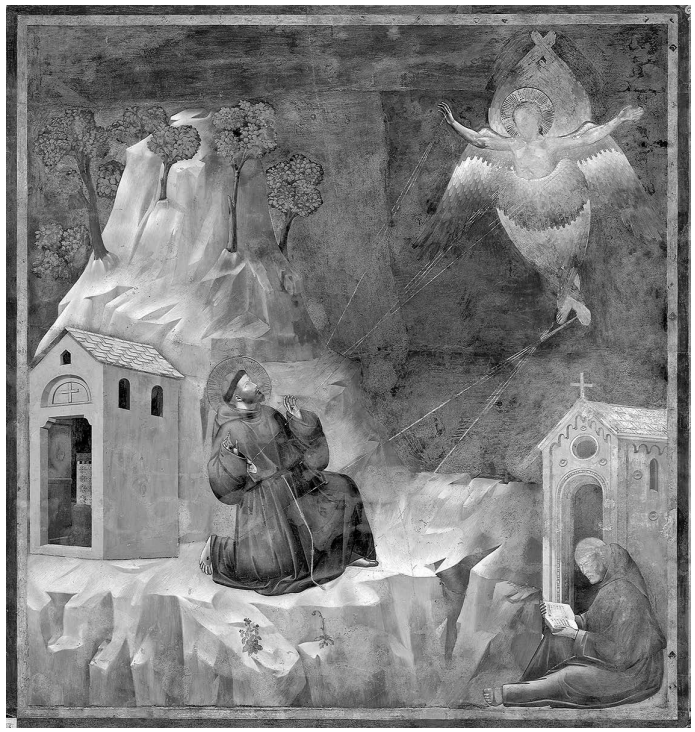

Figure 9.6 *Stigmatization of Saint Francis* from the *Legend of Saint Francis*, Giotto di Bondone, 270 × 230 cm, fresco, ca. 1290–1296, Upper Church, San Francesco, Assisi.
www.assisi.de/Stefan Diller.

aesthetic where light signified the essential form of the Divine and the means through which God communicated with the soul (Kessler 2004, 173).[20] It was thought He could enter into the body of the believer as a beam of light. This representation of symbolic light, as an artistic device, shows a relationship between an artist's material chosen to reflect light and the graphic illustration of spiritual light. While there is no evidence that the painters of the *Stigmatization* would have seen the mosaics of Sinai, certainly there was an understanding of the effectiveness of the visual tool and a utilization of Byzantine practices in the early Francis panels (Chatterjee 2014, 167–168).[21]

Arguably the most influential *Stigmatization* image is located in the Upper Church of San Francesco at Assisi, forming part of twenty-eight scenes illustrating the *Legend of St. Francis* (Figure 9.6). The frescos, traditionally attributed to Giotto di Bondone, are likely dated 1290–1296.[22] The work is innovative not only in its collective entirety but in the adaptation of Bonaventure's writings, on which the images are based, and in the profound influence the cycle had on successive generations of artists. Giotto's representation of the *Stigmatization* was also certainly the primary inspiration for Pietro Lorenzetti's version, painted in the Lower Church only a decade or two later, which was the source for many of the images in gilded glass.[23]

Changes were made to Celano's legend through the writings of Bonaventure, whose work is interlaced with his own beliefs in the mystical transmission of light and the embodiment of Francis as *alter Christus*. Bonaventure's *Legenda maior* is a re-telling of Francis's story.[24] Chapter XIII is devoted to the Sacred Stigmatization, and in his enrichment of the hagiography Bonaventure significantly changes the Seraph into 'Christ in the appearance of a seraph' fastened to the cross (Armstrong et al. 1999–2001, 630–639).[25] He writes that the wounds were actually impressed upon Francis's body, implying that the vision of the Seraph and the manifestation of the stigmata were simultaneous, interrelated events. These changes formulated a more physical phenomenon than a visionary experience.[26]

In 1266 Bonaventure's *Legenda* was authorized as the only official biography. Measures were taken to destroy all previous accounts, including Celano's, thus placing his philosophies at the centre of accepted Franciscan beliefs (Brooke 2006, 244–245; Burr 2003, 37).[27] His biography effectively became the principal source of knowledge on Francis's life and a primary source for artistic representation (Vauchez 2012, 200). Each scene of Giotto's *Francis* cycle, for example, is accompanied by a title from Bonaventure's text.[28] The artistic device of using golden rays to represent the transmission of spiritual knowledge was already commonly used in the *Stigmatization* imagery. Whereas the earliest examples depicted a spiritual gaze, those at Assisi presented rays connecting equivalent wounds on the figures. Giotto's application of this device demonstrating the transferral of the stigmata wounds from the Christ/Seraph to Francis's body is unique (see Brooke 2006, 403–404). Its presence in the fresco marked not only a change in the painted image but also a change in Franciscan theology (Cooper and Robson 2013, 148–151). This shift in emphasis moves the figure of the Seraph, as a symbolic vehicle of Christian virtue and spiritual illumination, to a central position in the story. Bonaventure's intention in his writings was to reshape Francis's life within a theological classification, presenting it as a framework for the mystical journey towards union with God (Robson 2006, 88).[29]

Bonaventure's classifications and influence

St. Bonaventure is considered one of the great philosophers of the late-medieval period. His titles include Cardinal Bishop, Minister General of the Order of Friars Minor and 'Seraphic' Doctor.[30] He was educated in Paris where he joined the Franciscans, beginning the study of theology at the time of Alexander of Hales. As the first Franciscan to hold a chair at the university, Hales introduced a Neoplatonic classification system and Peter Lombard's *Sententarium* as a standard text (Kenny 2005, 60–61). Bonaventure eventually served as regent master for the Franciscan Parisian school.[31] His appointment to Minister General in 1257 took Bonaventure out of an academic environment as lecturer of theology and placed him in an administrative role (Hayes 1999, 14). This position ensured the success of his writings by providing a wide-reaching platform for his ideas, which were firmly rooted in a Christian Neoplatonic tradition. Bonaventure, like his contemporaries, was well versed in both Plato and Aristotle and his main influences were the writings of Hugh of St. Victor, St. Augustine and the Pseudo-Dionysius, whose corpus of works translated into Latin in the 9th century had a lasting effect on medieval Christian thought (Hayes 1999, 21–22; also Kenny 2005). Due to the nature of the subject and the material that influenced Bonaventure's writings we find liberal metaphorical references to illumination and vision, particularly in

his *Itinerarium mentis in Deum*, or Journey of the Mind into God, written after his own profound visit to La Verna in 1259.

With the advancement of philosophy in the medieval universities came also the emergence of theology as a profession. In the 13th century the mechanics of sight were not yet understood, and vision was debated in terms of internal processes, what we might now call 'seeing', or supernatural processes that transported the viewer to a higher spiritual understanding (Hills 1987, 13–16). Developments in the field of optics would come with the more Aristotelian studies of Roger Bacon or John Duns Scotus, offering a physical approach to the discussion of visionary experience (Lindberg 1986, 18–22; Hills 1987, 64–69). While the instrument of the human eye has not changed, our understanding of what we see is different from our medieval counterparts.[32] Interpretation and belief in what one knows through sight is subject to cultural conditioning (see Eco 2002, 4–16). This is challenging when evaluating the medieval aesthetic, or in considering what was once even meant by the terms 'seeing' and 'vision'.

The logical structures of Aristotle were introduced into the Neoplatonic ideas through Porphyry, a 3rd-century disciple of Plotinus (Remes 2008, 19–21). His work became the standard medieval text on the subject, and within his writings is a system of organization still used in biological classification. Porphyry's scale of being, or *Arbor Porphyriana*, was translated into Latin by the 6th-century philosopher Boethius, who brought the ideas forward into a Roman-Christian context (Remes 2008, 198). The system allows for the connection between tangible and intangible aspects of existence,

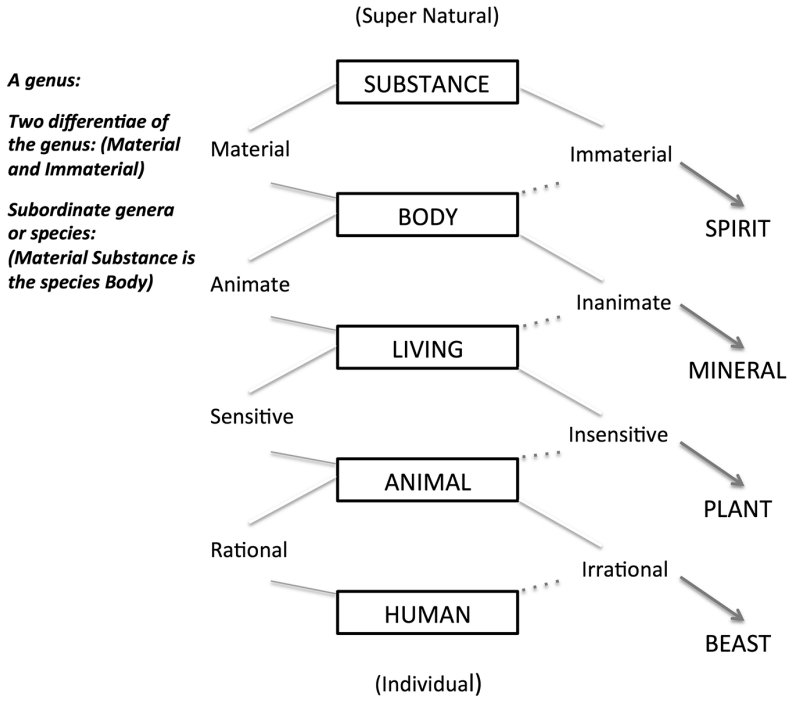

Figure 9.7 Arbor Porphyriana, translation of a version by Peter of Hispania, ca. 1239. Diagram by the author.

Figure 9.8 *De sex alis cherubim,* CCCC MS 66, p. 100, manuscript illumination, 1180–1190, Corpus Christi College, Cambridge.

Courtesy of the Master and Fellows of Corpus Christi College, Cambridge.

forming hierarchical structures within categories of classification, namely *genus* and *species* defined by *differentia* (Kenny 2005, 119–122). Examples of 13th-century variations of Porphyry's tree present the *differentia* with an extended classification, showing similar structures to those found in Bonaventure's writings (Figure 9.7).[33] Within the system there is always an inferior and superior species, allowing one to pose questions about the place of things within a hierarchy. Introduction of these concepts fundamentally changed the understanding of experience and perception in the academic environment of Bonaventure's world, forming a basis for his cultural conditioning and approach to seeing.

Classification trees were one of the most successful medieval devices, employed as written and visual diagrams to focus the mind. The system could be applied to any number of concepts, and we find it used in examples of Seraph imagery (Figure 9.8). An illumination from Cambridge shows similarly arranged structures of classification using the form of a Porphyrian tree. This late 12th-century manuscript illustrating *De sex alis cherubim* (i.e. seraphim) presents the six wings as a tree of virtue.[34] Each wing is labelled as a *species* and each feather the *differentia*. The wings

represent dualities on love, purity and revelation, which are further defined in the feathers as properties such as chastity, modesty and temperance, used as an allegorical exegesis on virtue. Similarly Bonaventure's *Itinerarium* is written as an instruction via the symbolic spiritual representations of the six-winged Seraph, presented as a classification tree.

Though initially found in the Old Testament of Isaiah, the Seraphim became more prolific after 9th-century translations of Pseudo-Dionysian texts (Frugoni 1997, 137).[35] The Seraph diagrams are strongly rooted in Porphyrian classification structures but also in Pseudo-Dionysian philosophy. In his writings the Seraphim are placed closest to God within a well-defined hierarchy of angelic choirs (see Rorem 1993, 60–68). Their name signifies 'the burning ones', and they are subsequently associated with properties of heat, fire and continuous illumination.

In Bonaventure's *Itinerarium*, which he presents as six stages of spiritual illumination, the two lower wings of the Seraph correspond to the human body, the second pair to the soul, and the third to the spirit. According to his text the spiritual journey is one of 'burning love' moving from the level of the body to the spirit by the power of the theological virtues, thus progressing through a Porphyrian classification structure (Hayes 1999, 28–29). Bonaventure's writings additionally introduce to this argument different types of light, and like the Seraph they are presented within a hierarchy (Kenny 2005, 62). His classifications interrelate metaphoric light and representative light as physical and supernatural phenomena, such as found in Augustinian writing where light is discussed as the corporeal substance most related to the incorporeal (Lindberg 1986, 12). He classifies light into *Lux*, the source of uncreated light that one experiences as a life-giving presence; *Lumen*, the light that travels through space as a radiant glow or beam; and *Colour* or *Splendour*, the light that is reflected from terrestrial bodies or from luminous celestial bodies (Eco 2002, 49–51).[36] As light in its pure luminous state was associated with the substantial form of God's presence, Bonaventure's description therefore suggests a metaphysical reality.[37]

All three types of light were attempted in different ways within the frescoed walls of San Francesco. Bonaventure's texts on spiritual instruction contain multiple layers of symbolism presented to the reader through classification structures. These ideas formed the context in which the imagery was created and viewed. While much import has been placed on Bonaventure's re-telling of Celano's text, less weight has been given to the wider context of his writings and their influences on the *Stigmatization* imagery.[38] Hills (1987) discusses how Giotto's use of light as a device for creating depth, realism and perspective was based on the contemporary writings of Roger Bacon and John Pecham. He explains that it is unlikely that Giotto would have read their treatise on optics (Hills 1987, 64). However, it is probable that Giotto was intimately familiar with the ideas of light found in the writings of Bonaventure through his work at Assisi, as these were the official texts used in the construction of the imagery.[39]

Giotto's frescos literally highlight the categories of light according to Bonaventure. His *Stigmatization* is rich in variations of light source, considered one of the innovative elements of the composition, which can still be seen in the *Splendour* from the fiery Seraph illuminating the scene (Figure 9.6).[40] *Lux* and *Lumen* are largely represented in the lighting on the rocks of La Verna and the hermitage behind Francis, while his figure and foreground appear lit by reflected light from the luminous Seraph. We

could even say the roof of the little church and book of brother Leo (at lower right) are also lit by *Splendour* from the *Crucifixion* scene located diagonally above the *Stigmatization* in the upper register, while *Lumen*, as a radiant beam, has been used in the golden rays transferring the wounds of the passion to Francis's body (See Figure 9.9 in colour plates).

Giotto's specific use of golden rays connecting the Christ/Seraph to Francis evidences the spiritual magnitude of the *Stigmatization*, thus supplying a much more sophisticated representation of the transmission of Divine illumination. This and the pose of Francis, on bended knee with arms thrown wide, contribute to his depiction being considered an exemplar of *Stigmatization* imagery. The success and immediacy of the fresco ensured that it became the symbol of contemporary Franciscan vision. If we also consider that the form of the Seraph was used as a classification tree on virtue, then it could potentially be read as a devotional instruction. This same concept, within the context of a scholastic Franciscan environment, could be applied to other images and materials.

The gilded and painted glass

Let us now return to representations in gilded glass. These objects provide a look into Franciscan spirituality through the choice of materials based on light and reflectivity, and through their use of shared images representing the transformational moment of the *Stigmatization*. For pilgrims visiting Assisi, the frescoed images and objects of devotion would have had to compensate for the lack of access to the saint's body entombed below the altar (Cooper and Robson 2013, 151). The gilded-glass

Figure 9.11 *Stigmatization of Saint Francis,* from the *Scenes of the Passion*, Pietro Lorenzetti, 247 × 171 cm, fresco, ca. 1319, Lower Church, San Francesco, Assisi.

www.assisi.de/Stefan Diller.

reliquaries produced in Assisi served an important function, as they housed relics valued by the Franciscan community and illustrated images found inside San Francesco. Typically the gilded glass was integrated into diptychs with small windows, enabling a visual connection with the relic bundles contained within.

Bonaventure's *Itinerarium* speaks of illumination as natural metaphor, implying that there must be a material or medium through which one understands spiritual illumination. The sacred was thought to be affected by the earthly luminosity of refraction and radiation, which were elements that could be governed by the laws of physics, and thus structured through paint and glass.[41] Clear and coloured glass held a particular place in the classification of materials. Because of its transparency it was thought to be the material vehicle for *Splendour*, the light associated with the Divine. Glass manufacture is closely connected to the construction of San Francesco, and the campaign of stained glass was one of the first decorative elements of the Upper Church.[42] Much of the current scholarship on the gilded glass suggests that its re-emergence was initiated by friars, such as Fra Pietro, associated with the glass kilns of Assisi. Certainly the properties of glass were familiar to the painters of the vault frescos in the Upper Church, like Jacopo Torriti, who was also a friar and master mosaicist (Cooper and Robson 2013, 22–27).[43]

A reliquary diptych now in Turin contains stylized adaptations of frescos from the Lower Church (See Figure 9.10 in colour plates). Even in its simplified form the basis for the *Stigmatization* image is easily recognized as Lorenzetti's representation of the scene, depicting a variation greatly influenced by Bonaventure's writings and Giotto's

Figure 9.12 *Chalice of Pope Nicholas IV*, Guccio di Mannaia, 22.4 × 18 cm, gilt silver with translucent enamel, ca. 1288–1290, Museo del Tesoro, Sacro Convento, Assisi.

www.assisi.de/Gerhard Ruf.

composition (Figure 9.11). Lorenzetti's fresco presents Francis in a pose of acceptance. He uses gold lines to connect the wounds of the Christ/Seraph to the saint but also envelops its body in golden wings. This moves the Seraph as a figure burning with fiery illumination towards one of divine *Splendour.* Compared to fresco it is difficult to convincingly create penetrating shafts of light in the gilded-glass medium.[44] The artist of the plaque has chosen to clearly emphasize this aspect of the iconography by removing other elements of the composition, making it identifiable as the moment of transformation. Placement of the *Nativity*, *Crucifixion* and *Resurrection* scenes follow a standardized configuration of many of the reliquaries. However, the *Stigmatization* sits in the place typically reserved for the Annunciation, suggesting a connection between the rays of the stigmata and those found in Annunciation scenes where beams of light signify the Incarnation (Figure 9.10).[45] As with the golden rays of the early Francis panels, the representation of symbolic light shows a relationship between artists' materials that reflect light and the graphic presentation of spiritual light. It is thought that the gilded-glass technique was developed in part to remind the devout of the Divine light being delivered to the mind, directly from the relics, through the clear glass and reflective gold (De Benedictis 2010, 15). The physical presence of the relics acts as material intercession, as does the presence of gold, which as a metal sits closest to Spirit on the scale of being. In 13th-century examples of the *Arbor Porphyriana* Minerals, such as metals, are closest to Spirit, sitting several places up the hierarchy from the Individual. This is an important point when considering the role of materials like gold in devotional artworks.

Figure 9.14 Saint Francis of Assisi Receiving the Stigmata, Giotto di Bondone, 313 × 162 cm, tempera on panel, ca. 1300, Musée du Louvre, Paris.

Photo RMN-Grand Palais/Michel Urtado.

By far the most elegantly crafted image of the *Stigmatization* in gilded glass is the small roundel (Figure 9.1). The plaque demonstrates a personalized variation of the scene with the figure of Francis carefully drawn to suggest movement and emotion, showing originality in the compositional design. Inclusion of fine details such as wood grain on the cross and shading within the Seraph's feathers indicate that it was conceived as a fully developed miniature rather than a small-scale copy of a fresco. The drawing demonstrates a command of the reflective properties of the gilded glass as well as a solid understanding of Bonaventure's *Legenda*. The roundel is fastened to a casket that likely contained the rare relic of Francis's robe (Gordon 1994, 37; De Benedictis 2010, 64).[46] It functioned as a sight-based reliquary, and the placement of the glass plaque between two cut-crystal windows was strategic. The only way to see the tiny roundel is to approach as if peering through the windows to view the relic contained within, thus connecting the act of seeing to the golden image of the *Stigmatization*.[47] The casket's form copies that of the *Reliquary of St Andrew's Finger*, included as part of an important sacristy donation from Nicholas IV (Cooper and Robson 2013, 36–39). With the gift was a collection of saintly remains from the Roman catacombs and an extraordinary chalice by the goldsmith Guccio di Mannaia from 1290, encrusted with translucent jewel-like enamelled medallions (Figure 9.12).[48] It is thought that the *Stigmatization* roundel was produced to emulate the beauty and opulence of these enamels in a more modest material (De Benedictis 2000, 107–109). As discussed by Gordon (1994), the manufacture of the Franciscan gilded glass may have been developed to negotiate the duality between vows of poverty and the newly enriched environment of the Basilica.[49] The glass plaques were less expensive, simpler and faster to produce than metalwork, enamelling or rock crystal. Yet, they have similar material properties of light and reflectance (De Benedictis 2010, 9; Bolgia 2012, 155). As devotional objects they were likely more accessible to the friars, who were feasibly their creators as well as collectors.

Gold itself, as a metal with incorruptible and reflective properties, was considered the manifestation of Divine light in solid form (Bucklow 2009, 272).[50] This meant it could be treated as a material of intercession. Just as Christ himself had two natures, one divine and one human, these materials could also exist in duality (Kenny 2005, 17; Bucklow 2009, 268–269). Within a Neoplatonic classification system, gold sits between Human and Spirit in the journey to God. Value was placed not on monetary weight but on the metaphysical significance of the materials. Furthermore, the presence of glass enhanced this meaning as a vehicle for Divine light (De Benedictis 2010, 14–15; Kessler 2004, 29). The act of seeing implied that the viewer was affected by the spiritual property of the material itself.

While the Assisi roundel is the most artistically innovative of the gilded-glass *Stigmatization* images, it is another version that proves to be most enigmatic (See Figure 9.13 in colour plates). It too is a version of the Giottesque iconography from the *Legend* cycle; however, the variation comes not from the artist of the gilded glass, but from Giotto himself. Traditionally this plaque has been dismissed as a later academic copy of the *Stigmatization* image, yet the quality and use of the incised and painted technique indicates that it was reproduced from a drawing (Pettenati 1986, 18). The composition suggests that its production was more likely connected to Giotto's immediate followers in either Pisa or Florence.

The plaque closely follows Giotto's panel from San Francesco in Pisa, which was clearly designed to reproduce the most contemporary Franciscan imagery (Cook

2004, 139–142). It too faithfully illustrates Bonaventure's writings. In this variation, Giotto presents the *Stigmatization* scene as the most important element of the altar panel (Figure 9.14). He further refines the figure of the Seraph and the key components of the composition to create stylized clarity in the image. The plaque conforms to the same gabled shape, and most of the elements of the composition, but in place of smaller predella scenes is a coat of arms.[51] Unusually, this is one of the few gilded-glass examples created as an individual plaque rather than a reliquary. Certainly in this case, the subject and material are more important than the reliquary function. In the absence of relics, and the presence of the coat of arms, we can postulate that it was specially commissioned for use as a portable devotional image, possibly by a follower of Francis or a supporter of Bonaventuran teaching who wanted a personal aid for contemplating their journey to God.

Conclusion

The miraculous *Stigmata of St Francis* is a story that was adjusted with each retelling to suit the changing needs of the Franciscan Order. Bonaventure's variations not only emphasized the role of the Seraph, but they combined the Seraph and the visionary experience with metaphors for light – two important structures of classification at the core of scholastic teaching. The use of glass and gold in the construction of the plaques places the small reliquaries in a hierarchy, indicating they were perhaps exalted objects within the late-medieval world of Franciscan devotion.[52] The imagery and physical existence served the function of advancing the devout to a state closer to God in their presence as devices of light and material intercession. Bynum (2011, 116) writes of Bonaventure's suggestion that imitation and assimilation to Christ can come through human contact with devotional objects. Just as the earliest panels fulfilled the needs of the friars in their didactic representations of Francis from the texts of Celano, the gilded-glass objects combined a post-Bonaventure and post-Giotto environment in their existence as objects that are at once visually and spiritually rich, yet modest in form. This study suggests a greater understanding of the significance of light on the part of those involved with constructing Assisi. Their awareness may have been rooted in the writings of Bonaventure, but it was also the reflectance of a contemporary knowledge of symbolic hierarchical systems, metaphysical studies and even of categories of light.

Notes

1 Called also gilded glass or *verre églomisé*. The term *verre églomisé* is an 18th century expression named after the Parisian framer Jean Baptiste Glomy, and is therefore not used for this study.
2 Most of the catalogued examples are in the form of reliquary diptychs with multiple plaques displaying several narratives. In some cases they are *ostensoria* or *staureteche*.
3 Technically the gilded and painted glass is more similar to drawing and manuscript illumination than painting or metal engraving. Variations on the technique are considered at length by De Benedictis (2010).
4 The late 13th and early 14th century technique is thought to have its origins in the Roman Christian gilt-glass medallions dated from the 3rd through 5th centuries (see Pettenati 1986, 3).
5 Pietro Teutonic arrived in Assisi from his native Freiburg in 1288. He is particularly associated with the scriptorium of the Porziuncola, and is recorded as having donated a glass cross and vestments (De Benedictis 2000, 107–110).

6 Medieval technical treatise on the arts such as Theophilus's 12th century manual *De diversis artibus* and Cennini's late 14th century *Il libro dell'arte* discuss the gilded glass in their instruction (Theophilus 1979, 59–60; Cennini 1960, 112–114).
7 Particularly important were St. Anthony, or St. Louis of Toulouse who was canonized in 1317 (Bolgia 2012, 157).
8 De Benedictis has published the most comprehensive study focusing on 58 works of Umbrian production (2010, 64–132).
9 The *Reliquary of the Companions of St Ursula* is still located in the Treasury Museum of the Sacro Convento, where it has been housed since the 14th century. It is one of the only examples to reside in the location for which it was intended.
10 The date, feast day and what transpired are debated in Dalarun et al. (2006, 9–26).
11 This is Elias of Cortona's *Epistola encyclica* of 1226, though there is some debate as to its date and authenticity. See Armstrong et al. (1999–2001 Vol. II, 485–487). St. Francis of Assisi was born around 1181 as Giovanni di Bernardone and died in 1226. He was canonized 16 July 1228 under Pope Gregory IX.
12 The study of subtle changes in representation of the subject has been the focus of research by a number of art historians such as Brooke (2006), Frugoni (1993) and Cook (1999).
13 Certainly the concern was that Francis's unique marks of the stigmata were not seen as heresy. This is discussed in Brooke (2006) and Vauchez (2012).
14 Commonly referred to as the *Vita Prima*, the First Life or Celano I.
15 Mention of the stigmatization in the *Mira circa nos* Bull of 1228 was avoided. Celano's account was intended to support a formal process of canonization (Dalarun et al. 2006, 11–14). On this subject see also Blastic (in Robson 2012, 69–71).
16 '*vidit in visione Dei virum unum, quasi Seraphim sex alas habentem, stantem supra se, manibus extensis ac pedibus coniunctis, cruci affixum. Duae alae supra caput elevabantur, duae ad volandum extendebantur, duae denique totum velebant corpus*' and continues '*Cumque liquido ex ea intelectu aliquid non perciperet et multum eius cordi visionis huius novitas insideret, coeperunt in minibus eius et pedibus apparere signa clavorum, quemadmodum paulo ante virum supra se viderat crucifixum.*'
17 Celano also refines and adjusts his retelling of the stigmata in accordance with the function of the text. This indicates the malleable nature of the event and possibly an acceptance of variation in the hagiography of St. Francis.
18 Brooke successfully argues that the Bardi altar panel dates from 1263–1266 (2006, 186), which differs from Frugoni's dates of 1243–1245 (see Vauchez 2012, 212).
19 The *vita* icon format emerged in the late 12th century, and is thought to link a written hagiography to a visual one. The paintings are strongly connected to the Monastery of St. Catherine, Mount Sinai (see Chatterjee 2014).
20 McGrath discusses the Augustinian origins of this concept in the doctrine of Divine Illumination in his paper on 'Light, the Dominicans and the cult of St Thomas of Aquinas', the succeeding chapter of this volume.
21 It could be argued that the painters of these early images were in contact with the Byzantine artists in port cities such as Pisa, and were deliberately painting in a style that emulated Greek icons and *vita* panels such as those from Mount Sinai. If so, it may be that this use of graphic golden rays to show symbolic light was specifically modelled after the Byzantine examples (Brooke 2006, 168–169, 176, 285).
22 For the question of attribution see Cook (2004, 136–137). Proposals for the dates of the frescos can range from 1280 to 1320. The most extensive research and thorough discussion on the decoration of the Upper Church is in Cooper and Robson (2013), who date the frescos to 1290–1296. See also Bourdua (2004, 2–3).
23 Lorenzetti's frescos in the Basilica are generally dated from 1316–1319, based on the chronology of his other commissions and the Ghibelline control of Assisi of that same year as argued successfully by Maginnis (1984). See also Robson (2005, 40–44).
24 Bonaventure's *Legenda* was commissioned by the Franciscan Order and approved in 1263.
25 *'Christo sub specie Seraph'*
26 For the most comprehensive discussions on this topic see Frugoni (1993) for the study of the image, or Benfatti (2011) for the study on interpretation of the texts.

27 The *Legenda maior* was commissioned at the general chapter of 1260, approved in 1263 and declared the only official version of Francis's life at the general chapter of 1266.
28 The accompanying inscription to the *Stigmatization of St Francis* fresco reads: 'While the Blessed Francis was praying on the side of Mount La Verna, he saw Christ under the appearance of a crucified Seraph, who impressed on his hands and feet, and on his right side, the stigmata of the cross of our Lord Jesus Christ.' *Legenda maior* 13:1–3.
29 Bonaventure's core belief was that all knowledge came through Divine Illumination. See also McGrath in this volume for his discussion on the implementation of Divine Illumination in Dominican painting.
30 St Bonaventure was born 1221 (or 1217) as Giovanni di Fidanza, and died in 1274. He was canonised by Pope Sixtus IV on 14 April 1482 and declared Doctor of the Church on 14 March 1588.
31 This period was marked by division within the order. Beliefs were shared between the so called 'Spirituals' who supported observation of Francis's rule through simple preaching and mendicant living, and by those who believed in a more structured and organized religious order, using Francis purely as a spiritual model (Burr 2003, 32–39).
32 The mechanics of light, the lens, rods and cones and even how the eye perceives colour has remained fundamentally the same as a physiological action.
33 Evidence of the widespread use of classification trees can be found in numerous works of art in the 13th century. The *Jesse Tree*, for example, has a very different significance but employs a similar visual classification structure.
34 'Cherubim' as apposed to 'seraphim' is used in this case as it refers to the title given to MS 66, though the manuscript explicitly addresses seraphim. As discussed by Chase (2002, 124) the use of the terms cherubim and seraphim were often confused as they have interconnected significance in Christian angelic spirituality.
35 The use of the six wings of the Seraph as a pedagogical device is found also in Thomas of Celano's *Vita*.
36 These classifications of light are re-defined by subsequent Franciscan scholars, such as Bartholomew of Bologna's late 13th century *Tractatus de luce*. Lindberg (1986, 18) discusses origins of the same classifications from Avicenna and also Grosseteste. See also Hills (1987, 11–12).
37 Plotinus expresses this fundamental concept of unity between the physical and metaphysical realms in his theory on the nature of light (Lindberg 1986, 10), primarily in his *Enneads*, compiled by Porphyry in the 270s (Remes 2008, 20).
38 Certainly the importance of Bonaventure's discourse on light and his influence on Franciscan imagery is not ignored in the current scholarship. The relationship has been extensively explored, but the topic has not been the central focus of any one study.
39 Hills presents a thorough study on light and colour in Italian painting and includes a chapter on Franciscan Optics (1987, 11–16). It is not clear if the use of Bonaventure's classifications of light were introduced at Assisi by Giotto, who rendered them, or by the friars responsible for the development of the visual programme. Though present in many of his writing, Bonaventure's *Legenda* does not specifically address light in relationship to the Stigmatization.
40 These techniques would have been more pronounced when the fresco was newly painted, and there is evidence that several white pigments were applied to reinforce the effect. Giotto's use of light in the frescos is much discussed. See Brooke (2006) and Cooper and Robson (2013).
41 For the medieval viewer the materiality of glass was likely just as important as the image depicted (Kessler 2004, 19–20).
42 The glass production on-site at Assisi, and campaigns of decoration in the Basilica, were tremendously significant in their material presence and function. They have been studied in depth by Martin and Ruff who distinguish between glass painting styles that are closely associated with Austrian illuminators (see notes in Brooke 2006, 307–332).
43 Other objects from this period have been found to contain elements of gilded glass. Several pre-date the production of the reliquaries such as Giotto's *Crucifix*, 1288–1289, from Santa

Maria Novella in Florence, where gilded-glass plaques have been imbedded into the raised halo (see Pettenati 2005).

44 This is partly related to scale and the relative ease of applying metal leaf directly to the wall, as apposed to scratching through the gold-backed glass from the reverse to reveal the design.

45 A similar relationship between the *Stigmatization* and the *Annunciation* can be found in Taddeo Gaddi's frescos and the stained glass windows of the Baroncelli Chapel in Santa Croce, Florence (see Hills 1987, 77–81).

46 Currently the casket contains the relics of five heads of the martyred companions of St. Ursula, which have been housed together since 1797. The treasury inventory indicates they were placed in the casket originally containing Francis's robe.

47 The casket body is fashioned from an earlier reliquary container with residual enamelling on the underside, depicting scenes of the *Adoration of the Magi*. Its body is embellished with precious materials such as crystal cabochons and red coral beads. As discussed in Kessler (2004, 14–15) medieval multi-media objects had their own properties and significance, which affected their meaning.

48 It is possible that the Papal donation of Roman relics initiated the production of the reliquaries in Assisi. Mannaia's extraordinary Nicholas IV chalice must have made a profound impression with its 80 gold and enamelled portrait medallions.

49 Division within the order greatly affected beliefs on Franciscan decoration. Official restriction of art and architecture was enacted under Bonaventure's generalate, though he believed in the need for ecclesiastical decoration. Under the instruction of the general chapter of Narbonne in 1260, decorative glass, gold vestments and other excessive materials were forbidden (Bourdua 2004, 23–25). Relics however, which formed a relationship between the visible and invisible through their presence, were to be preserved at all costs (De Benedictis 2010, 14).

50 This concept is argued in numerous Neoplatonic texts. Bucklow presents an alchemical discourse on the incorruptible nature of gold, but also addresses its use as an 'un-earthly' metal used to represent the incorporeal in a tangible manifest form. He references the writings of Origen and Albertus Magnus (see Bucklow 2009, 268–270).

51 The patron's coat of arms was created in silver leaf and is unfortunately no longer identifiable.

52 Gordon (1994) discusses their existence as mass produced reliquaries for distribution within the Franciscan friaries, while De Benedictis (2010) discusses their function as important devotional works of art of similar quality to painted altarpieces.

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10 Glints and colours of human inwardness

Bartholomaeus de Bononia's *De luce* and contemporary preaching

Francesca Galli[1]

This paper analyzes select similes and metaphors around the optics and philosophy of light which were conceived by medieval scholars and preachers, whose aim was to render doctrines and the life of faith into a visual form, and make complex theological concepts and precise moral directives more fascinating, accessible and easier to secure in the mind. In particular, the focus is on magister Bartholomaeus de Bononia O.F.M. In his tract De luce (c. 1270), this Franciscan finds suggestions of the properties and workings of the Divine Sun in the operation of solar rays, and 'depicts' several parallels between Christian virtues and the different materials which decorate sacred architecture, whose preciousness is often enhanced by the embrace of light. Similar representations of God's actions and methods of communication recurred, and were refined, in later vernacular preaching which was addressed to an ever wider audience; some examples are taken from the work of the Dominican friar Giordano da Pisa, who frequently persuaded his audience to think of the divine and of their own intellectual and emotional dimension in terms of brightness, shapes, colours and tangible consistency.

For today's reader, these multifaceted schemas, at the same time both mental and visual maps, stand out as a valuable key to medieval art. They offer an insight into the way in which we look at and think about material and spiritual light and colours of that time, and act as an instrument through which we can experience past places and objects.

The imagery of light permeates all medieval culture. Science, philosophy, theology, art and aesthetics all intertwine around what shines, sparkles, enlightens and glitters, physically or metaphorically. From the 13th century onwards, Mendicant orders in particular inherited the classical, Christian and Arabic tradition (Aristotle, Pseudo-Dionysius, Augustine, Alhazen, Avicenna, etc.) and engaged in the study of optics (they included Robert Grosseteste, John Peckham and Roger Bacon, to name but a few), as well as reasoning around the mystery of *lux* (Bonaventure, Thomas, etc.).

The main focus of this paper is a relatively 'minor' figure in the Franciscan order, the *magister* Bartholomaeus de Bononia,[2] author of sermons and of a compendium, the *De Luce*, which is credited with containing 'perhaps more information about light than any other single medieval work' (Gilson 2000, 234). The works of the *frater*, probably conceived in the academic context of Paris and most likely dating to around 1270, are tinged with analogies and metaphors related to optics, by which philosophical concepts are expressed '*sub lucis similitudine*' (through the simile of light); this is along with depictions of the human interior and the life of faith which draw from correlations between the properties of sensible[3] light and its effects through different

materials. For example, a page of *De luce* is devoted to the parallel between various kinds of human faith (the 'naïve beliefs' of simple men, the in-depth erudition of preachers, etc.) and different levels of sparkle in materials (glass, precious stones, alabaster). Elsewhere, a sainted soul is compared to a coloured stained glass, and steadfastness in faith is assimilated to a golden board.[4]

Alongside the work of the comparatively little-studied Franciscan, some sermons of a better-known preacher, Giordano da Pisa O.P.,[5] are considered here. Like Bartholomaeus, this Dominican friar, who was also active in Florence at the very beginning of the 14th century, took advantage in his sermons of many considerations relevant to *Scientia perspectiva* and philosophy of light. By means of images, objects and mental maps (e.g. the Virgin Mary is likened to specific shapes of mirrors, human virtues to glittering gems, etc.), he attracts and guides both the carnal and the spiritual eyes of his audience.

Despite the clear differences between their perspectives and contexts (Franciscan vs Dominican, Paris vs Florence, Latin vs Vulgar, University-educated audience vs common people, scientific treatises-manuals vs preaching), the two authors share the same expressive codex and observation of the theories of optics and metaphysics of light. Indeed, the numerous references to objects and materials we often find in their contemporary sacred places, and their relevant spiritual interpretation, serve as a valid instrument with which to 'experience images and buildings from the viewpoint of the particular person or group for whom they were made' (Camille 1996, 15), allowing a glimpse into a medieval perspective on coeval art and the role light plays in it.

A manual of spiritual optics

> 'Let those who enjoy better eyes consider the other metaphors of the Scripture, almost all opaque by nature and therefore not properly discernible by our eye, since the less all things opaque and obscure by nature partake of light nature the less they are visible. Now we, instead, consider Christ who proposes himself to us through the simile of light, as it is visible per se and capable of comforting and reducing to act that dim light which is naturally inborn in human eye'.[6]

With these words, the Franciscan Bartholomaeus de Bononia closes the preface of his *De luce* and invites the audience, be they students attending his lecture, or later readers, to muse upon the words of Christ, who, in John 8:12,[7] introduces himself to the world through the metaphor of light ('*sub lucis similitudine*').

Presumably written during his early Parisian years (c. 1270) before his return to Italy (Bologna 1282–1294),[8] the *De luce* – similarly to the homilies inspired by the new style of *sermo modernus*[9] – builds on to and gives a thorough explanation of one single evangelic verse. To this intent, it collates a varied corpus of scientific doctrines, images and common places about light and optics, drawing upon Aristotle, Pseudo-Dionysius, Alhazen, Robert Grosseteste, Bonaventure and many other previous or contemporary philosophers and theologians.[10]

Like the better known *Tractatus moralis de oculo* by Peter of Limoges,[11] Bartholomaeus's work is situated halfway between optical science and pastoral care, and focuses principally on the distinguishing aspects of the phenomenon of *lux* (its properties, operations and effects) and its spiritual and moral equivalents. The variety of

content, and some of its textual aspects, make it challenging to precisely define the literary genre, the specific topic and the kind of audience the book is addressed to – the term *tractatus* is in fact ambiguous, polysemous. Furthermore, one should always bear in mind that 'the distinction between preaching and classroom, though indispensable to a theoretical discussion, is largely artificial. The masters who taught also preached, and made preaching tools; the students they taught were being prepared to spend much of their time in the pulpit' (Rouse 1991, 211).

The science historian David C. Lindberg (1975, 42–43), author of fundamental editions (e.g. John Peckham, Roger Bacon) and studies about medieval optics, highlighted the hybrid quiddity of Bartholomaeus's compendium. He decided to comprise it into his *A Catalogue of Medieval and Renaissance Optical Manuscripts*, but he felt it was necessary to point out that 'although the purpose of this treatise is ultimately theological', it was worth listing it 'because it contains a significant body of optical matter'.

Although his scholastic style is viewed as fairly repetitive and the content is often commonplace in the clerical culture of the Late Middle Age (our *magister* is not an original thinker and usually borrows from other authors and refashions their theories), we often come across interesting and remarkable pages which provide medieval students with notions of anatomy, geometry and physics. This 'eclecticism' certainly arouses curiosity and admiration in contemporary readers – more than that, it discloses the medieval all-embracing perspective on the world and shows, as the widely renowned Romanist Leo Spitzer (1944, 426) states in his *Classical and Christian Ideas of World Harmony*, 'the Christian world harmony makes possible the shift from one picture to the other, since they all converge in the transcendental'. Undoubtedly, the distinctive and dominant feature of this *tractatus* is the analogical relationship that Bartholomaeus establishes between single sensible light phenomenon and the corresponding properties of spiritual light. Unlike some authors in the tradition of the metaphysics of light, the Franciscan always makes a rather careful distinction between divine and material light, and 'the relation between the two kinds of light is purely analogical and is never described as substantial or essential derivation' (Mazzeo 1958, 202).

Light similes by Bartholomaeus de Bononia

In the tradition of many other ancient and medieval exegetes,[12] Bartholomaeus sometimes dwells on metaphorical readings of physical matter and attempts to spiritualize materials of everyday usage, commonly employed by artisans and artists. By means of analogies and parallelisms, the Franciscan 'paints' a mental picture through his words, rendering a visual form of metaphysical reality and of human inwardness. Thus, readers of the *tractatus* find themselves thinking of the divine and their own intellectual and emotional dimension in terms of shapes, colours and tangible consistency, and are able to perceive and memorize complex theological concepts and precise moral directives.

Certain paragraphs[13] dedicated to the four levels of shining and enlightening things[14] seem particularly significant because of their specific content, but also because they open the path to understanding the *modus operandi* of the friar. Bartholomaeus pens a methodological foreword which is indispensable in comprehending his line of reasoning. Quoting *De divinis nominibus* by Pseudo-Dionysius the Areopagite (II, 8), he

highlights that, in order to ascend and contemplate spiritual things,[15] we have to start from what we see, from the revealed world. The expression '*materialis manuductio*', which comes from theological and mystical lexicon, is quite meaningful: sensible things guide us by the hand (*manu ducere*); they accompany us hand in hand to what is beyond. After this preamble, the author goes straight to the matter and outlines his scale of brightness.

At the first level of the scale we encounter things which shine; which can be seen in the dark, but do not enlighten other things ('*lucent sed non illuminant*'), such as glass ('*vitrum*').[16] In the same vein, but now moving to spiritual light, there are men, believers, who have light in themselves (Bartholomaeus speaks of authentic faith, orthodox and transparent, clear, pure of conscience, without marks – like glass), but they do not know and understand much about the principles they believe in ('*tenuiter intelligunt*'), and so they are not able to teach or persuade other people with their knowledge and words.

At the second level of the scale, the *magister* includes things which shine and which also illuminate the surrounding area, making the rest visible ('*alia faciunt videri*'). In the Florence manuscript, the material example for such properties are generic precious stones ('*lapides pretiosi*'), whereas in the Bodleian Library codex a more precise reference to carbuncles or rubies is made ('*ut carbunculus*'). In the spiritual dimension, these people possess the light of faith and are able to share such light through their words and behaviour.

We now reach the third level, where we find those things that shine in themselves, light up the surroundings and are able to make other things bright and capable of giving light.[17] Here Bartholomaeus considers the example of a flame (maybe a candle) behind an alabaster sheet: the flame shines in itself, illuminates the alabaster, and the alabaster itself diffuses light around it. In this same way, there are believers, usually theologians and preachers ('*doctores vel praedicatores*'), who have a pure faith and are able to transmit – through their knowledge, words, actions – their faith to others who in turn become lights for yet more people.[18]

At the fourth and highest level, Bartholomaeus situates those elements that shine, light up other things and are sources of light themselves ('*principium luminis*'), giving light to others and not receiving from anything else. The sun, for example, shines, is a source of light, and lights up the planets so that the moon itself can illuminate the night. Likewise, Christ is the Sun of Justice in the spiritual world, the purest light, and the source of faith and every kind of enlightenment.

It is worth noting that the same classification (the four levels of sensible and spiritual luminosity) also occurs in a sermon by Bartholomaeus, the *Sermo in Nativitate Domini*[19] preserved in the manuscript Ashmole 757 of the Bodleian Library, and is inserted, without mentioning the source, by Servasanctus de Faentia in his *Liber de virtutibus et vitiis*.[20] The fact that some paragraphs of the *De luce* are repeated almost *ad litteram* in one sermon, which was probably held at the university of Paris by the author himself, and in a book to be counted among 'the large number of texts which were produced in the later Middle Ages as educational tools for the pastoral care' (Newhauser 1993, 130), confirms the tight link between the *De luce* and contemporary homiletic activity. Similarly to *The Moral Treatise on the Eye* mentioned above, the *tractatus* by Bartholomaeus collects materials he may have availed himself of – yielding blazon and authority to the preacher at the pulpit of a church or at the lectern of a university classroom – adjusting the specific contents of natural science to

a consideration about morality, and fostering the legitimacy of reading optics as the 'key that would unlock nature's door' (Lindberg 1976, IX).

Other examples highlight the Franciscan's attempt to spiritualize physical light and its effects (reflection on different surfaces, colouring, etc.). In discussing the need to turn the face to divine radiation,[21] Bartholomaeus explains that faith favours the reception of spiritual beams as it renders the human mind more similar to the non-created Image, and thus lets the Sun of Justice act with greater effectiveness. Depending on the grade of likelihood to God the mind reaches due to faith, the mind will then be likened to a board, the material of which corresponds to the degree of likelihood to God. The lowest board is made of polished wood; the next is painted white; the next made of silver, and finally, the highest board is of gold (which is more similar to light, thus reflects and shines more intensely). Elsewhere,[22] in talking about the operations and effects of sensible and spiritual light, the Franciscan emphasises the ability of light to communicate, transmit and share its brightness and luminosity.[23] This property is illustrated through comparison with a coloured stained-glass window.[24] Like sensible light (also divine light), the light from the Sun of Justice propagates after being received in the diaphaneity[25] of the human mind ('*in perspicuo mentis humanae*') and needs a 'medium' – something in which it can incorporate itself. Air is the medium for material light, or the 'place' in which it becomes visible and is able to spread, in the same way as words, actions and good behaviour constitute the means of diffusion of spiritual enlightenment. When the light of the sun passes through the coloured and transparent stained-glass window of a church, it casts tinted reflections over the walls and decorative elements, sharing its beauty ('*ornatus*') and painting the surrounding stones with its hues. In the spiritual reality, the sainted soul is similar to this window: it is a '*fenestra*', an opening to God's light; it is '*vitrea*', pure and transparent like glass, without spots which can eclipse God's irradiation. It is multicoloured, since it is adorned by Christ, its bridegroom ('*sponso suo*'), with different virtues and qualities. Moreover, it does not keep light in itself, but its internal beauty shines through words and actions ('*affatu, gestu et actu*'), bringing light and decoration to the *ecclesia militans*, to the environment where it is inserted, and to the people it meets. Already here, in this medieval text, colour becomes, as Marguerite Yourcenar (1992, 9) wrote in her *Écrit dans un jardin*, 'l'expression d'une vertu cachée' ('the expression of a hidden virtue').

As remarked upon by Kessler (2011a, 50) in his study on silver, it was not only materials, but also 'the processes used to produce such materials [which] were allegorized'. The author of the *De luce*, an attentive observer of the craftsmanship and commercial activities which animated medieval towns, often employs the sort of common

Table 10.1 Quattuor gradus rerum lucentium et illuminantium.

	Levels of luminosity	*Material world*	*Metaphysical counterpart*
1	Lucent sed non illuminant	Glass	Naïve believers
2	Lucent et illuminant	Precious stones or carbuncle	Believers who set an example through their words and behaviour
3	Lucent, illuminant, alios faciunt illuminatores	Flame behind an alabaster sheet	Theologians and preachers
4	Fons luminis	Sun	God

words and tools chiefly fit for workshops,[26] and in a similar fashion to Bonaventura (II Sent, d.XIII a.2q.2), compares the process of purification of the soul to processes in the *ars vitraria* (the art of glassmaking).[27] Just as shining glass is obtained by heating powder to very high temperature,[28] so the soul, by the inflammation of divine ardour is brought to perfection and becomes more beautiful.

The *magister* not only considers the transformation of objects due to human intervention and technique (*ars*), but also directs the attention of his readers to natural phenomena. The parallelism instituted by Bartholomaeus (Squadrani 1932, 486–487) between tears and earthly water is particularly effective. Salty seawater is warmed by the sun and rarefied ('*subtilius*'), rising to the sky as vapour and then returning to the ground as freshwater, in the form of cleansing, fecund rain, so divine that irradiation blows off a '*vaporem aquosum*' which, after reaching the head, falls down through the eyes under the shape of tears, clearing away any trace of impurity, and donating new life and spiritual sweetness.

On other occasions, cosmological theories, notions of geography, principles of optics and the natural sciences are combined in mental representations: actual *mappae mundi lucis* (light maps) intended to help the reader and the listener to pass from physical to metaphysical, to learn and retain the fundamentals of Catholic faith, mediated through the web of correspondence drawn between words and images. At the beginning of the *tractatus*, for instance, following a precise distinction between *lux, lumen, radius* and *splendor*, the Franciscan explains, starting from the elaborations of Grosseteste[29] and others, that illumination travels spherically, like sound and odours, extending in all directions from a specific locus, forming around the central point as if it were a luminous globe.[30] This is seen as corresponding to Christ, who chose to live and bring the Word into Jerusalem, considered as the centre of the world, in order that the light of his Word could spread in all directions[31] from the holy city. The intellectual rays proceeding from the Son serve to enlighten the angelical minds above, the fathers in Limbo below, the Patriarchs and the Prophets behind, the Apostles and disciples in front, the blessed on the right and, although with a different, yet still undeserved and sorting different effects, '*luminis influentia*', the damned souls on the left (Figures 10.3 and 10.4).

Such a repertoire of imagery and *similitudines* was particularly favoured by preachers, who wished to steer the attention of their listeners, to favour mnemonic acquisition and to render comprehensive the high theological concepts, by referring to objects

Table 10.2 Fenestra vitrea.

Material word	*Metaphysical counterpart*
Sun – Sensible light	Sun of Justice
Air – Medium	Words and actions
Glass-window:	Sainted soul:
- Transparent	- Pure
- Lets light pass through	- Shares its faith
- In different colours	- With different virtues
Sacred building	*Ecclesia militans*
Paints the surroundings	Shines through words and gestures
Coloured reflections	Spiritual enlightenment of neighbours

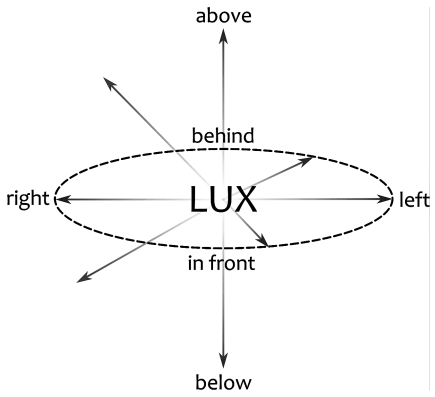

Figure 10.3 Spherical diffusion of light.
Graphical synthesis by the author.

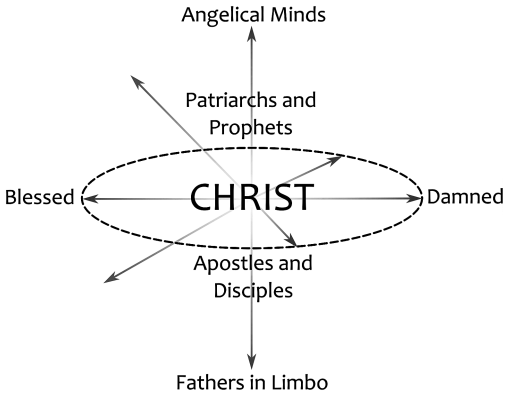

Figure 10.4 Emanation of spiritual Light in all directions.
Graphical synthesis by the author.

and phenomena with which people were familiar, and which could be seen within the walls of a church, or in their day-to-day life.[32] In addition, as was shown by Delcorno (2009) and Ledda (2003), capturing metaphors and erudite references helped preachers to affirm their prestige and defend their place in the increasingly contended sphere of 'professionals of the word'.

Bartholemaeus himself, as mentioned above, took advantage of the material dealt with in the *tractatus* for some of his sermons. In the *Sermo in Nativitate Domini*,[33] along with the aforementioned paragraphs about different levels of luminosity, the friar returns to his considerations on the reflection and refraction of light and, without entering into specialist details (geometric demonstrations, lexicon technicalities, etc.), makes use of some assumptions about optics to illustrate the various typologies and modalities of *visio Dei*.[34] Bartholomaeus holds that there are three different ways of seeing the light of a candle: directly, without mediations ('*per rectitudinalem*

Table 10.3 Visio Dei.

Ways of seeing	*Material world*	*Metaphysical counterpart*
Per rectitudinalem inspectionem	Candle	Direct vision after death
Per penetrationem	Candle through a transparent material	Christ during his life on earth
Per reflexionem	Candle reflected in a mirror	Signs in the book of Creation and the holy Writ

inspectionem'); through a glass or any other transparent material ('*per penetrationem*'); or reflected in a mirror ('*per reflexionem*'). Similarly, the Franciscan explains, through the letter of Paul (I Corinthians 13:12, 'For now we see in a mirror dimly, but then face to face') and the longtime exegetic tradition, that we will be able to see God in a direct way only after our death, when the eye pupils of the saints will become '*aquilina*', like those of an eagle. Christ's contemporaries had the chance to see the incarnate Logos, and thus they could perceive the light of God through his human body ('*per penetrationem*'). For all human beings, while living, the only possible way of seeing is the one '*per reflexionem*', which is an enigmatic view, as one can comprehend divinity only through the reading of the book of Creation and the holy Writ.

Optical metaphors in the preaching of Giordano from Pisa

Other better-known preachers also followed a similar path to that taken by Bartholomaeus, who evangelised in vernacular on the city streets, rather than in Latin inside universities. Ten years or so after the death of the *magister*, the famous Dominican preacher Giordano from Pisa often recalled optical images and similes – not taken directly from Bartholomaeus, yet raised in the same historical and cultural *milieu* – to explain the Bible to the Florentines.

In one sermon, pronounced from the pulpit in Santa Maria Novella on 2 February 1303 and dedicated to the gospel verse Luke 2:22 ('And when the time came for their purification'), Giordano dwelled on reflective surfaces and their properties[35] – essential topics for all treatises about *perspectiva* – identifying three types of mirrors: '*tondi*', i.e. convex, in which the reflected image is smaller than the real one; '*piani*', flat, in which the reflected image is the same size as the real one; and '*cavo*', concave, in which the reflection is turned upside down with respect to the object. Whatever the shape, the surface must be '*purissima*', clean, without any stain, because otherwise nothing would be visible on it.

After this 'scientific' foreword, the Dominican returns to theological contents and explains how the immaculate Virgin[36] can be compared to a spotlessly clean mirror – in fact she reflects in herself divine light more than any other creature – and she gathers the properties of all reflecting surfaces at the same time: convex, flat, and concave. In her life she could be compared with '*tonda*' mirrors, a circular figure, and thus perfect and complete, with nothing lacking and nothing in excess. In addition, she reflects God in various fashions: through her humility, she embraced him as her newborn child in swaddling clothes, and then as a man, somewhat 'upturned' and 'redimensioned' before divine power. On the other hand, Christ incarnate, born of the Virgin's womb, is '*perfetto*', like the reflection of a flat mirror, and in his earthly dimension is at once God and man, who, when questioned by Philip, could answer 'Whoever has seen

me has seen the Father' (John 14:9). Giordano makes a further comparison between mirrors and the Mother of Jesus: just as the former are cold, but become warm and reflective of heat when exposed to the sun, even to the extent of igniting wood, so did Mary receive and multiply in herself the '*lume celestiale*', the divine light, to become an example of ardent charity. In the following year (1304), he compared the Virgin with fabrics of various colours and qualities (Giordano da Pisa ed. 2006, 586–588). Referring to the Gospel and Proverbs 31:13 ('She seeks wool and flax, and works with willing hands'), the preacher highlights that Mary is similar to the fabrics she weaves.[37] As precious linen has to be kneaded and beaten,[38] so she 'macerated' her very flesh through penitence, until she became completely pure, as white as the fine white linen byssus.[39] At the same time the Virgin was compared with wool, 'warm' for the love and charity by which she was inflamed. Following the example of Mary, who gave her Son one dress of byssus and one of crimson, the faithful should be re-clothed in white linen, in order to live in innocence and without sin; and in crimson-coloured wool, in order to strive for goodness and to act under the drive of love and charity.

The collections of sermons of the Pisan, whose activity is widely documented and studied, contain a large amount of valuable hints into the metaphoric and symbolic meanings attributed to light and colours. In one of his sermons dated 25 April 1305, Giordano (ed. 1867, 329) makes use of the example of the luminous ray which passes through glass without breaking it, to explain the egress of Jesus from the sepulchre without damaging a single stone. From the same year, in a homily based on Mark 10:52 ('And immediately he recovered his sight and followed him on the way'), the preacher (ed. 1867, 329) muses upon the three lights necessary for vision – an external light, like the one from the sun; the light of the eye ('*omore lucido*'); and the light of intention, i.e. the will to see – and finds a spiritual correspondence with the divine triad grace, love and faith. All of these juxtapositions are further discussed. For instance, as colours cannot exist without the light of the sun,[40] so light and human virtues have no means of being without divine grace. Colours can thus partake of light at varying degrees, and white is the most luminous. In the same way, says Giordano, 'every virtue is a colour of the soul',[41] and charity, like the colour white, is the 'highest' and at the same time the most basic: the fundamental assumption on which any other quality builds.

In other pages, the Dominican takes the hint from artistic objects to give voice and efficacy to his own metaphysical cogitation. The virtues, which beautify souls, are thus compared to colours as well as to gems and precious stones[42] (Giordano da Pisa, ed.

Table 10.4 Representations of the Virgin.

Material world	*Metaphysical counterpart*
Mirrors	Virgin Mary
Clean, spotless	Pure, immaculate
Reflect light	Reflects in herself divine light more than any other creature
Circular figure	Perfection
Different properties of reflecting surfaces	Embraces Christ, perfect God and man
Fabrics	
Byssus – White	Purity through penitence
Wool – Crimson	Love and charity

1831, 73–74), and the *homo interior* is seen as a '*vasello*', a small vase, or as a window whose beauty lies in the joint presence of various tones.[43]

As for contemporary art, 'material, color, and ornament served to attract medieval viewers from the chaotic world of real life and to construct the spiritual experience' (Kessler 2004, 42). In the predication of Giordano, mental imagery evokes sensorial experiences in the audience (from time to time associated with eyesight, touch or taste, etc.) so that it could be led and accompanied in the meditation of what lies inside and beyond man ('trasumanar' says Dante, *Par.* I, 70).

Conclusion

The passages cited in this work are valuable – over and above their not inconsiderable literary importance and the fascination they hold – for the development of understanding into that constellation of meanings, theories and images which translated the physics and metaphysics of light (and colours) into one fundamental component of medieval culture. As we have seen, 'all could be described using metaphors of vision' (Conklin Akbari 2004, 42), and the reference to optical phenomena (together with relevant vocabulary) becomes indispensable for characterising, preaching and reflecting on such intangible concepts as divine mystery and intellectual faculties.

The texts examined here, which are filled with information and precious hints for the depiction of a certain scientific and philosophical scenario, constitute fertile ground for the extension and advancement of research into the 'allegorization of matter' (Kessler 2011a, 49), which was initiated and carried on by scholars such as Raff (1994) and Kessler. The metaphoric reading of natural phenomena and/or artistic products in a classroom or from the pulpit, the images and the mind schemes depicted by, among others, Bartholomaeus and Giordano, tell us much about the perception of reality, the worldview, of an epoch. The observation of how preachers in the Middle Ages employed 'pieces of material reality' to describe, illustrate and clarify metaphysical or philosophical concepts can surely help us to look at the art of that time, as was intended by Camille (1996, 11), 'not through the abstract eye of the engineer or the text-bound gaze of the iconographer, but rather through the eye as medieval understood it – a powerful sense-organ of perception, knowledge, and pleasure'. Although it is quite difficult, if not impossible, to empathize with the men and the vision of another historical era,[44] these witnesses which arrived to us in written form, but characterized by a tight bond with the places and the audiences for which they were conceived, constitute a valid instrument to 'grasp the codes', to come nearer to the perspective of the specific people they were addressed to, and to look more closely into those constructions, images and objects in which '[m]edieval people love to project themselves [. . .] just as we can enter into our video and computer screens' (Camille 1996, 15).

Notes

1 USI, Lugano-CH – francesca.galli@usi.ch.

2 Not much is known about Bartholomaeus's life. He surely studied in Paris in the late 1260s and was appointed regent master of theology around 1275. In 1279 he took part in the general chapter at Assisi as master of theology, and since 1282 until his death, after 1294, he lived and was active in Bologna, where he was also Provincial Minister (1285–1289).

3 The adjective 'sensible' (from Latin *sensibilis*) has here, and in all other occurrences in this paper, the meaning of 'perceptible by the senses', 'perceivable', which pertains to the material world, vs the 'spiritual'/invisible.

4 See *De luce*, Pars II, c. 1; Pars III, c. 1; Pars IV, c. 2 (Squadrani 1932, 346–349, 354–355, 373–374). The edition by Squadrani (1932) is always referred to when quoting *De luce* and *Sermo in Nativitate Domini* (published in the appendix of the same edition: 488–494) by Bartholomaeus de Bononia. A new critical and edition of *De luce* is currently being prepared. For a general introduction to Bartholomaeus and his work, see at least Galli 2013, where other references on this topic are listed.
5 On Giordano da Pisa, see at least Delcorno 1975.
6 My translation, from *De luce*, Introductio (Squadrani 1932, 229): 'Aliae vero Scripturae metaphorae, quae fere omnes sunt opacae naturae et hoc ipso ab ipso nostro debili oculo nequeunt videri perspicue, eo quod omnis res opacae et obscurae naturae quo minus participat de natura lucis, eo minus est visibilis, ideo etiam illarum consideratio relinquitur illis qui gaudent limpidioribus oculis. Nos autem ad praesens considerabimus ipsum propositum nobis similitudine lucis quoniam haec et per seipsam est visibilis, et confortativa est, et quasi in actum reductiva illius debilis luminis quod per naturam complantatum est nostris oculis'.
7 'I am the light of the world. Whoever follows me will not walk in darkness, but will have the light of life' (John 8:12). When quoting the Bible, the English Standard Version (ESV) is always used.
8 As far as we know, there are today two codices which preserve the text of this *tractatus*: ms. Plut.17 sin.8 (ff. 10r.–21v.), Biblioteca Medicea Laurenziana, Florence; ms. Canonici Pat. Lat. 52 (ff. 96r.–99v.), Bodleian Library, Oxford. The first, previously housed in the Library of the Franciscan Studium of Santa Croce in Florence, is anonymous and datable approximately to the end of the 13th century. It should have included at least one image, which unfortunately was never realized (see f. 20r.). See Doucet 1933, 309–328. The latter, which reports a much briefer version, is datable to the second half of the 14th century and was previously housed in the monastery of St. Bartolomeo in Pusterla, near Vicenza. See Coxe 1854, col. 318–321.
9 On *sermo modernus* see at least Beriou 2000 and Delcorno 2000.
10 On optics and philosophy of light in medieval culture, literature and art, see, at least, beyond works directly mentioned in this paper, Lindberg 1976; Camille 2000; Trottman and Vasiliu 2004; Denery 2005; Belting 2008.
11 See Peter of Limoges, ed. 2012.
12 About the construction of a luminous hierarchy and the selection, use and interpretation of certain materials, see also the papers in this volume by Vladimir Ivanovici, dealing with the same issue with focus on Late Antique art and culture, and by Maryam Mahvash, who makes a clear distinction between light absorbing and reflecting surfaces in Persian architecture.
13 For the passages explicitly quoted or mentioned, see *De luce*, Pars II, c. 1 (Squadrani 1932, 346–349).
14 '*Quattuor gradus rerum lucentium et illuminantium*'.
15 '*Ad immaterialem rerum ascendere contemplationem*'.
16 About the allegorical meanings ascribed to glass, see at least Dell'Acqua 2004.
17 '*Lucent, illuminant alia, et ita efficaciter illuminant ea, ut illa sufficient etiam illuminare, tertio loco, alia*'.
18 See also the study about the representations of the transmission of the Word through the 'iconographic device' of light conducted by Anthony McGrath in the article published in this volume.
19 See *Sermo in Nativitate Domini Fratris Bartholomei de Bononia* (Squadrani 1932, 490–491).
20 On Servasanctus de Faentia and its work, see Oliger 1924 and Del Castello 2013.
21 See *De luce*, Pars III, c. 1, r. 2 (Squadrani 1932, 354–355).
22 See *De luce*, Pars IV, c. 2 (Squadrani 1932, 373–374).
23 *Est radiorum suorum communicative*.
24 On metaphoric and symbolic meanings attributed to glass windows in the Middle Ages, see Galli 2013, in which several bibliographical references on this topic are listed.
25 About *medium-diaphanum*, material and mental transparency, see at least Vasiliu 1997 and Coccia 2005.
26 See *De luce*, Pars IV, c. 3 and c.5 (Squadrani 1932, 374–375, 472). In most cases, these are examples and *topoi* already recurrent in ancient works (Aristotle, Augustinus, etc.) and often returning in medieval treatises (Albertus Magnus, Thomas, etc.).
27 See *De luce*, Pars IV, c. 5 (Squadrani 1932, 472–473).

28 '*Per fortissimam ignitionem de aliquibus cineribus vitri lucida substantia educitur*'.
29 See at least the treatise *De luce*, edited by Panti (Roberto Grossatesta, ed. 2011).
30 See *De luce*, Pars I, c. 3 (Squadrani 1932, 235–238).
31 See also Figure 10.1.
32 With reference to the use of images in the exegesis and in medieval preaching, see at least Bolzoni 2004; Mocan 2010.
33 See *Sermo in Nativitate Domini Fratris Bartholomei de Bononia* (Squadrani 1932, 488–489).
34 For a wide introduction to this issue, see Trottmann 1995; Muessig and Putter 2006.
35 See Kessler 2011b (where several bibliographical references on this topic are listed).
36 Different images from optics are often associated to the Virgin and to the mystery of Incarnation. See at least Gros 1991 and Stoichita 1997, 67–87.
37 About the spiritualization of fabrics and dyes, see also the paper by Idries Trevathan in this volume, dealing with similar issues in Sufi culture.
38 '*Il lino sapete che ssi vuole curare molto, e macerare e battere, e di molta fatica è spezialmente quello lino d'Egitto*'.
39 '*Che significa per questo lino la carne sua, la quale ella maceroe per penitenzia, onde ella pervenne a quella purità, che fu come bisso bianchissima*'.
40 '*Colori non sono altro, secondo che dicono i savi, se non luce partecipata dalla prima luce*'.
41 '*Ogni vertude è uno colore dell'anima*'.
42 '*Ogne virtù è una gemma bellissima, ed una pietra preziosa, ed uno colore ornatissimo*'.
43 '*Questa natura pare di colori che tutti paiono legati ed attrecciati insieme e chi volessi fare una bella finestra di vetro, conviene che ci metta di tutti i colori, e quelle sono belle*'.
44 See Baxandall 1972, 29–40 (concept of the 'Period Eye').

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Figure 1.1 Map of Easter Island showing the locations mentioned in the text.
Image © 2016 DigitalGlobe; 2016 CNES/Astrium.

Figure 1.2 *Ahu* Anakena. Note the way differently coloured stones were used for visual effect.
Image © Adam Stanford, Aerial-Cam, http://www.aerial-cam.co.uk/.

Figure 1.3 Quarry of Puna Pau, with some *pukao* laying at the bottom.
Image © Adam Stanford, Aerial-Cam, http://www.aerial-cam.co.uk/.

Figure 1.4 Ahu moai with inserted coral eyes and *pukao*.
Image © Adam Stanford, Aerial-Cam, http://www.aerial-cam.co.uk/.

Figure 1.5 Exterior face of the *moai* quarry of Rano Raraku.
Image © Adam Stanford, Aerial-Cam, http://www.aerial-cam.co.uk/.

Figure 1.7 Paintings on cave wall depicting local birds.
Image © Adam Stanford, Aerial-Cam, http://www.aerial-cam.co.uk/.

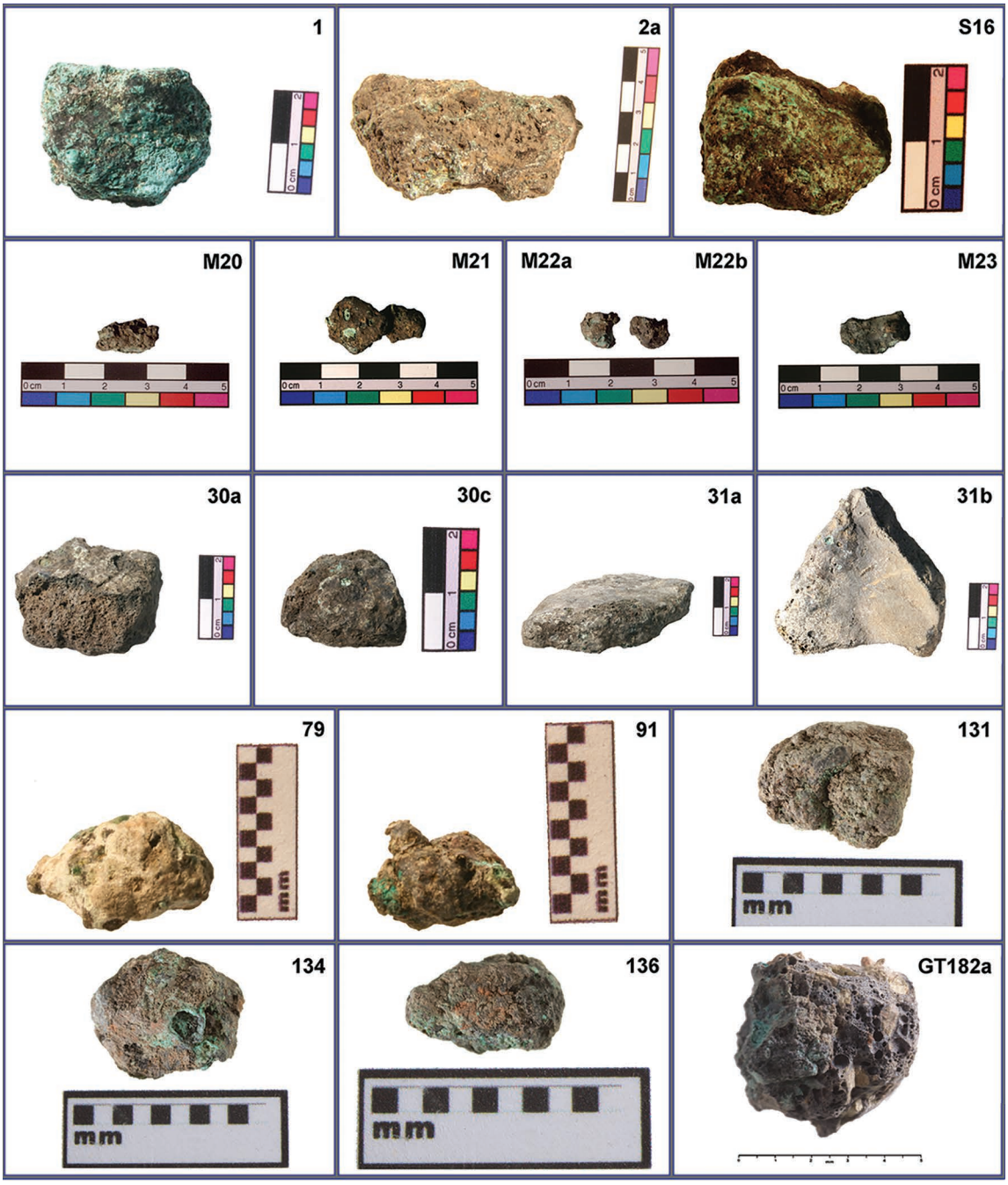

Figure 2.3 Copper minerals (Early Neolithic) and copper slags and slagged sherds (Vinča culture) studied here, with sample numbers in top right corner. Lepenski Vir 1 (copper mineral); Vlasac 2a (copper mineral); Kolubara- Jaričište S16 (copper mineral); Belovode M20, M21, M22a, M22b, M23, 131, 134 and 136 (free slag samples); ˇ Belovode 30a, 30c, 31a, 31b (slagged sherds); Vinča 79, 91 (free slag samples); and Gornja Tuzla 182a (fragment of a slagged sherd).

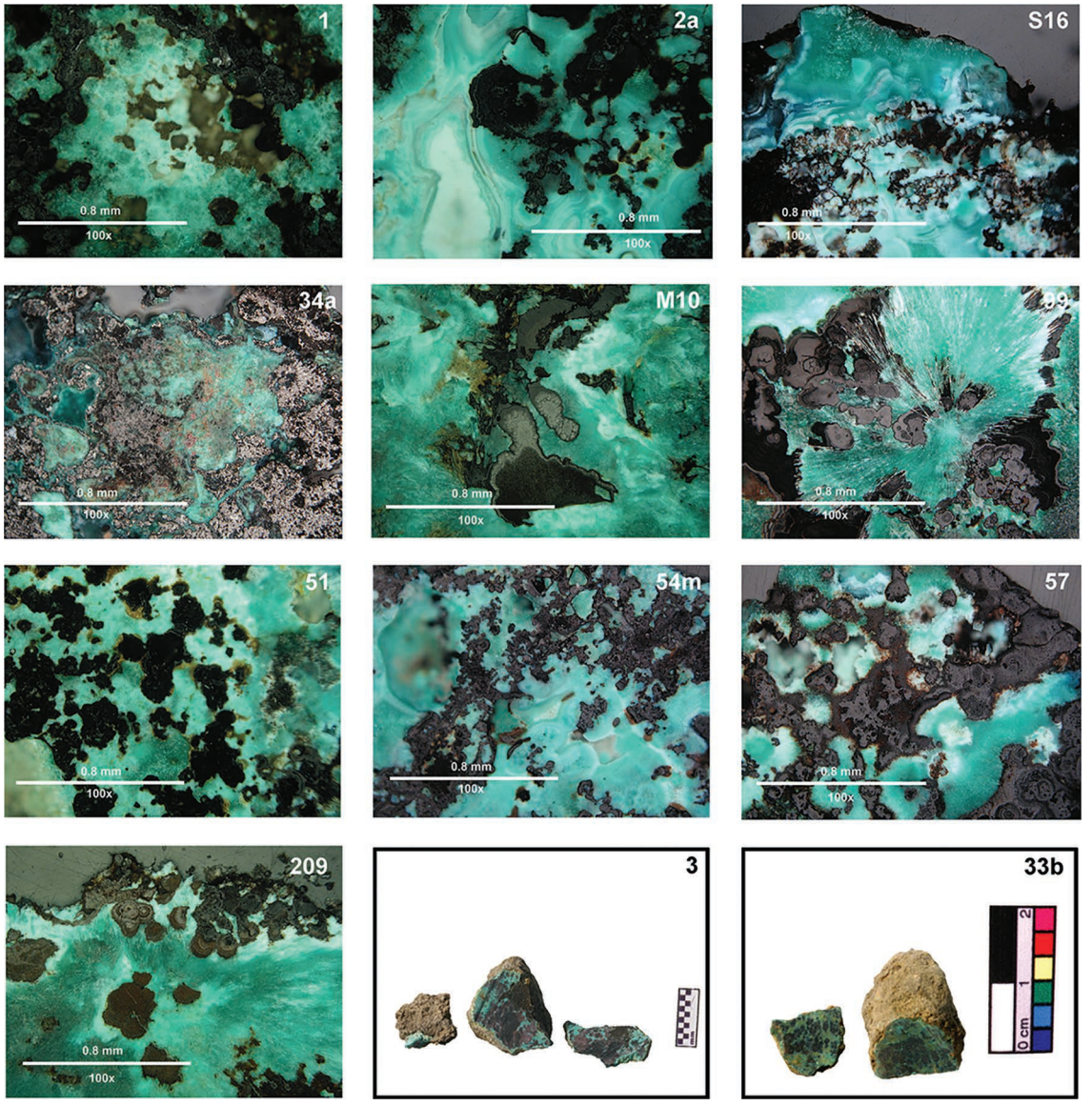

Figure 2.4 Photomicrographs of oxidic and sulphidic minerals studied here, under cross polarized light and with sample numbers on top right corner. Lepenski Vir 1; Vlasac 2a; Kolubara- Jaričište S16; Belovode 34a, M10; Vinča 99; Pločnik 51, 54m, 57 and 209; Belovode 3 and 33b.

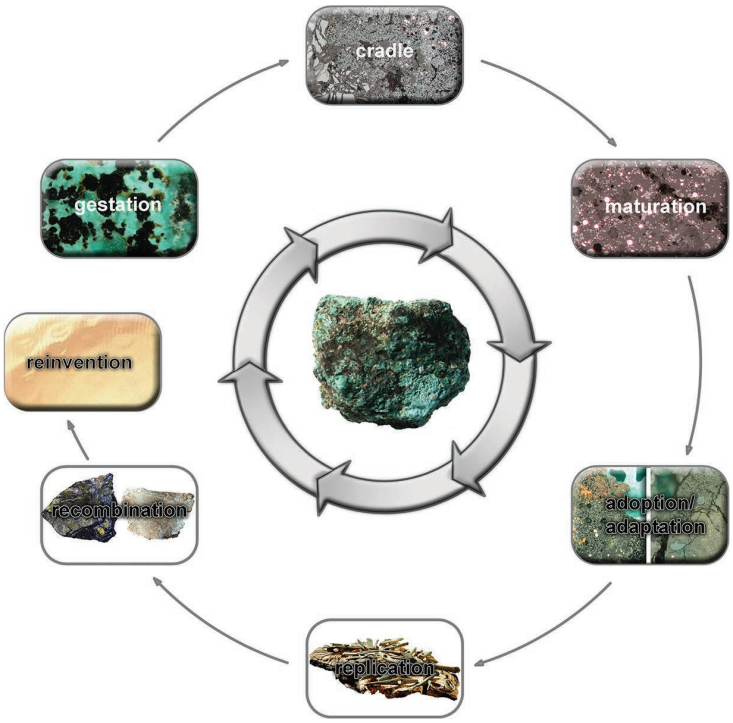

Figure 2.5 Schematic representation of the invention and innovation stages in Balkan copper metallurgy leading into another cycle of (re)invention of tin bronzes. The underlying technological meme is the black and green mineral/ore.

Replication stage image C K. Dimitrov; recombination stage image (left) C Ko Collection of minerals, Kyushu University, Japan.

Figure 2.6 Green flames during copper smelting.

Photograph by author.

Figure 3.1 A side-by-side comparison of two bronze jugs; whilst the jug on the left retains its patina, the example on the right has been extensively cleaned, revealing the original surface colouration of the metal.

Photograph by author.

Figure 3.3 Polychrome cultic bull-head rhyton from Shaft Grave IV at Mycenae, currently held at the National Museum at Athens (no. 384). A gold rosette was riveted to the centre of the bull's forehead. Its horns were of gilded wood. The muzzle area was gilded and originally included inlay. There is evidence to suggest the eyes were also originally inlaid, perhaps with a reddish substance. The ears were cast separately in copper, gilded on the front and silvered on the back.

Photograph by author.

Figure 3.4 Two examples of Mycenaean bronze daggers decorated with the 'Peinture en métal' technique. Top: Lily dagger from Mycenae, currently held at the National Museum at Athens (no. 764). Bottom: Dagger with hunting scene inspired by Egyptian iconography, from Mycenae, currently held at the National Museum at Athens (no. 765).

Photograph courtesy of Nicholas Soderberg.

Figure 3.5 Three bronze axeheads of differing ages. Top: This axehead, approximately a year old, retains its shine and colour. Right: This example, at five years old, has a visibly duller surface with a slightly darker colouration. Left: This axehead, at ten years old, has a duller and darker blade, with regions of deposited corrosion product.

Photograph by author.

Figure 3.6 Two of the three troublesome vessels from Shaft Grave IV at Mycenae (it was not possible to obtain a photograph of the third vessel at the time of going to press). Left: Patinated electrum goblet. Right: The silver Conical Rhyton. These are all currently held at the National Museum at Athens (nos. 390; 605–607; 477 and 481).

Photographs by author.

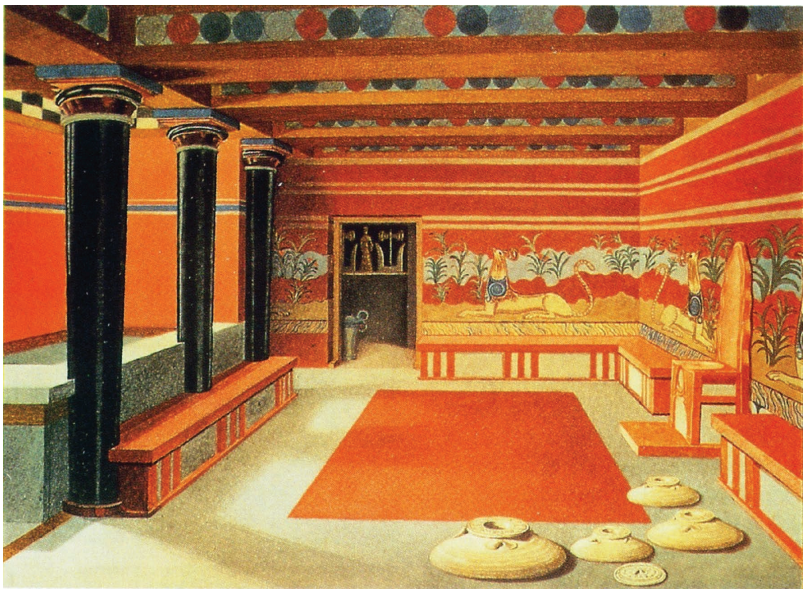

Figure 4.1 Edwin Lambert's reconstruction of the Throne Room. Evans 1935, frontispiece.

Figure 4.3 Gillierion's watercolour reconstruction of the Griffin Fresco. Evans 1935, Pl. 32.

Figure 5.1 The southern slopes of the Acropolis as seen from Philopappos Hill. It is images such as this, which depict the Parthenon basking in the light of an almost cloudless blue sky, which shape the public, and indeed scholarly, perception of the ancient temple and the "unique Attic light" that shines upon it.

Image: J.M. Beresford, summer 2006.

Figure 5.2 The urban sprawl of eastern Athens with Mount Hymettus rising behind. The New Acropolis Museum stands in the middle distance; the large building dwarfs the rest of the surrounding architecture and has thus been described as "[h]alf-asphyxiated by its surroundings, the filthy, untidy Athenian polykatoikies [apartment blocks] that seem to be piled on one another . . . the new Acropolis Museum appears as an alien creature landed in the heart of Athens, determined to fight for its vital space" (Plantzos 2011, 617).

Image: J.M. Beresford, taken early autumn 2014.

Figure 5.3 The Parthenon Gallery, located on the topmost floor of the New Acropolis Museum. The glass-walled gallery was specifically designed to maximize the amount of natural Attic light within, as well offering views across to the nearby Acropolis.

Image: Nikos Danielidis © Acropolis Museum.

Figure 5.4 Overcast conditions above the Acropolis. Despite the popular impression of invariably bright natural sunlight and clear blue skies over Athens, the reality is often rather different, especially from late autumn through to the middle of spring.

Image: J.M. Beresford, late November, 2014.

Figure 6.2 Presbytery and apse of San Vitale in Ravenna (ca. 548), seen from the gallery.
Photo by Vladimir Ivanovici.

Figure 6.3 Mosaic on the apse of San Vitale in Ravenna (ca. 548).
Photo by Vladimir Ivanovici.

Figure 6.4 Opus sectile decoration behind the sunthronon of the basilica Eufrasiana in Poreč; (ca. 560).

Photo by Vladimir Ivanovici.

Figure 6.5 Episcopal cathedra from the basilica Eufrasiana in Poreč; (ca. 560).
Photo by Vladimir Ivanovici.

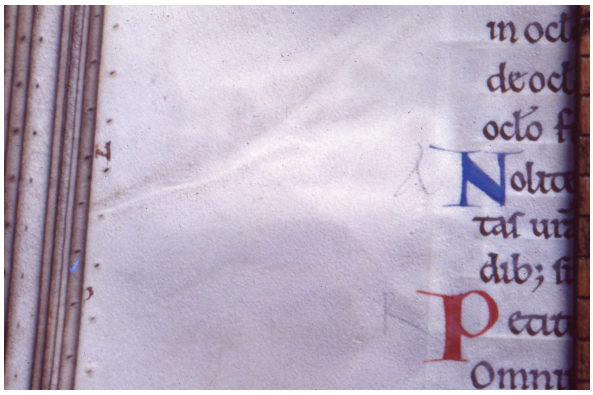

Figure 7.1 Hereford Ms. O. I. VIII.
Image: Hereford, Cathedral Library.

Figure 7.2 St. Albans Psalter, p. 52 (Incredulity of St. Thomas).
Image: Munich.

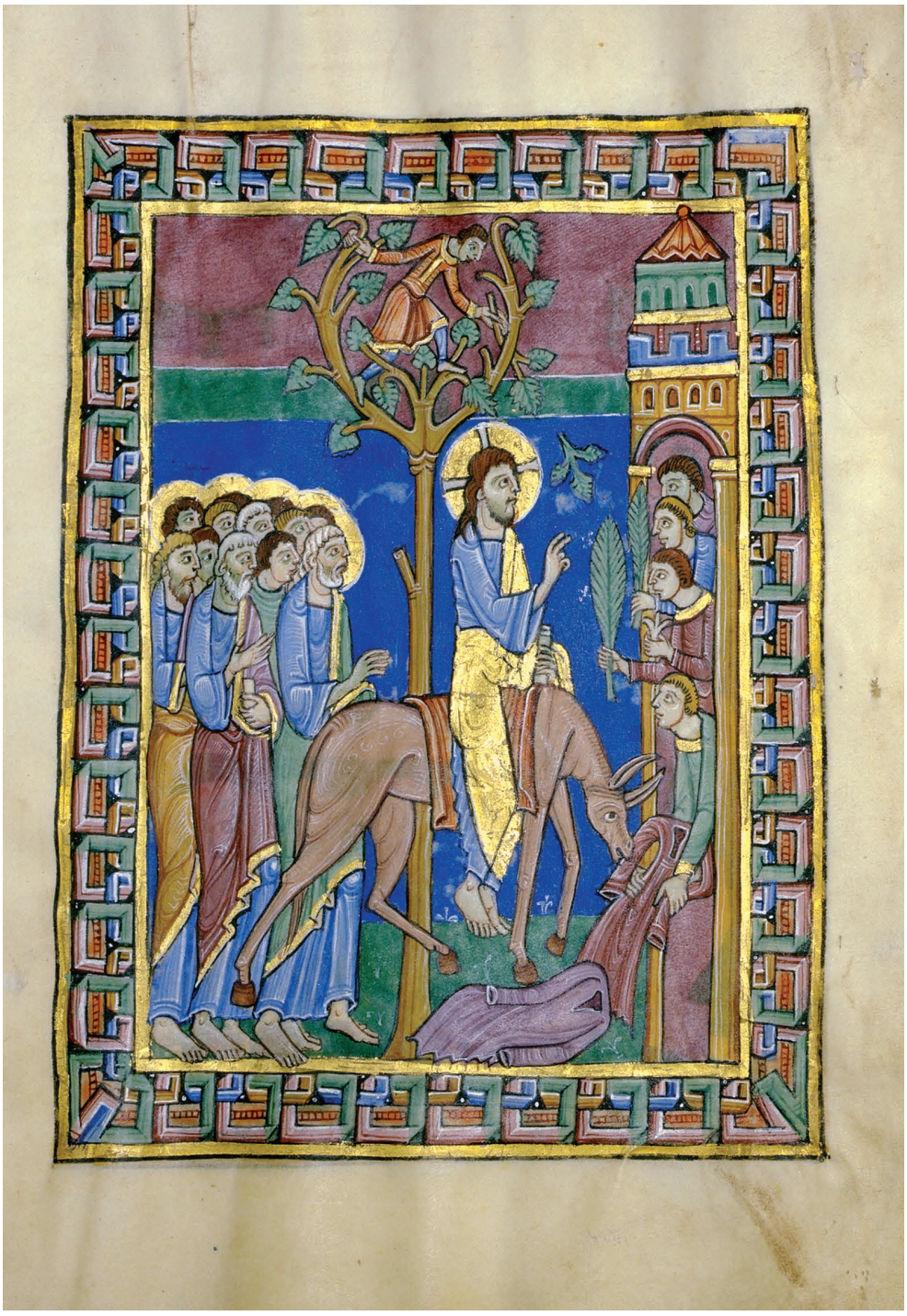

Figure 7.3 St. Albans Psalter, p. 37 (Entry into Jerusalem).

Figure 7.4 St. Albans Psalter, p. 23.

Figure 7.5 St. Albans Psalter, p. 51 (Mary Magdalen announcing the resurrection).

Figure 8.1 Church of St. Peter of Rates, general view of the nave and of the clustered piers that divide it from the collateral aisles.

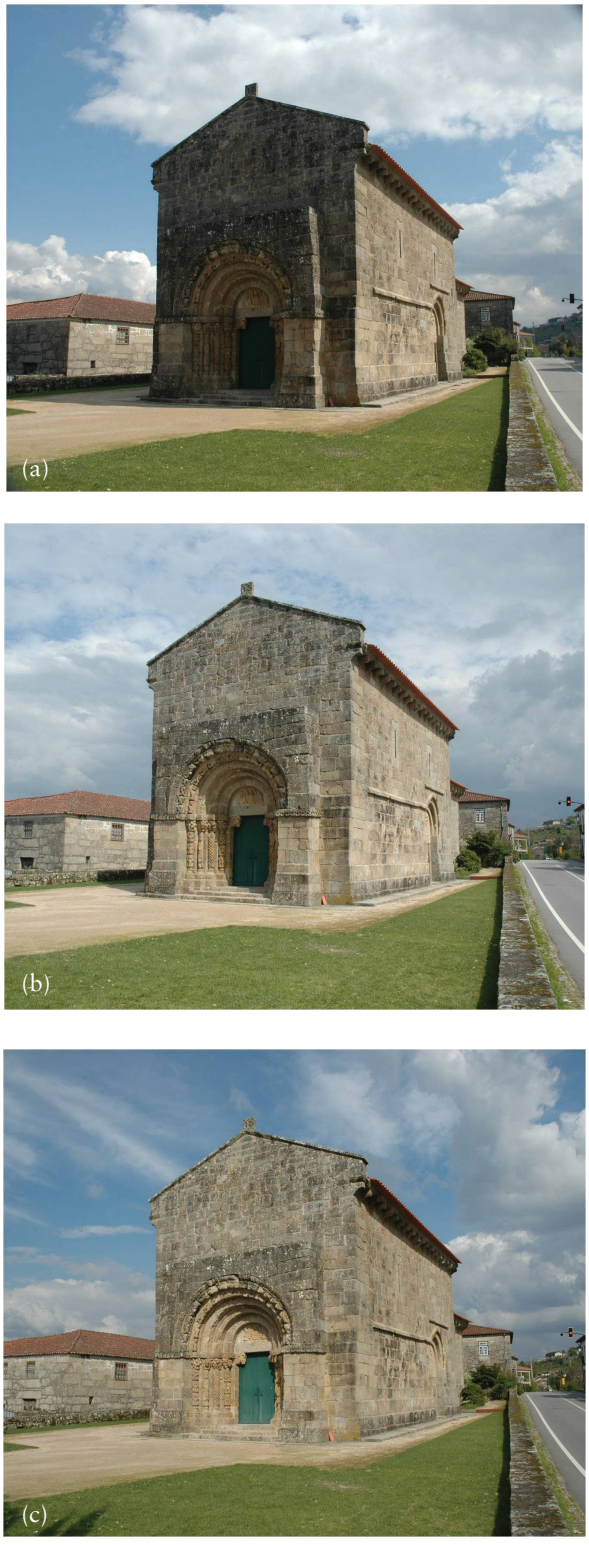

Figure 8.5 Church of the Saviour of Bravães: three views of the western façade being slowly lit at around (a) 12.30, (b) 14.00 and (c) 16.30 hours.

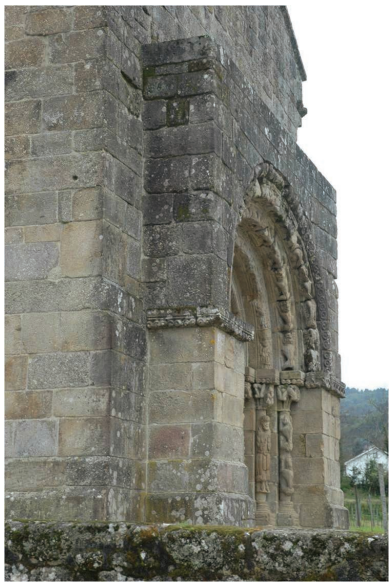

Figure 8.6 Church of the Saviour of Bravães, stonemasonry structure thickening the western façade.

Figure 9.1 Roundel of The Stigmatization of Saint Francis (detail), Umbrian workshop, 7 × 7 cm, gilded and painted glass, first half of the 14th century. From the Reliquary of the Companions of Saint Ursula, 27 × 37 × 21 cm, gilt copper, rock crystal, gemstones, enamel, Museo del Tesoro, Sacro Convento, Assisi.

www.assisi.de/Stefan Diller.

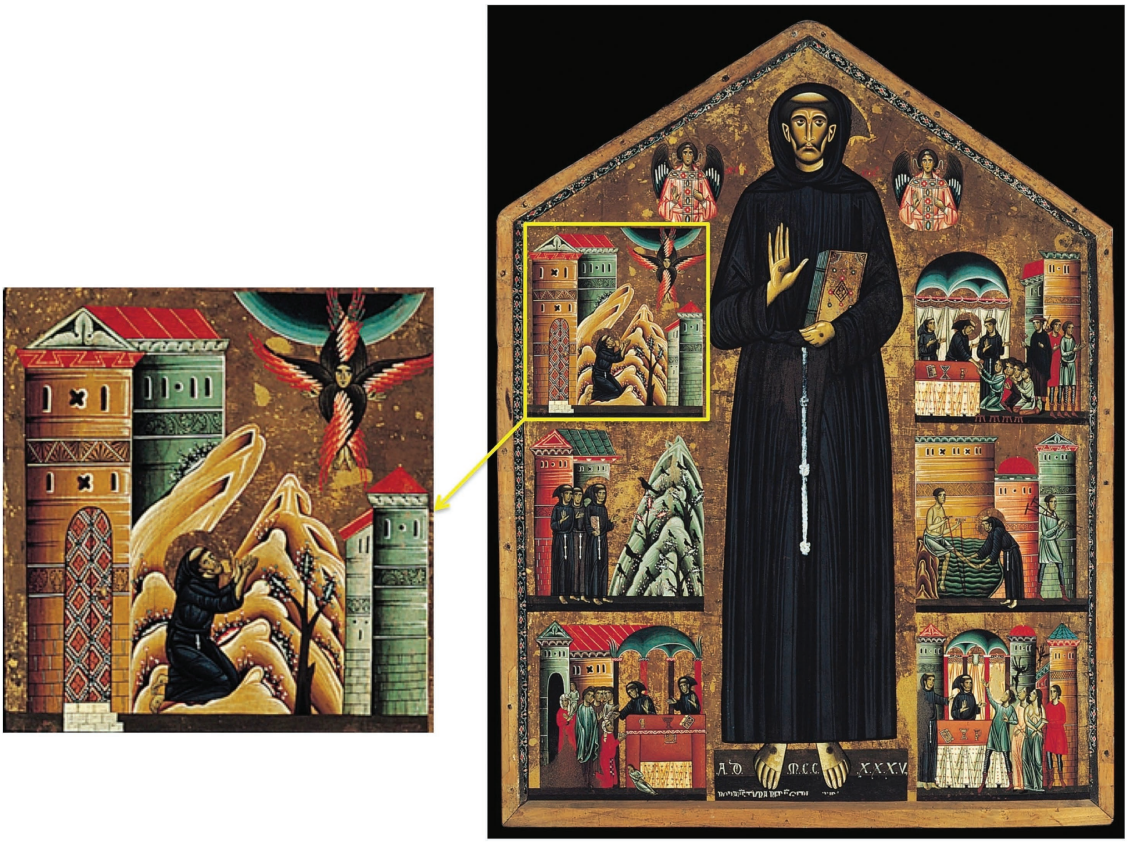

Figure 9.2 *The Stigmatization* (detail), from *Saint Francis and Stories of His Life*, Bonaventura Berlinghieri, 160 × 123 cm, tempera on panel, signed and dated 1235, San Francesco, Pescia.

The Art Archive. Photo Alfredo Dagli Orti.

Figure 9.3 *The Stigmatization* (detail), from the *Saint Francis Dossal*, Master of the Bardi Dossal, 234 × 127 cm, tempera on panel, ca. 1263–1266, Santa Croce, Florence.

Photo by the author.

Figure 9.4 The transference of light as a spiritual gaze, seen in: *The Stigmatization of Saint Francis* (left), Gradual MS 5, f. 181v, manuscript illumination, second half of the 13th century, Archivio Comunale, Montalcino (Courtesy of the Archivio Storico Comunale, Montalcino); and *Saint Francis Receives the Stigmata* (right), Master of the Bardi Dossal, 81 × 51 cm, tempera on panel, ca. 1240–1250, Galleria degli Uffizi, Florence (Courtesy of the Ministero dei Beni e delle Attivita Culturali).

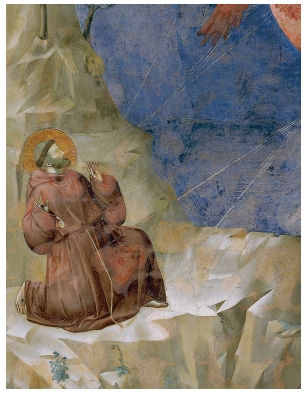

Figure 9.9 Detail of the *Stigmatization of Saint Francis* from the *Legend of Saint Francis*, Giotto di Bondone, fresco, 270 × 230 cm, ca. 1290–1296, Upper Church, San Francesco, Assisi.

www.assisi.de/Stefan Diller.

Figure 9.10 The *Stigmatization* (detail), from the *Reliquary Diptych 135/VD*, Emilian workshop, 27 × 33 cm, gilded and painted glass, 14th century, Museo Civico d'Arte Antica, Palazzo Madama, Turin.

Reproduced by permission of the Fondazione Torino Musei.

Figure 9.13 *Stigmatization of Saint Francis,* Florentine artist, 30.5 × 33 cm, gilded and painted glass, second half of the 14th century, Museo Nazionale del Bargello, Florence.

Courtesy of the Ministero dei Beni a delle Attivita Culturali.

Figure 10.1 Miniature of the spheres between heaven and hell, with God emanating light around and angels at the top, and falling angels becoming devils – Book of Hours, Use of Sarum (The 'Neville of Hornby Hours'), England, S. E. (London?); 2nd quarter of the 14th century, possibly the 4th decade.

Figure 10.2 Detail of a diagram of the shape and strata of the universe, in Sacrobosco, 'De sphaera' – Astronomical miscellany including Sacrobosco, 'De sphaera' (ff. 22–33); Solar tables for 1292–95 (ff. 61–62v); 'Theorica Planetarum' (ff. 81–88); canons for Toledan tables (ff. 97v–119v) and Toledan tables (ff. 120–194v), France, Central (Paris); c. 1292.

Figure 11.1 Simone Martini, *S. Caterina Polyptych*, 1319–1320, Museo Nazionale di S. Matteo, Pisa (Soprintendenza BAPSAE di Pisa e Livorno).

Figure 11.2 Detail of St Thomas Aquinas.

Figure 11.3 Lippo Memmi (attrib.), *Triumph of St Thomas Aquinas*, after 1323, S. Caterina, Pisa (Photo Scala, Florence).

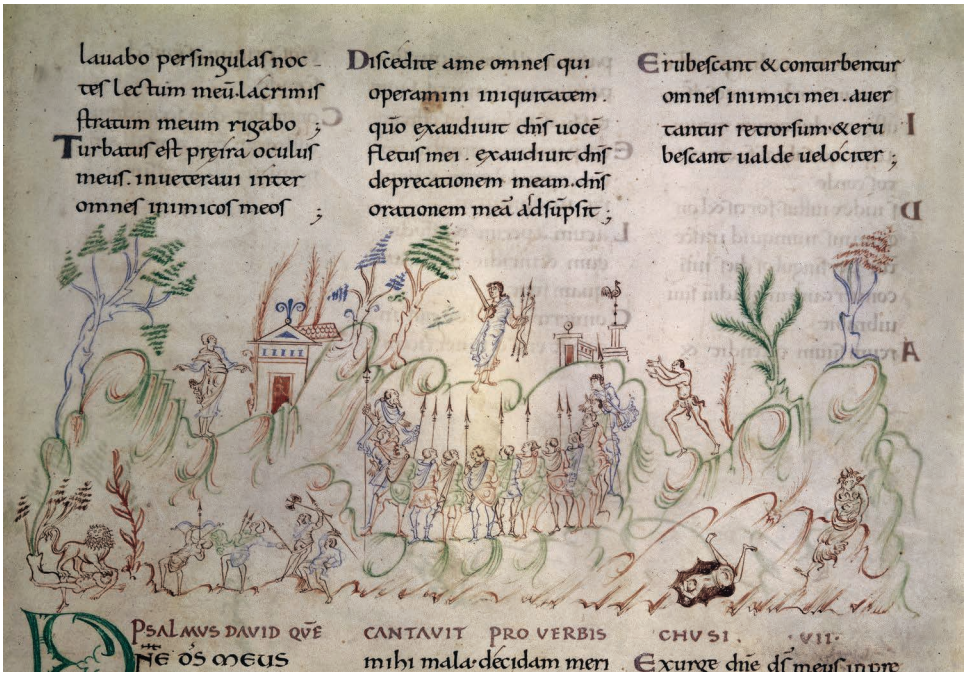

Figure 12.1 Harley Psalter (London, British Library, MS Harley 603, folio 4r).

Figure 12.2 Guthlac Roll (London, British Library, MS Harley Roll, Y. 6, roundel 8).

Figure 12.3 Ramsey Psalter (London, British Library, MS Harley 2904, folio 3v).

Figure 12.4 Tanner Apocalypse (Oxford, Bodleian, MS Tanner 184, folio 23r).

(a) (b)

Figure 12.5 *The Life of St. Edward the Confessor*, Cambridge, University Library, MS Ee.3.59, folio (a) 12r (*left*) and (b) 12v (*right*).

Figure 13.2 Southern prayer hall, Friday Mosque (Masjid-I Jāmi'), Iṣfahan, Iran, 8th–11th century.

Photograph of author.

Figure 13.3 Looking from the *Qibla* wall upwards, to the dome; details of stucco decorations of the *mihrāb* and brickworks of the Friday Mosque of Ardistan, Iran, 10th–11th century.

Photograph of author.

Figure 13.4 Dome chamber and grilles, looking at eastern wall towards dome, Shaykh lutf Allah Mosque, Iṣfahan, Iran, 1601–1628.

Photograph of author.

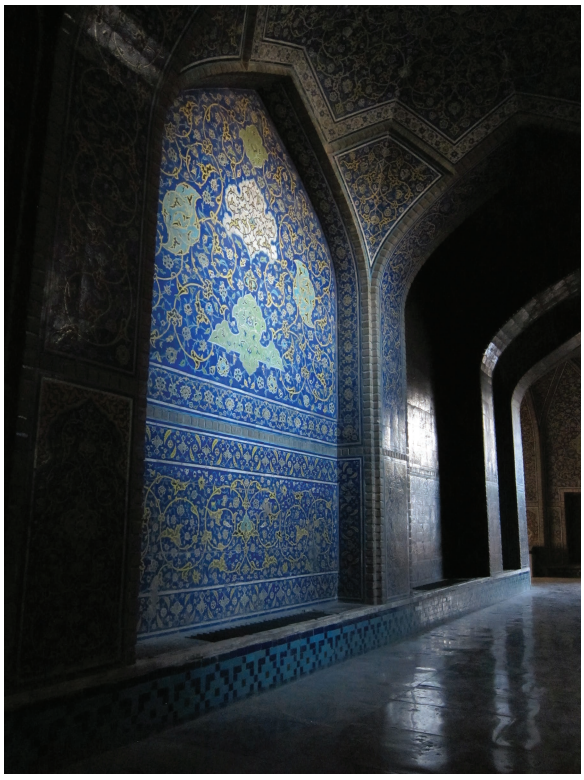

Figure 13.5 Northern corridor, Sheykh lutf Allah Mosque, Iṣfahan, Iran, 1601–1628.
Photograph of author.

Figure 13.6 Dome Chamber, Sheykh Lutf Allah Mosque, Iṣfahan, Iran, 1601–1628.
Photograph of author.

Figure 13.7 Southern *iwān* and dome chamber, Shah mosque, Iṣfahan, Iran, 1611–1629.
Photograph of author.

(a)

(b)

Figure 14.1 The Shah Mosque, Isfahan, (a) the interior courtyard, (b) as seen from Maidan Square.
Photograph author's own.

Figure 14.2 The main prayer hall, Shah Mosque, Isfahan.
Photograph author's own.

Figure 14.5 Completed *Haft rang* revetment ready to be applied to a wall. While the colours are mass-produced glazes from abroad, the technique has remained unchanged since the Safavid period.

Photograph author's own.

Figure 14.6 Muqarnas portal employing both tile mosaic and *Haft rang*.

Photograph author's own.

Figure 14.7 The interior of one of the domes.
Photograph author's own.

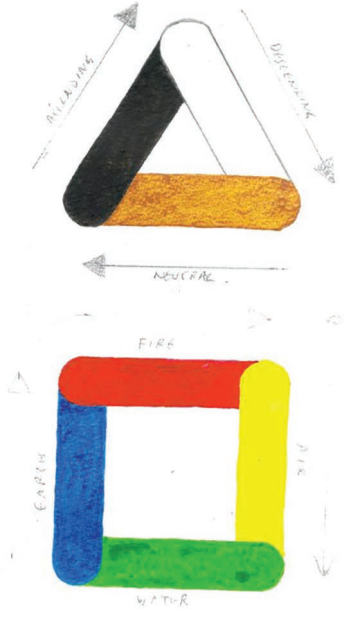

Figure 14.8 *Haft rang* is composed of two groups. The first comprises three colours: white, black, and sandalwood; the second includes red, yellow, green, and blue. Glazed bricks employing the seven colours are shown on the right. These were used in the conservation of the mosque's dome.

Photograph author's own.

11 Light, the Dominicans and the cult of St. Thomas Aquinas

Anthony McGrath

This chapter will explore the importance of light in the early promotion of the cult of St. Thomas Aquinas in the first half of the 14th century. Representations of divine illumination are found in pictures of the Annunciation where rays are used to symbolise the transmission of the Word to the Virgin, in pictures of the Stigmatisation of St. Francis, and in some images of Christ where he is shown with a surrounding luminescence. However, in the earliest images of Thomas Aquinas he is shown with one or more books, from which rays of light emerge. A key example is Simone Martini's S. Caterina Polyptych, which was installed before Thomas was canonized in 1323 and arguably commissioned before the canonization process had even begun. The inclusion of Thomas in the predella with the attribute of a book and light rays leads to an interpretation of the polyptych as a schematic of the way God's teaching is transmitted, with the Dominican Order at the centre of that process. The schematic is developed further in the Triumph of St. Thomas Aquinas, c.1323, by (probably) Lippus de Sena, where the descent of knowledge is represented by a network of rays, again emphasising the role of the Dominicans and reflecting their study of light, both physical and divine.

Introduction

This paper will consider in some detail two important Italian paintings from the first half of the 14th century, the *S. Caterina Polyptych* by Simone Martini and the *Triumph of St. Thomas Aquinas*, attributed to Lippo Memmi, and will explore how light was represented and used. First, however, it reviews the progress made through the 13th century in understanding light as a physical phenomenon and the shifting role it was deemed to play in God's interaction with mankind.

Light and the friars

The first and largest of the Mendicant Orders of friars were the Franciscans, founded in 1209, and the Dominicans, founded in 1216. Both Orders expanded rapidly in the 13th century and attracted some of the finest teachers and scholars of the time – and it was these friars who took the lead in the 13th century in thinking about light and optics. First Franciscan, and then Dominican, friars sought to explain light and understand its role in the divine order, building on the writings of St. Augustine, who considered light to be a central and essential feature of a synthesis of theology and

philosophy. Augustine identified God with light, the Trinity with light and knowledge with light. One of the hallmarks of the Augustinian tradition was the doctrine of divine illumination, whereby 'for a grasp of intelligible things, the mind must be irradiated with divine light' (Lindberg 1983, xli) – and it was by divine illumination that Christ had access to the human soul, and the mind perceived the Word of God (Markus 1967, 366).

The Franciscan St. Bonaventure (1217–1274) stated that all knowledge came by divine illumination and that light was the vector that connected body and soul (Lindberg 1986, 17). An explanation of how this was achieved in terms of optics was constructed by another Franciscan, Roger Bacon (c.1214–1294), with his theory of 'Multiplication of Species' (Lindberg 1983, xxxv ff). The Baconian optical synthesis reconciled the differing theories of a whole range of philosophers including Augustine, Aristotle and Averroes, as well as Euclid, Ptolemy, al-Kindi, Avicenna and Alhazen. While Bacon's explanation would later be challenged (notably by William of Ockham) it was, nonetheless, the prevailing theory of optics in the early decades of the 14th century.

The Dominican Ulrich Engelbert of Strasbourg (1225–1277) was a direct contemporary of Thomas Aquinas and a fellow student under Albertus Magnus (Torrell 1993, 314). Ulrich and his fellow German students were more impressed by the Neoplatonic aspects of Albertus's teaching than the Aristotelian (Weisheipl 1975, 43), and Ulrich went on to write *De Summo Bono* ("On the Supreme Good"), that cast God as the Absolute Truth at the summit of an hierarchical order. Knowledge flowed down this hierarchy by divine illumination and was a form of 'Light Metaphysics' that was clearly Neoplatonic and Augustinian in its origins (Hinnebusch 1973, 299–300).[1]

A second Dominican disciple of Albertus was Dietrich of Frieberg (1250–1310).[2] Characterised as 'Neoplatonist and Augustinian in theology and as Aristotelian in philosophy' (Hinnebusch 1973, 300), Dietrich was active in natural philosophy (optics), metaphysics and theology. He opposed certain doctrines of Thomas Aquinas as to the nature of existence, and accepted the traditional Neoplatonic concept of a hierarchical order. In *De visione beatifica* Dietrich reworked the Doctrine of Divine Illumination and argued that the 'hidden recess of the mind' allowed a continuous knowledge of, and by, God.[3] In 1304 Dietrich was attending the General Chapter in Toulouse and was asked by the newly elected Master General of the Dominican Order, Aymeric Giliani of Piacenza, to write a treatise 'on the causes and mode of generation and apparition of rainbows and other radiant phenomena'. This treatise, *De iride et radialibus impressionibus,* was completed by 1310 and is the work by which Dietrich is best known, as he was the first person to correctly explain the phenomenon of the rainbow. In the preface of this work Dietrich notes that scientific knowledge is 'one of the most esteemed goods in the Dominican household' and that the science of the 'rainbow and of radiant phenomena' ranks among the most valuable of scientific matters.[4]

The spiritual dimension of light had been characterised in Italian art in the 13th century with the depiction of rays of light used to symbolise the transmission of the Word from God the Father to the Virgin in Annunciation scenes,[5] to symbolise the transfer of the Stigmata to St Francis[6] and sometimes to show the personal luminescence of Christ.[7] A novel application of this trope was to symbolise the onward transmission of the Word to the faithful. The intermediary was Thomas Aquinas, and the earliest example is found on the S. Caterina Polyptych by Simone Martini.

The S. Caterina Polyptych

This altarpiece once stood on the high altar of the Dominican church in Pisa.[8] It is large, imposing and justly regarded as important[9] (See Figure 11.1 in colour plates). The museum's description of the subject as *Vergine col bambino e santi* suggests that the polyptych was intended as a devotional object dedicated to the Virgin and Child, albeit with a large number of saints and prophets in attendance. However, the complexity of the piece and the unusual iconography raises the possibility that there were other objectives in the minds of the commissioner and the artist. There are 44 figures, 28 books or epistles, six scrolls and two tablets, plus assorted additional attributes for individual saints. Such a density of books in a single composition is unprecedented.[10] Saints that were not customarily portrayed with books now have them, and one book, that held by the *Doctor Communis*, Thomas Aquinas, is portrayed radiating light, a detail that is again without precedent (See Figure 11.2 in colour plates).[11] The degree of innovation deployed by Simone Martini, whether of his own volition or at the command of others, suggests that unusual factors were influencing the composition. That this innovation was being used on an altarpiece for a high altar, when the norm would have been a composition on traditional lines, is also significant (Gardner von Teuffel 1999, 195). The purpose of what follows is to unpick the detail and derive a hypothesis explaining those factors.

At the heart of the composition is an assertion of the Catholic Church's right to be the sole gatekeeper to the Word of God, and the claim of the Dominican Order to be the authority on the interpretation and exposition of the Word. This claim depended on the acceptance by the Church and the Universities of the doctrines and commentaries written by Aquinas. It was a bold power play by the Order, and the altarpiece is a first attempt to render pictorially both the process by which knowledge of God's wisdom is received and transmitted to the faithful, and the central role of the Dominicans in that process.

The inclusion of Thomas Aquinas, complete with a nimbus denoting sainthood, is an innovation of particular significance, one that influences many aspects of the overall composition. Other scholars have demonstrated that the polyptych was finished and installed in 1319/20.[12] Aquinas was not canonised until 1323, so it is relevant to analyse the altarpiece in the context of his canonisation process. Aquinas died in 1274. His canonization was an important objective for the Dominican Order, not least as a way of reversing the condemnations issued against aspects of Thomist teaching by the Bishop of Paris, Stephen Tempier, in 1277.[13] An initial attempt by the Dominicans to interest Pope Benedict IX in a cause for canonization was made in 1303, but terminated with the death of the Pope in 1304 (Gerulaitis 1967, 36). In about 1317, Pope John XXII offered to add a third Dominican Saint to Saints Dominic and Peter Martyr, as a mark of his esteem for the Order, and possibly as part of his encouragement to the Order to expand (Vauchez 1997, 75, n.41).[14] This seems to have prompted the Dominican Province of the Kingdom of Sicily, a province which included Naples and the Aquino family estates at Roccasecca, to commence an inquest or inquiry into the life and miracles of Aquinas in November 1317, the consequence of which was a submission to the Pope in Avignon in August 1318. This submission contained a record of the miracles ascribed to the saintliness of Aquinas, a draft biography (the *Ystoria)*, and a request for his canonization supported by King Robert of Naples and his mother Queen Marie, by the University of Naples and by the Dominican Province (Gerulaitis

1967, 37; Vauchez 1997, 79; Kelly 2003, 98). John XXII was already well disposed to Thomist teachings, as evidenced by his collection of all the works of Aquinas (see Torrell 1993, 317–318), and had declared in March of that year that the doctrines expounded by Aquinas were miraculous and that 'He alone enlightened the Church more than all other doctors; a man can derive more profit in a year from his books than from pondering all his life the teaching of others'.[15] It was in response to the submission that Pope John ordered the formal process of examination and appointed a commission of three cardinals (Gerulaitis 1967, 37). The first Canonization Enquiry took place at the Archbishop's Palace in Naples from 21 July to 18 September 1319 (Foster 1959, 82).

An altarpiece of the scale of the S. Caterina Polyptych (in its current form it has a surface area of over 5.7 square metres and originally had an elaborate frame (see Gardner von Teuffel 1979, 46)) would have taken many months to construct, carve and paint. If it is correct that it was installed on the high altar in 1319/20, then the commission must have been awarded in 1318 or even 1317,[16] well before the first Canonization Enquiry or even the submission by the Sicilian province in August 1318. No contract for the commission has survived, thus it is not known whether it was the intention from the first to include an image of Aquinas, although it will be argued that the detail of the iconography suggests that it was.[17]

There were precedents for the painting of an un-canonised person. Local cults existed in the 12th and 13th centuries which included the making of devotional images of saintly persons, often to further their cause for canonization, a matter then for the local bishop. However, following the *Decretals* of Gregory IX in 1234, the authority to canonize was reserved to the pope alone (Gerulaitis 1967, 28), and subsequently moves were taken to suppress the practice of venerating images of the un-canonized.[18] The decision by the Dominicans in Pisa to include an image of Aquinas in their new altarpiece would presumably only have been countenanced after the pope had offered to make a third Dominican saint and (given that Aquinas was not the only candidate[19]) made his declaration about the importance of Aquinas in March 1318.

Whatever the reasons for the initiative, the decision to include Aquinas on the altarpiece was a risk, as his canonization might not have taken place. The experience of 1304, when Pope Benedict IX had showed a willingness to see a process of canonization for Thomas but then died, showed what could go awry.

The image of Aquinas is placed on the predella, immediately to the right of the central section. He is shown half-length (as are all the figures) and facing the viewer. He has a sombre face and the eyes are lifted upwards, as though gazing into the distance. He wears Dominican dress and has a nimbus that matches those of the other saints on the predella. Aquinas holds an open book that has an inscription that is shown as radiating light. The inscription, a contracted form of 'veritatem meditabitur guttur meum et labia mea detestabuntur (impium)', is from verse 7 of Chapter 8 of the Book of Proverbs concerning Wisdom ('My mouth shall meditate truth, and my lips shall hate wickedness'), but is also the *incipit* of Book I of the *Summa contra Gentiles*. This book is regarded as the second most important of Aquinas's works, the first being the *Summa Theologiae*. The *Summa Theologiae* does not have quotations from the Bible as *incipits* in the same way as each book of the *Summa contra Gentiles* has a quotation. This may have been significant in that while the designers of the iconography may have wished to indicate a work by Aquinas, a passage from the Bible may well have been deemed more appropriate for an altarpiece, especially as Aquinas was not

then a saint. An advantage of indicating Book I of the *Summa contra Gentiles* was that the opening chapters of the book proclaim both the wisdom of the author and the importance given to the pursuit of wisdom. Thus:

> Among all human pursuits, the pursuit of wisdom is more perfect, more noble, more useful, and more full of joy.[20]
>
> (*Summa contra Gentiles, Book I, Chapter 2)*

For an institution such as S. Caterina, which was a place of learning with an important library, this was validation of its objectives and a justification for its occupation and possessions.

A second, possibly complementary, explanation may lie in the wider purpose of the *Summa contra Gentiles*. Book IV includes Aquinas's explanation of how mankind can achieve knowledge of God, and that God's wisdom descends to man by divine revelation. Therefore, although the inscription is the *incipit* of Book I of the *Summa contra Gentiles*, it may be that the whole work is intended to be referenced.

In the late Middle Ages it was believed that God favoured his earthly servants with divine powers, and as a consequence, saintliness in a person might be detected or determined by the presence of those exceptional, God-given, attributes. Among the most keenly sought attributes were physical beauty and luminosity. In Book IV of the *Summa contra Gentiles*, Aquinas writes:

> Therefore, just as the soul which enjoys the divine vision will be filled with a kind of spiritual lightsomeness, so by a certain overflow from the soul to the body, the body will in its own way put on the lightsomeness of glory. Hence, the Apostle says: 'It is sown in dishonor. It shall rise in glory' (1 Cor. 15:43); for our body is dark now, but then it will be lightsome; as Matthew (13:43) has it: "The just shall shine as the sun in the kingdom of their Father.[21]
>
> (*Summa contra Gentiles, Book IV, Chapter 86)*

What constituted physical beauty was not straightforward. However, beauty in a modern sense was not something that anybody could claim for Aquinas. Witnesses speak of him being large and heavy with a bald forehead (Torrell 1993, 278). His nickname at Paris had been 'the Dumb Ox', and this was probably an accurate summation of his physical appearance, albeit not his intellectual ability (Weisheipl 1975, 44). There are also accounts of him being followed and admired by country folk because of his size and corpulence (Vauchez 1997, 437). However, it was his mind that was celebrated, the product of which was his writings. Thus, if the intention was to indicate and promote the saintliness of Aquinas, the addition of light rays to his words was a symbol that would have been understood and would have drawn attention to his teachings. It would also be an attribute that was distinct and did not conflict with the attributes and appearance of the other saints.

Aquinas's position on the predella was significant. The central Man of Sorrows has been associated with the feast of Corpus Christi, the liturgy for which has traditionally been ascribed to Aquinas (Cannon 1982, 73).[22] He is placed immediately to the right of the central trio of the Virgin, Christ and St. Mark.[23] To his right is St. Augustine of Hippo and St. Agnes, a saint for whom Aquinas had a particular devotion. Next to Agnes is another Doctor of the Church, St. Ambrose. Mirroring Augustine

and Ambrose are, on the left hand side of the predella, the remaining Doctors of the Church, Saints Jerome and Gregory. Between these two saints is St. Lucia, looking towards the Man of Sorrows (and hence Aquinas) and holding up her lamp, thereby providing light and 'illuminating grace'.[24]

Altarpiece predellas were an established format by 1317, even though they were still novel. While their pictorial content was usually well integrated with the other registers, there appears to be some evidence to suggest that they could be used to convey a particular message.[25] This is the case with the predella of the Pisa Polyptych: it was used to promote the cause for the canonisation of Thomas Aquinas. He is shown in the company of the Doctors of the Church, but the symbolism of the book with radiating inscription demonstrates that his teachings are superior: he is accompanied by St. Agnes for whom he had a particular devotion; the need to demonstrate saintliness by luminescence is achieved by the rays of light from his book and the presence of St. Lucia; and he is placed immediately adjacent to the central panel with the Man of Sorrows. Yet, Thomas was not yet a saint, thus some caution was in order, and placing his image on the predella, the lowest register of the altarpiece, may have been regarded as appropriate. However, while caution was exercised, the inclusion of Aquinas was essential to the overall message of the altarpiece: that the Dominican Order was the authority on the interpretation and exposition of the Word.

Turning to the parts of the altarpiece above the predella, these consist of seven vertical sections, each divided into main, upper and gable registers.[26] The central gable is occupied by Christ Verbum, shown half length, giving a blessing with his right hand and supporting a book with his left. The book is open and appears to be resting on the picture frame. The text is an abbreviated form of 'ego sum Alpha et Omega principium et finis' from Apocalypse 1:8. The other six gables are occupied by the four major prophets holding inscriptions that foretell the incarnation, plus King David holding a harp, and Moses with tablets inscribed with the ten commandments.

In the upper register there are 12 apostles, including St. Paul. The latter holds his epistles and, although they are not open, the top one does have its title, 'AD ROMANOS' – I suggest that this is symbolic of their accessibility. St. Jude (Thaddeus) also appears to be holding an epistle, although without a title.[27] Of the remaining apostles, all hold books. St. Matthew is writing in his book, which carries the text 'In illo t[em] p[ore] dixit ihs discipulis' ('at that time Jesus said to his disciples'), which is the standard phrase used when introducing the *Evangelium* or reading from the Gospels in the liturgy of the mass (see Sheerin 1996, 166).

The main register has a central Virgin and Child, supported by John the Evangelist and John the Baptist and, outside of them, Saints Dominic and Mary Magdalene, and Saints Peter Martyr and Catherine of Alexandria. The Christ child in the central panel holds a small, red book; Saints Peter Martyr and Catherine hold closed books; and Saints John and Dominic hold open books. Only the letter 'I' (plus possibly the top of letters 'p' and 'r') is visible in John's book, presumably to indicate the opening words of his gospel: 'In principio erat verbum'. St Dominic's book has the words: 'Venite filii audite me timorem domini docebo vos' from Psalm 33, verse 12.[28] As is clear from the commentary on this verse by Thomas Aquinas, this is about teaching the word of God to the faithful, the central role of the Order of Preachers.[29]

The greater incidence of images of books in the Pisa altarpiece may be part of the pictorial statement in support of the canonization of Thomas Aquinas, or a statement about the claims of the *Studium Artium* and substantial library at S. Caterina, or a

reflection of what was then the current trend to associate sainthood with intellectual activity (Vauchez 1997, 346 ff).

The S. Caterina Polyptych can be 'read' with at least three layers of meaning. The first is straightforward and is as a work of devotion to the Virgin and Child. The second meaning is as a statement of the Dominican cause for the canonization of Thomas Aquinas. He is shown in the predella with a saint's nimbus and radiant text, on the same level as the four Doctors of the Church, adjoining the central panel of the Man of Sorrows, and with St. Agnes close-by to signify his miracles.

The third meaning is the most profound, in that for the first time the altarpiece plots a process by which God's teaching is transmitted, placing the Dominican order at the centre of that process. The book held by Christ Verbum is open. The text held by Matthew proclaims that Christ taught his disciples, and the Apostles are shown holding books to symbolise that received wisdom. The writings of the Evangelists (and it should be noted that all four of the Evangelists hold open books, although the two in the predella do not have visible texts) in turn informed the Doctors of the Church, and then Thomas Aquinas. The texts held by the prophets and the commandments held by Moses are also 'open' in that their texts can be read, as, I suggest, are the epistles of St. Paul. Finally, there is Thomas Aquinas, facing the viewer and presenting his open book with radiant text, thus transmitting the wisdom of Christ to the faithful.

In the main register, the presence of Saints Dominic and Peter Martyr holding books makes a clear statement of Dominican learning and authority. The binding of each of their books is coloured red, as is the book held by St. Catherine of Alexandria (a patron saint of learning and education) and the little book held by the Christ Child. The books share an identity, thereby showing that Dominican teaching was consistent and doctrinally sound.

Thus, at the heart of the composition is an assertion of the Catholic Church's right to be the gatekeeper to the Word of God, and a claim by the Dominican Order to be the authority on the interpretation and exposition of the Word. However, this was a claim that depended on an acceptance of the doctrines and commentaries written by Thomas Aquinas. Therefore, including an image of Thomas on the altarpiece had to be part of the composition from its inception.

Thomas Aquinas was canonized in 1323 by Pope John XXII, and on 14 February 1325 the bishop of Paris, Stephen Bourret, annulled the 1277 condemnations by Bishop Stephen Tempier, to the extent that they affected Thomas (Torrell 1993, 324). The Dominicans had triumphed, and this paved the way for a more expansive representation of Thomas Aquinas, the so-called *Triumph of St Thomas Aquinas,* also at S. Caterina, Pisa (See Figure 11.3 in colour plates).[30]

Triumph of St Thomas Aquinas panel

There is no certainty of the authorship of this panel. It was attributed to Francesco Traini by Vasari and subsequently to various obscure masters. Current opinion follows the analysis by Joseph Polzer who attributes the painting to Lippo Memmi, the brother-in-law of Simone Martini, assisted by others. Various dates have been offered although Polzer has argued that the altarpiece dates from the time of the canonization in 1323, or even just before.[31] While a commission at the time of canonization is possible, for the reasons given earlier in this chapter, it is highly unlikely that the altarpiece

would have been commissioned earlier. Even with the precedent of Simone Martini's *Polyptych*, the commissioning of a large altarpiece with Aquinas as the dominant figure, and with a nimbus, would have been too risky an enterprise prior to the canonization process being completed.

In the middle of the panel the figure of Aquinas is shown seated, at the centre of a series of concentric circles, the meaning of which is unclear but may refer to the spheres of the cosmos. Around him are ten identifiable figures plus a crowd of the faithful. Sixteen books or tablets are visible, the majority of which are open. Golden rays connect figures and books, symbolising the transfer of knowledge and forming a radiance that emanates from the book held by Aquinas.

At the top, Christ is enthroned within a mandorla. Holding a closed book with his left hand and raising his right in blessing, Christ looks down at Aquinas, seated below him. Moses, Paul and the Evangelists are shown as half-length figures, seemingly leaning over the parapet of Heaven, and all staring at Aquinas. Plato and Aristotle are on either side, full length, with their names inscribed, and also looking directly at Aquinas. Directly below him is the figure of the Arabic scholar Averroes, lying on the ground and looking dejected.[32] To either side is a crowd of figures, seemingly clerics and lay people, but they include no women and only one Franciscan.

Aquinas holds one book and has another four books resting on his lap. The book held by Aquinas bears the same inscription as appears on his book in the Simone Martini *Polyptych*, the *incipit* from the *Summa contra Gentiles*. Of the four books lying on his lap, the two lower books have meaningless ornamental texts, while the upper left book shows the beginning of *Genesis,* and the upper right book has the opening words of Peter Lombard's *Sentences*.[33] These were the two key texts used in the study of theology when Aquinas was at Paris, therefore they represent the foundation of his knowledge.

The two tablets held by Moses are inscribed with four abbreviated Commandments: 'non adorabis deos alienos', 'honora patrem et matrem', 'non occides' and 'non furtus facies'.[34] The book held by Paul is inscribed with 'Paulus servus Ihu Xpi vocatus apostolus segregatus', which are the opening words of his Epistle to the Romans. The formula of using the opening words is also followed with the books held by Matthew, Mark and John, while Luke's book shows the fifth verse of his gospel, which is equivalent, being the opening verse of his narrative on Christ.[35] On each book or tablet the initial letter of the text is in red. These books and texts represent the teachings contained in the Old and New Testaments and the Acts of the Apostles, the fundamental texts for Aquinas's work.

The inclusion of images of Aristotle and Plato in a religious panel is without precedent.[36] The presence of Aristotle is understandable given Aquinas's life-work in reconciling Aristotelian philosophy with Catholic theology; the presence of Plato is potentially significant. Weisheipl notes that 'Thomas had access to practically nothing of Plato's writings' (1975, 318),[37] and his only significant discourse on him is an evaluation of Plato, Aristotle and other philosophers in the unfinished *De substantiis separatis* (or *De angelis*) that dates from his last years (Torrell 1993, 220–221). Aquinas was not a Neoplatonist like Albertus Magnus, but his thinking was nonetheless influenced by Platonism (see Quinn 1996, 91). As the altarpiece was intended to show the sources that influenced Aquinas, Plato's inclusion makes sense and allows the composition to be balanced. It may also have suited those who commissioned the altarpiece in that it accommodated the Neoplatonist thinking of the early 14th century.

The descent of Divine Knowledge is represented by a network of rays. While the enthroned Christ holds a book, it is closed, and the rays do not come from it. The rays emerge from the mouth of Christ: single rays travel to the heads of the Evangelists, Paul and Moses, and three rays descend to the head of Aquinas. The four Evangelists, Paul, Moses and the two philosophers all hold up books, and from the initial red letter of each there is a single ray that goes to Aquinas's head. From his book there is an all-round radiance of rays which are extended downwards to the massed clerics on either side, plus a single ray that strikes the book lying by Averroes. In the midst of the rays extending downwards are two more texts. On the right is 'doctor gentium in fide et veritate' from Paul's first Epistle to Timothy,[38] while on the left is 'hic adinvenit omnem viam disciplinae' from the Old Testament Prophecy of Baruch.[39]

Such a construction of rays has no precedent in art and should be considered as being in two forms. The first is the radiance that emanates from Aquinas's book. This is the saint's attribute and can be seen as deriving from the S. Caterina Polyptych. In addition, it is entirely plausible to think of these rays as indicating the transmission of the Wisdom of Christ to the congregation, especially as Aquinas's eyes now engage with the viewer, a 'reciprocity of gaze' that had significance in the Middle Ages (see Gardner 2007, 215). However, to a degree greater than in the Polyptych, the rays seem to inhabit the picture plane and do not suggest a forward or outward radiation.

The second form of rays is the network that connects the various persons in the composition. If these rays had been omitted, the Descent of Knowledge would still be obvious given the juxtaposition of the various figures, their manner of staring at Aquinas and the way the texts are held open to him, rather than to the viewer. Furthermore, Aristotle and Plato would only be included on an altarpiece in a clear role of giving philosophical instruction to a saint, and this would suggest a process of knowledge transfer. Thus, the need to innovate and add rays connecting the figures points to there being a deeper meaning, a requirement to emphasise something in addition to the Descent of Knowledge. Given that these rays start from the mouth of Christ, the immediate interpretation is that they are intended to represent Divine Illumination. Yet this was also a theory that was largely rejected by Aquinas, who is now seen as the man who caused the theory to fall out of favour.[40] Therefore, is it not a contradiction to see the rays as representing the Divine Illumination in the context of the doctrines of Aquinas?

It is my proposal that this construction is a product of a Neoplatonic reaction against some aspects of Thomistic thinking: an assertion that Divine Illumination was still valid and had played a role in the development of Aquinas's teaching. If so, it was an assertion made against the tide of opinion and would not be repeated. The choice of symbolism was also apposite given the Dominican interest in optics. So, while placing Aquinas at the heroic centre of a process whereby God's wisdom is made available to the clergy, the composition nevertheless seems to include a symbolic representation of the doctrine of Divine Illumination that Thomas had rejected.

Indeed, it is clear that while the weight of opinion had shifted away from Neoplatonic philosophy at the end of the 13th century, there was a succession of Dominican scholars who maintained an essentially Neoplatonist philosophy based on the works of Proclus throughout the 14th century (Gilson 1955, 437). It is impossible to know now how, and to what extent, these currents of changing philosophical belief and scientific knowledge might have influenced the composition of *The Triumph of St Thomas*

Aquinas altarpiece. The presence of a *Studium Artium* and a substantial library at S. Caterina would suggest a level of awareness of those currents, but we know too little about the Dominican friars there to permit any conclusions to be drawn.

The possibility that the system of rays was intended to symbolise the Neoplatonic doctrine of Divine Illumination is supported by the absence of this symbolism appearing in later compositions celebrating Aquinas. While in future images his book may radiate light[41] and he may be portrayed illuminating the church,[42] there is no further representation that shows a descent of knowledge by light. The most substantial example of a *Triumph* from the 14th century is the fresco by Andrea di Bonaiuto in the Chapter House at Santa Maria Novella, Florence (1366), by which time the doctrine of Divine Illumination had been largely discredited. Aquinas is enthroned and there is a radiance of light around him, but there is no system of rays connecting the figures.

Conclusion

The *S. Caterina Polyptych* and *The Triumph of St Thomas* together make a remarkable statement by the Dominicans of the convent of S. Caterina. Their schematics of the way God's teaching is transmitted to the faithful placed the Dominicans, and specifically Thomas Aquinas, at the heart of the process. They emphasised the importance of books as sources of wisdom and knowledge, and provided a pictorial demonstration of the role of light as the vector by which the wisdom and knowledge is transferred from Christ to the learned and, through their books, onwards to the faithful. The importance of books to the Dominicans was not something new. A former Master General of the Order, Humbert of Romans, had written: 'Celestial wisdom is like a fountain flowing from heaven through the channel of books'.[43] As representing the Word of God, books lend authority. As representing the studies, learning and writings of the Dominican Order, they add authority to the Order's claim to be the conduit by which Christ's teaching is passed to the clergy and the faithful. Books represent wisdom, whether it be from God or from the 'ancient philosophers'; yet the pictorial use of light rays, whether radiating from an inscription or linking persons and books, was a novel device, and one that was probably linked to a belief in divine illumination. The Dominicans had attempted to understand and explain the philosophical and theological dimensions of light and, in that context, it can be seen as appropriate that the representation of light was employed by the Dominicans as an iconographic device for the transmission of the Word.

Notes

1 Also Gilson 1955, 431–433.
2 Often referred to in the literature as Theodoric of Freiburg. It is actually uncertain whether Dietrich did even meet, let alone study under, Albertus (see Führer 2009).
3 See Gilson 1955, 437 and 754, note 18. However, Markus Führer states that it is unclear whether Dietrich accepted or rejected the Doctrine of Divine Illumination and that it depends on how his writings are interpreted. He contrasts the writing of Dietrich on this subject with those of Albertus Magnus and takes the view that when Dietrich writes 'All beings shine forth in its essence' he is not advocating a doctrine of divine illumination but merely that 'the intellect reflects all things'. He also indicates that Dietrich's attitude to the doctrine shifted with the general decline in its support at the end of the 13th century (Führer 2009, Aug 2010, Section 11).

4 The text of *De Iride* is given in Würschmidt 1914. See also Wallace 1959, 174.
5 For example: Guido da Siena, the *Annunciation* panel from the San Domenico Altarpiece, c.1270, Princeton University Art Museum.
6 For example: Master of the Bardi St. Francis/Coppo di Marcovaldi, *Stigmatisation* scene from the Dossal of St. Francis, 1245–1265, Bardi Chapel, Santa Croce, Florence.
7 For example: Giotto, the figure of Christ in the *Last Judgement*, c.1304, in the Capella degli Scrovegni, Padua.
8 The panel is now in the Museo Nazionale di S. Matteo, Pisa. Dimensions: 195 x 340 cms (Cannon 2013, 138–148). For bibliography see also Leone de Castris 2003, 352–353.
9 'One of the most important altarpieces to have survived from that period' (Van Os 1992, 252).
10 For example, the Polyptych No 47 in Siena's Pinacoteca Nazionale, by Duccio, c.1305–10, has the Madonna and child accompanied by four saints, 12 prophets, four angels and Christ Logos, with 11 scrolls and just three books. In the main front panel of Duccio's *Maestà*, c.1308–11, (that 'richest and most complex altarpiece to have been created in Italy' – John White) the Madonna and Child are accompanied by 20 saints and 20 angels, the former with 9 books and 3 *rotuli*.
11 That manuscripts should be thought of as illuminating the reader was already an established idea. See Sharon Lacey, "Tinted drawing: Translucency, luminosity and lumen vitae", in this volume.
12 The evidence is helpfully laid out in Cannon 1982, 69. The *Annales* of S Caterina indicate that the installation took place in 1320, and it is assumed that this date is according to the medieval Pisan calendar which was in advance of the calendar in common use elsewhere by eight months and seven days (see Maginnis 1977, 285). If correct, the actual date of installation was during the 12 months following Easter 1319.
13 While not initially aimed at the writings of Thomas Aquinas, the moves taken by the Church against 'radical Aristotelianism' in Paris had the effect of stopping Thomist teaching and led to a revival of Augustinian doctrines. See Torrell 1993, 298 ff.
14 Also Hinnebusch 1965, 252
15 As quoted by Pope Pius XI in *Studiorum Ducem* 1923, http://www.papalencyclicals.net/Pius11/P11STUDI.HTM. See also Maritain 1931, 184.
16 Measured by date of contract to installation, Duccio's *Maestà* took 2 years and 8 months, although it has been suggested that the work had been commenced prior to contract (see Bellosi 1999, 11). The few contracts of the period that have survived do not contain a completion date. See White 1979, 34 ff and Appendix on Documents; also Milanesi 1893, 22–23.
17 As John White has noted, the initial stage of production of an altarpiece was the making of the frame, so a final decision on the iconography could have been taken part-way through the process (1979, 35).
18 For example, the cults of Armanno Pungilupo in Ferrara and Gugliema Boema in Milan, which were suppressed by Boniface VIII (see Vauchez 1997, 88–89).
19 King James II of Aragon had proposed the Catalan Raymond of Peñafort (see Torrell 1993, 317).
20 'Inter omnia vero hominum studia sapientiae studium est perfectius, sublimius, utilius et iucundius.' Aquinas (c. 1260).
21 'Sicut igitur anima divina visione fruens quadam spirituali claritate replebitur, ita per quandam redundantiam ex anima in corpus, ipsum corpus suo modo claritatis gloriae induetur. Unde dicit apostolus, I Cor. 15–43: *seminatur corpus in ignobilitate, surget in gloria*: quia corpus nostrum nunc est opacum, tunc autem erit clarum; secundum illud Matth. 13–43: *fulgebunt iusti sicut sol in regno patris eorum*.' Aquinas (c. 1260).
22 The question of whether Aquinas was actually the author of the liturgy has been disputed, not least because of the seeming reluctance of the Dominicans to observe the feast, but this has now been resolved in his favour, and it is clear that by the early 14th century there was belief, even among Dominicans, in his authorship. It may be relevant to the dating of the polyptych that the Dominican order only adopted the feast of Corpus Christi at their General Chapter in 1318. The feast had been originally promulgated by Pope Urban IV in 1264, although this was generally ignored in the Church, and the papal promulgation was repeated by John XXII in 1317. See Weisheipl 1975, 176–177, 183.
23 The inclusion of St. Mark rather than St. John is presumably a consequence of the latter's presence in the main register. This is possibly the earliest example of the Man of Sorrows appearing in a predella, and its appearance may be influenced by the earliest sculptural

example, on the lectern of the Pulpit for Pisa Cathedral, by Giovanni Pisano (1301–1310), now in the Staatliche Museen zu Berlin (see Stubblebine 1969, 8–9).

24 In the *Golden Legend*, de Voragine commences his account of St. Lucia by stating that the name comes from *lux*/light and can be interpreted as 'way of light' (de Voragine 1993, Vol. I, 27). Another contemporary literary source is *The Divine Comedy* where Luccia appears as an emissary to Beatrice from the *donna gentile* (i.e. the Virgin Mary). This is in Canto II of the *Inferno*, which was in circulation by 1314, and demonstrates that St. Lucia, albeit a cult saint of Sicily and Southern Italy, was also revered in Tuscany by the early 14th century. An interpretation of the meaning Dante attached to Luccia, as the 'illuminating grace', is given by Curtius, although he concedes that what Dante was intending is not entirely clear (see Curtius 1953, 376–377).

25 See, for example, Simone Martini's panel *St Louis of Toulouse Crowning Robert of Anjou,* 1317, now in Museo Nazionale di Capodimonte, Naples. This panel was painted shortly after the canonization of Louis in 1317, and while the main panel celebrated the new saint and his relationship to Robert of Anjou, the predella established an iconography for the saint (see Gardner 1976, 30).

26 In total, the altarpiece is in 14 pieces and various reconstructions have been proposed and tried in the past. The sequence of the predella panels has been determined by reference to the grain of the wood on which they are painted and the main sections assembled by reference to the relative importance of the upper tier figures (see Cannon 1982, 69–70 and notes 7 and 8).

27 The lack of title could be because Jude only wrote one epistle, or because Aquinas did not write a commentary on Jude.

28 'Come, children, hearken to me: I will teach you the fear of the Lord.'

29 Latin and English text of Aquinas's Commentary of the Psalms is available on http://dhsprior y.org/thomas/PsalmsAquinas/ThoPs33H34.htm.

30 Also known as the *Glorification of St Thomas*. Its dimensions are 421 x 259 cms, so it is higher but narrower than the Simone Martini *Polyptych*. Documentary evidence from the 14th century suggests that the panel was originally not associated with an altar and was hung in the nave of S. Caterina. Popular devotion to the saint prompted the placing, in c.1355, of an altar in the nave of which the panel became the altarpiece (Polzer 1993, 31).

31 While the altarpiece was attributed to Francesco Traini the date was thought to be later. An extant fragment of a contract was supposed to relate to the altarpiece and gave a date of installation of 1364, although this has now been shown to be an error. There is no known contract for the altarpiece, and the earliest documentary reference to it is an entry in the *Annali* of S. Caterina which refers to events in c.1353, indicating that the altarpiece had been existence for some time before then. See Meiss 1933, 116; also Meiss 1960, 55 n.2; Mallory 1975, 17 n.24; Polzer 1993, 31; Cannon 2013, 148–150.

32 Ibn Rushd, 1126–1198, known in the Middle Ages for his Commentaries on Aristotle.

33 The words from Genesis are: 'Im principio creavit Deus caelum et terram – terra autem erat inanis et vacua' ('In the beginning God created heaven, and earth. And the earth was void and empty'). The words from the *Sentences* of Peter Lombard (Book 1, Chapter 1) are: 'Veteris ac nove legis continentiam diligenti indagine (etiam atque etiam) considerantibus nobis' ('While diligently considering the contents of the old and new law again and again').

34 Commandments one: 'thou shall not honour false gods', four: 'honour thy father and thy mother', five: 'thou shall not kill', and seven: 'thou shall not steal', all from Exodus Ch 20.

35 The texts are Luke: 'Fuit in diebus herodis regis judee sacerdos quidam nomine zaca(rias)'; Mark: 'Initi(um) evan(gelii) Ihu Xpi'; Matthew: 'Liber generationis Ihu Xpi, filii David filii Abraam. Abraam genuit Isa(ac)'; John: 'I(n) principi(o) erat ve(r)bum et v(e)rbum er(a)t apud Deum et Deus erat verbum'.

36 The most obvious precedent with a religious context are the statues of Aristotle and Plato made by Giovanni Pisano for the façade of the Duomo in Siena which date to about 1290 (see Ayrton 1969, fig. 215, 225; Pope-Hennessy 1963, 528–533). Plato, at least, may also have been portrayed in manuscripts in his perceived role as a prophet of the Incarnation – there is an illuminated initial that shows Plato in the Book of Genesis in the 13th-century Merseburg Bible (see Knipp 2002, 389 n.64).

37 The works of Plato available were essentially limited to part of *Timaeus* in a translation by Cicero and a version by Chalcidius; the *Meno* and the *Phaedo* in the translation by Henricus

Aristippus; part of the *Parmenides* in a translation of Prolus's *Commentary* by William of Moerbeke; plus fragments of the *Republic* from Microbius' Commentary on the *Somnium Scipionis* (Klibansky 1981, 51)

38 'Doctor of the Gentiles in faith and truth', 1 Timothy, 2, 7.

39 'He discovered all the ways of knowledge', Baruch, 3, 37.

40 See Pasnau 1995, 49–52, but also 1999. In the later article Pasnau concludes that while Thomas rejected many aspects of Divine Illumination it was by no means complete. What is clear, however, is that Thomas was not alone in rejecting aspects of Divine Illumination, a rejection that provoked a reaction, though the theory gradually fell out of favour nonetheless.

41 As in the *The Last Judgement* panel by the 'Master of the Dominican Effigies' in the Metropolitan Museum of Art, Robert Lehman Collection, c.1340.

42 As in the stained glass window in the Strozzi Chapel, Santa Maria Novella: *Madonna and Child plus St Thomas Aquinas,* by Nardo di Cione, 1340–1350.

43 'Sapientia coelestis est sicut fons qui de coelo venit per canale librorum' (Berthier 1956, 419; translation by Hinnebusch 1973, 192).

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12 Tinted drawing

Translucency, luminosity and *lumen vitae*

Sharon Lacey

Tinted drawing is a form of manuscript painting characterized by thin applications of paint that allow light to pass through the vellum surface. This spare handling of pigments has been explained as a 'thrifty' alternative to fully painted miniatures, as mere fashion, and more recently, as a valid aesthetic choice. This paper will address how in tinted drawings, the translucency of the vellum itself contributes to the desired visual effects and how medieval artists utilised this feature to convey both aesthetic and philosophical ideas related to luminosity, especially those expressed by Roger Bacon and Hugh of St. Victor. Artists used the translucency of vellum in innovative ways throughout the medieval period. The artist-scribe who produced the Lindisfarne Gospels transferred drawings from the recto to verso sides of the pages aided by a lightbox. In a palimpsest flyleaf from London, BL, MS Cotton Nero D.1, Matthew Paris instructed the viewer not to write on the back of the image and to hold the drawing up to the light in order to view it best. This inquiry will focus on such technological and conceptual developments to this technique, as well as the correlation between the 13th-century revival of tinted drawing and the rise in popularity of stained glass, particularly the grisaille techniques being developed contemporaneously – it will also position this technique within its broader cultural context.

Three major traditions of manuscript illumination developed from late Antiquity to the late medieval period. One was characterized by fully painted miniatures and decoration, which were often further embellished with gold or silver leaf. Another used outline drawing, whether in text ink or colour.[1] The third tradition was characterised by tinted outline drawing, which might be used for miniatures and in the marginal counter. For this last technique, the same pigments used for full painting were applied in translucent washes of colour, which allowed the parchment itself to operate as the light areas of the composition. In some manuscripts these techniques were combined, and in certain cases even within the same miniature (Brown 2007a).[2] Not only do these techniques of illumination not preclude one another, but they also do not necessarily indicate different styles, merely different media, and perhaps intent (Wormald 1952, 24; Henderson 1967, 119). The tinted drawing technique gained popularity in England in the late Anglo-Saxon and early Norman period, and was revived in the 13th century. The linear art of medieval Christian England drew upon several traditions including Anglo-Celtic (or Insular), Byzantine, and Antique Italian art, fusing these influences into an art that was at once 'abstract and transcendental' with 'flashes of naturalism' (Dodwell 1971, 2–4; Wilson 1986, 176–79).

The schools of illumination most closely associated with tinted drawings are Reims, Canterbury, Ramsey, Winchester, and, in the 13th century, St. Albans and London,

and possibly even a court school at Westminster. The Utrecht Psalter (Utrecht, Universiteitsbibliotheek, MS 32), a Carolingian masterpiece made in the diocese of Reims around the 830s, and its English copies, such as the Harley Psalter (London, BL, Harley MS 603), of the first half of the 11th century, contain elaborate drawn illustrations. Examples of works with tinted drawings produced before 1150 include St. Dunstan's Classbook (Oxford, Bodleian, MS Auct.F.4.32), the Ramsey Psalter (London, BL, Harley MS 2904), the Aratea (London, BL Harley 2506), the Cædmon Manuscript (Oxford, Bodleian, MS Junius 11), and the Tiberius Psalter (London, BL, MS Tiberius C.VI).

From the second half of the 12th century to the early 13th century, tinted drawing was not widely used for manuscript illumination, but the technique was revived in the early Gothic period and includes the Guthlac Roll (London, BL, Harley Roll Y.6) of the late 12th to early 13th century, the drawings at the back of the Westminster Psalter (London, BL, MS Royal 2.A.XXII) of c. 1200, manuscripts such as the *Life of St. Alban* (Dublin, Trinity College, MS E.I.40) and the *Chronica Majora* (London, BL, Royal MS 14.C.VII) by Matthew Paris, and numerous Lives of Saints and Apocalypses. In the 14th century, the drawing techniques gained further complexity, and examples from this period include the prefatory and bas-de-page drawings in the Queen Mary Psalter (London, BL, Royal MS 2.B.VII) and the Holkham Bible Picture Book (London, BL, Add. MS 47682). While each manuscript bears the stamp of the artistic developments and particular influences of its age, they all share in their use of expressive line drawings.

Much of the existing research into tinted drawing emphasizes its material differences from opaquely painted miniatures adorned with gold or silver. By comparison, tinted drawings are less lavish. However, a major material difference is overlooked – the translucency of the vellum surface itself. Opaque paintings in books do not allow the light to shine through the pages in the same way that the thinly applied pigments of tinted drawings do. Translucent use of the vellum is a key feature of tinted drawing, and perhaps it was this quality that delivered the desired luminous effect that attracted medieval audiences to this technique. This investigation of tinted drawings in English manuscripts will focus on material features of this technique and possible reasons for its rise in popularity in the 13th century, including how contemporary artistic concerns and philosophical discourse on light may have contributed to the demand for, and revival of, this particularly graphic form of manuscript painting. Shifting emphasis away from the handling of pigments to this use of light may yield new insights into manuscript production and medieval aesthetics.

Once thought to be a less costly alternative to fully painted images or merely unfinished works, tinted drawings are the chosen form of illustration in many luxury manuscripts and are the product of a highly refined aesthetic. Francis Wormald (1944, 17) argues that drawings 'are not unfinished sketches for the illuminator to fill in with colour afterwards, but are independent works of art whose principal aesthetic effect was not achieved by colour but by line'. In contrast, M. W. Evans (1969, 5) claims, 'If a Romanesque or Gothic manuscript was illustrated with drawings, it was quite probably not because the artist or his patron preferred that technique, but simply because there was not enough time or money to do the thing properly'. Such material characteristics as high-grade script, fine parchment, and superb draughtsmanship, coupled with aristocratic patronage, are evidence these books were not, however, downmarket commodities (Wormald 1952, 20). Moreover, what is often overlooked is that

material and financial constraints often contribute to creating an aesthetic. Economy of means is not always an artistic liability.

In cases where no budgetary imperative required this more restrained form of manuscript decoration, the use of tinted drawing was clearly an aesthetic and functional choice (in terms of providing a separate but complementary time/space zone or a comparative and often typological narrative, as in the Queen Mary Psalter, where tinting is used for the prefatory cycle of images and for the bas-de-page glossing of the Old and New Testament typological iconographies of the text's main fully painted miniatures and historiated initials). Before examining possible reasons for the technique's popularity among 13th-century artists and patrons, it may be useful to look at the historical basis for tinted drawings.

The origins of tinted drawing in England

The origins of tinted drawing in England, as it pertains to book illumination, had two primary sources – earlier indigenous Insular art of the Celtic and Anglo-Saxon traditions with its abundant use of calligraphic line, and the art of the classical period with its use of line to convey a certain degree of naturalism, as also practised in Anglo-Saxon England and as promoted and interpreted in Carolingian scriptoria (Brown 2016; Nees 2002; Callet and Lafitte 2007; van der Horst et al. 1996). Regarding the former, perhaps no book typifies the decorative potential of line drawing better than the Lindisfarne Gospels (London, BL, Cotton MS Nero D.IV) with its elaborate patterning in both its carpet pages, decorated initials and evangelist portraits, executed by a single, gifted artist scribe who, if this was Bishop Eadfrith of Lindisfarne (698–722), was also the planner of the theologically complex decorative scheme (Brown 2003 and 2011). The Insular spiritual adoption of the eremitic scribal practices of some of the desert fathers promoted the phenomenon of single saintly makers, extending skilled mastery of the pen from script into design of imagery (Brown 2011 and 2016). This use of elaborate outline was not exclusive to manuscript painting; it was also evident in stone, metalwork, and other media in Celtic, Pictish, and Anglo-Saxon art (Brown 2016).

Regarding Mediterranean classicism, an illusionistic style of outline drawing based upon that of Roman Antiquity (Brown forthcoming) became part of the repertoire of Carolingian book illumination from the second quarter of the 9th century (Nees 2002; Callet and Lafitte 2007; van der Horst et al. 1996) and was introduced to England during the early 10th (Wormald 1952, 21; Brown 2011 and 2016). This radical new drawing style – usually termed 'Reimsian' – had lasting impact on the art of manuscript illumination in Britain. The Utrecht Psalter is the most widely known and celebrated example of the classicising potential of outline, with its use of expressive bistre ink (a dark grayish-brown soot-based ink) drawings depicting vigorous multi-figured compositions full of illusionistic forms and movement. The Psalter was in England at Christ Church, Canterbury by the 1020s, where it was used as a model for other manuscripts. The most notable of these in the history of tinted outline drawing is the Harley Psalter, made at Canterbury during the 1020s–1030s, which features coloured outlines instead of the monochromatic drawings of the Utrecht Psalter. While this form of Anglo-Saxon book illumination has been named the 'Utrecht' style after this remarkable book of psalms, more than likely there were many examples of manuscripts with line drawings, which influenced book decoration in contemporary scriptoria. It is worth pointing out that in addition to the calligraphic use of line, the

other key component in this mode of book illustration was the effective use of the plain parchment grounds to signify space and light (Gameson 2006, 35).

On the whole, however, early medieval artists discarded a classical preoccupation with figural and spatial naturalism in favour of a semi-abstract aesthetic that better conveyed the deeper, internal 'spiritual and emotional forces behind reality' (Dodwell 1971, 4; Brown 2016). By the second half of the 13th century, as seen in such manuscripts as the Tanner Apocalypse (Oxford, Bodleian, MS Tanner 184), these two tendencies had been conflated and re-imagined by manuscript artists.

Beginning in the late 12th century, a transition from Romanesque to Gothic styles occurred, in which a Byzantine sensibility characterised by flat, linear, and idealised figures gave way to a classicising impulse to represent naturalistic poses and facial features (common in works from the second half of the 13th century onward) (Marks and Morgan 1981, 8).[3] The most famous representative of the 'Transitional' style of tinted drawing in England in the early 13th century was Matthew Paris, the chronicler, artist, and scribe based at the scriptorium at St. Albans, but who had Westminster court connections. His style is characterised by a bolder thicker outline for exterior contours, with finer lines describing the interior forms (Lewis 1987, 29). As a rare example of a medieval 'desk-top publisher' (as Michelle Brown puts it when lecturing), the use of the tinted drawing technique would have made the flow of production and of illustrating his own works quicker and simpler than full painting and gilding. While he popularised the use of text-ink drawings coloured with light washes in such manuscripts as the *Life of St. Alban*, and other lives of saints that he wrote and illustrated, this technique was not used exclusively at St. Albans. The Guthlac Roll (London, British Library, MS Harley Roll, Y. 6), Bestiary (Cambridge, University Library, MS Kk.4.25), Psalter (Cambridge, Emmanuel College, MS III.3.21), and *Roman de toute chevalerie* (Cambridge, Trinity College, MS 0.9.34), are a few examples of manuscripts with tinted drawings that originated at other scriptoria (Marks and Morgan 1981, 12).

Classical textual inheritance

Based on the number of extant manuscripts that rely on tinted drawings for their illustrations, it is fairly obvious that 13th-century artists and readers, like their Anglo-Saxon forebears, admired this technique. To understand why tinted drawing gained favour in the early medieval period, it may be fruitful to position the traditions of manuscript illumination in the wider discourse of art historical writing, with regard to line and colour. Carolingian copyists were presumably concerned with imitating the appearance of their Antique exemplars (McKitterick 1995, 154–55). In the case of the Ebbo Gospels (Épernay, Bibliothèque Municipale, MS 1) or the Utrecht Psalter, for instance, the artist-scribes preserved pictorial styles from Antiquity with their monumental figures and dynamic use of line (Wood 2001, 190–91; Dormer 2012, 5; Brown 2016 and forthcoming).[4]

In addition to perpetuating the pictorial precedent for this use of line, these 9th- and 10th- century copyists also preserved the texts from classical writers that support this form of picture making. For example, in the 4th century BCE, Aristotle wrote in *Poetics* about the relative merits of line and colour: 'colours laid on confusedly or indiscriminately will not produce as much pleasure as simple outline' (Aristotle, ed. by Barnes, 1995, 2321). Medieval audiences also inherited the works of Pliny and Vitruvius thanks largely to the activity of Insular and Carolingian scriptoria. In

their writings on art, they distinguish line from colour, discuss the merits of each, and establish a rhetoric that is used in aesthetic discourse through the centuries. In his *Natural History*, Pliny laments the decadence of colour over line, with its appeal to the unsophisticated masses: 'Nowadays when purple finds its way even onto party-walls and when India contributes the mud of her rivers and the gore of her snakes and elephants, there is no such thing as high-class painting. Everything in fact was superior in the days when resources were scantier' (Pliny, trans. by Rackham, 1952, 299). Vitruvius, a conservative in his time, also promotes line over colour: 'The ancients laboured to accomplish and render pleasing by dint of art, that which in the present day is obtained by means of strong and gaudy colouring, and for the effect which was formerly obtained only by the skill of the artist, a prodigal expense is now substituted' (trans. by Rowland, 1999, 92). Interestingly – although probably coincidentally – the copies of Pliny's *Natural History* and Vitruvius's *de Architectura* that were in England by 1100 were either made or owned by centres such as Fleury, Ramsey, Winchester, and Canterbury: all scriptoria where tinted drawing was popular (Gneuss 2001, 63–128). Earlier, Pliny's *Natural History* had also influenced Bede, and presumably Benedict Biscop and Coelfrith who adorned their churches at Wearmouth and Jarrow with images acquired on the Continent during the late 7th century (Brown 2011, 88).

These classical authors' works were also passed on to 9th- and 10th-century readers through the piecemeal copying of some of their recipes in medieval craft treatises. Fairly early in the transmission of Vitruvius's text, it was fused with technical manuals such as the 8th-century work the *Mappae Clavicula* (Krinsky 1967, 36–70; Smith and Hawthorne 1974, 4–5; Clarke 2001, 10–12),[5] and later some of the same information is repeated in the 12th-century work by Theophilus Presbyter, *On Divers Arts*. Did ideas espoused in ancient texts exert any impact on the illuminator's craft as they did on the art of architecture at Aachen, for instance? Or was this discourse merely theoretical? At the very least, these texts had indirect influence on the arts in the medieval period through the works of Boethius, Augustine, Cassiodorus, Isidore, and Bede, who all drew heavily upon classical sources in their writings on beauty and art, as well as the craft treatises, which repeated some of the pragmatic information amidst alchemical and theoretical formulas (Tatarkiewicz 1970, 78–89).

By the 13th century, this debate between *disegno* and *colori* had played out numerous times in art writing. Although medieval aesthetics relied heavily on the terminology and discourse of classical writers, new contributions to this subject did not specifically address the use of line, as opposed to colour. One can only extrapolate that ideas about 'appropriateness' and 'decorum', which were appropriated from the Greeks, influenced the way medieval philosophers viewed the use of the various techniques of illumination. If, from the ancients, medieval people learned to admire art, from the early Christians they learned to do so with a measure of suspicion. Tinted drawings, which are equally suited to creating flattened, stylised figures or volumetric forms rendered through monochromatic modelling, reflect this vacillation between mistrusting external beauty in favour of internal moral beauty and a Franciscan brand of Christian ecoism that embraced the natural world.

Similarities between tinted drawings and works in other media

Medieval writers on aesthetics, like their ancient predecessors, discussed the pictorial arts broadly, rather than limiting their discourse to one particular medium. Medieval

artists often worked in a variety of media,[6] and if an aesthetic took hold in one art form, it likely was evident in works in other materials.[7] The various traditions of manuscript illumination can be traced to antecedents in other media, namely wall painting, embroidery, metalwork, and sculpture (Wormald 1952, 17). Tenth-century tinted drawings borrowed several features from the designs of brooches and buckles, for instance. (See, for example, the masterly drawing of the mid-9th-century West Saxon Fuller Brooch in the British Museum.)

Thirteenth-century tinted drawings likewise share many stylistic traits with works in other media, in particular the relatively new medium of *grisaille* glass (Brown 2007b, 4–5). Techniques for painting on glass bear striking similarity to tinted drawings with bare vellum backgrounds, and there is a correlation between the rise in popularity of this form of manuscript painting and the increased use of stained glass. According to Theophilus, drawings were made as preliminary studies for designs to be fashioned in glass (Holt 1947, 14). It has been suggested, for instance, that the roundels in the Guthlac Roll were intended as designs for stained glass windows (Morgan 1988, 68). Drawings may also have been used to cover windows in domestic interiors in lieu of glass, which remained a luxury item throughout most of the medieval period. Richard Marks notes the use of paper or linen window coverings recorded in 1519: 'Paper, or lyn clothe, straked a crosse with losynges, make fenestrals in stede of glassen wyndowes' (1993, 92). Like the monochrome black or brown ink drawings on glass, those on blank vellum lent themselves to a special way of using light to describe the subjects' inner luminosity (Michael 2002, 8).

Craft knowledge

From a technical standpoint, tinted drawing is a relatively straightforward and unchanged process from its use in early 9th-century manuscripts through to its revival in the 13th century. In terms of style, however, each manuscript reflects a varied set of contemporary artistic influences and developments. In the earliest books illustrated with drawings, the outlines tend to be black or brown ink and hard-edged. This technique gives way to coloured outlines, possibly an innovation of the scriptorium at Glastonbury during the mid-10th century. By the end of that century, the Ramsey Psalter Master, who also worked in continental scriptoria including Fleury, developed a refined drawing technique that utilised more varied penwork, which some scholars refer to as 'tinted outline drawing' (Gameson 2010; Noel 1992; Brown 2011 and 2016).[8] Partial and full tinting became the most widely used technique over an extensive period of time (Dormer 1991, 61–93). Drawing techniques become increasingly more complex and varied in the later Gothic period, as figures like Master Honoré and Jean Pucelle develop grisaille techniques, which borrow from contemporary Italian painting and its modelling of forms. Manuscripts such as the Bohemian work *The Travels of Sir John Mandeville* (London, BL, Add. MS 24189) represent yet another drawing technique that is introduced in the early 15th century, which utilizes a terra vert (a green earth pigment) ground, and darks and lights are applied to this mid-tone base (Kràsa 1983, 27).

Just as the mastery of line was requisite for producing tinted drawings in manuscripts, so too medieval artists had to understand the lightfastness of pigments and methods for translucent applications of the paint. In his treatise on painting, *De*

Coloribus et Artibus Romanorum, the 10th-century author Eraclius wrote: 'if you wish to know well the natures of the colours and the mixtures of them as whether they are translucent or opaque give attention to what follows' (Dormer 1991, 124). Craft treatises became increasingly practical throughout the medieval period. While early medieval texts included theoretical and alchemical recipes, by the early 12th century such literary and philosophical knowledge of artistic materials and techniques had been replaced by experiential understanding, as similar treatises were written by and for practitioners (Clarke 2001, 15).

Theophilus's *On Divers Arts* (c. 1100) is the most commonly cited example, but several other practical guides from the 12th century survive, including the *Codex Matritensis* (c. 1130) in which details about pigments, varnish, inks, and adhesives are described, and a short treatise on glair '*De clarea*' by an unknown author referred to as the 'Anonymous Bernensis' (Clarke 2001, 15). The instructions for preparing egg white to be a suitable painting medium are relevant to tinted drawing techniques, since this medium was frequently used for the coloured washes. Tinted drawing relies on both the same pigments and the same medium as full painting, and the difference in appearance is not in the material, but in the handling of it (Dormer 1991, 126). Gum Arabic gained favour among manuscript illuminators for thinner applications of colour by the 14th century. It is not certain from surviving craft treatises what exactly comprised this medium. Whether or not craft treatises were circulated among practicing artists, these surviving examples do indicate that practical knowledge of the painter's craft was becoming more widely known in the later medieval period, and a more sophisticated vocabulary for technical information was being developed.

Examination of both textual and material evidence indicates that medieval artists were intimately aware of the unique characteristics of the translucent surface supporting their paintings. As early as the 8th century, artists utilized the translucency of vellum to aid production. The artist-scribe who created the Lindisfarne Gospels, for instance, used an innovative approach to planning this masterpiece. He devised a method for backlighting the folios, drawing his designs in leadpoint (which he also invented for the purpose) on the backs of the leaves of vellum to be painted. As Michelle Brown points out, he would then copy the image the right way around on the opposite side with pigment, with the use of backligthing and a transparent writing board of glass or horn. This avoided occluding the carefully geometrically planned drawings by overpainting them with opaque pigment, allowing the main construction lines to be visible via backlighting during painting and allowing the artist to still refer to his own meticulous measured drawings which remained visible in lead on the reverse and could themselves serve as his design models. His creation of a lightbox to aid the production of his masterpiece was an ingenious contribution to the craft, otherwise only referred to later by Cennino Cennini (Brown 2003 and 2011).

When the 15th-century manuscript the *Belles Heures* of the Duc de Berry was unbound for conservation purposes in 2010, it was placed on view at the Metropolitan Museum in New York in an exhibition entitled 'The Art of Illumination: The Limbourg Brothers and the Belles Heures of Jean de France, Duc de Berry'. The recto and verso sides of the elaborate borders exactly matched, even in cases where the line waivered or a mistake was made. This precise copying from recto to verso suggests that a similar technique to the one employed in the making of the *Lindisfarne Gospels* seven centuries earlier was used. Clearly the artist charged with producing the borders

understood that the light passing through the surface would mar the appearance of the manuscript if not duplicated precisely.

Not only is light used to aid production, but also it is used for aesthetic effect. In a palimpsest flyleaf from London, BL, MS Cotton Nero D.I, Matthew Paris instructed the viewer not to write on the back of the image (drawn by Brother William) and to hold the drawing up to the light in order to view it to its best advantage (Michael 2004, 239). Even when drawings were not held to the light, thin and translucent paint allowed the skin to show through beneath the image, and contributed to the overall effect of mass and volume (Smith and Hawthorne, 1974, 20). On several folios in the Tanner Apocalypse (Bodleian, MS Tanner 184) and *The Life of St. Edward the Confessor* (Cambridge, University Library, MS Ee.3.59), the composition in the miniature on the recto is reversed on the verso. This alignment of figure groups or other pictorial elements from front to back indicates that the vellum's translucency was considered in planning the compositions and contributes to the unity of the *mise-en-page* – that is, how all the decorative elements function in the overall layout. It also allowed the composition on one page to serve as a de facto cartoon for another page.

Light in medieval philosophy and the aesthetic appeal of tinted drawing

In addition to practical reasons, such as constraints due to time or cost (Wormald 1952, 19), there were aesthetic and philosophical reasons for the 13th-century revival of tinted drawing. As mentioned previously, the calligraphic use of line is embedded in the English aesthetic, the stylistic restraint of tinted drawing related to both the classical tradition and to monastic attitudes toward humility. By the mid-13th century, the discourse on light and vision in the writings of Roger Bacon, Hugh of St. Victor, and Robert Grosseteste may have contributed to the continued use of the technique and its further developments into the 14th century – when ideas about perspective begin to influence the illuminator's craft. The diagrammatic approach helped the reader to better understand the text by creating a sense of clarity (Dormer 1991, 164). Luminosity was prized above richness of heavily painted surfaces in this form of manuscript painting. Many medieval writers picked up on the New Testament image of Christ as light: '*Ego sum lux mundi: qui sequitur me, non ambulat in tenebris, sed habebit lumen vitae*' (John 8:12; Michael 2004, 39). Given the metaphorical meanings of *lumen* in the medieval world, it is no surprise that artists used light in a way that conjured something quite different from conventional reality. In the miniatures in a medieval codex, light does not strike the objects externally – rather, each object contains its own light source, in contrast to Renaissance art. Tinted figures on parchment conveyed the radiance and luminosity that was imminent in the medieval world. Ivan Illich describes the complex relationship of the light emanating from the manuscript's page to the reader's eye in the following analysis of Hugh of St. Victor's writings: 'The light of medieval manuscripts "seeks" the eye, as God "reaches out" to the soul . . . For Hugh the page radiates, but not only the page; the eye also sparkles' (1993, 19). Reading is a means of bringing light back into the world that was darkened through sin, according to Hugh of St. Victor. Could this decision to allow light to pass through the translucent vellum relate to the idea of the reader's enlightenment?

The way in which these images were intended to be read also had a bearing on their appearance. The Utrecht Psalter, for instance, contains illustrations to the text of the Psalms, which are unlike the unified narrative illustration later artists deployed. Each complex multi-figured composition presents multiple episodes for the reader's rumination and meditation, actively working back and forth from text to image, one part of the image at a time (van der Horst et al. 1996, 103). The effects of a single light source unifying a composition, which Renaissance artists found desirable, would have neither portrayed each being's inner luminosity nor encouraged the reader's more active engagement with the text's multivalent spiritual meanings.

The special use of light in 13th-century manuscripts perhaps relates to contemporary ideas about vision – both eyesight and insight. In *Perspectiva*, a work devoted to light, colour and vision, Roger Bacon argues the superiority of vision above the other senses and compares corporeal light to divine light, saying one can see nothing physical without the former and nothing spiritual without the latter (Lindberg 1996, 20). Many scholars stress the central role of 'divine illumination' in Bacon's conception of the acquisition of knowledge (Raizman-Kedar 2009, 131–34). Though the degree to which Bacon believes 'illumination' can aid knowledge is debatable, he does assert that humans could make better use of the information supplied to them were it closer to God's light (Raizman-Kedar 2009, 153). In another work, *De colore*, written by Robert Grosseteste in the mid-1220s, and copied in part in an encylopedia compiled by Bartholomew the Englishman in Paris in 1245, he describes colour as 'light incorporated in a diaphanous medium' (Grosseteste, ed. by Gaspar, 2013, 17). For Grosseteste, 'colour' includes light perception– according to him, the quality of translucency is identified as a property of light itself, rather than a property of the medium (Smithson et al. 2012, 346–48). While these ideas are compatible with the way light operates in tinted drawings on translucent vellum (as actual light rather than pictorial light), it would be difficult to link transmission of Bacon's and Grosseteste's texts directly to 13th century workshop practice.

Philosophical concerns may have affected the look of books used in monasteries or universities, but it is more likely that among lay patrons, the use of tinted drawing related to fashion. Patrons developed a taste for this style and commissioned books to be made with numerous coloured drawings. The resemblance of tinted drawings to embroidery and needlework may have been calculated to appeal to female patrons, as well as to ecclesiastics used to sophisticated opus anglicanum vestments and altar retables (Brown 2007c, 5). As they had done in previous centuries, continental influences played a considerable role in the technical and stylistic developments of drawing. Works produced in the Mosan region in Belgium and Northern France influenced the style of tinted drawing that was practised in the Early Gothic period (Marks and Morgan 1981, 13), while court patronage and taste for the French style of art may have contributed to its popularity in manuscript illumination in the 13th century around Westminster. The 'Court School' during the reign of Edward I, exemplified by books like the *Life of St. Edward the Confessor* (Cambridge, University Library, MS Ee.3.59) of c. 1260, bears a striking resemblance to Parisian painting of this period (Marks and Morgan 1981, 13–16).

Conclusion

The tinted drawing technique developed from two strains of drawing that are often at odds with one another, the impetus to use line to 'fix' an image to the

two-dimensional surface of the page and the desire to create the illusion of the third dimension through modelling. While the former did not disappear in the art of 13th-century manuscripts, this latter concern increasingly preoccupied manuscript artists. In the grisaille techniques of Jean Pucelle, it is evident how this tinted drawing technique influenced later generations of manuscript illuminators (Morand 1962, 12–13). Michael Baxandall points out in his work *Patterns of Intention* the fallacy that influence is thrust upon the follower from the side of the precursor, and argues that through appropriation and engagement with the past, the later artist influences the way the work of the former is viewed (Brown 2007b, 2–3). If we accept this interpretation of influence, then the features of tinted drawings that subsequent generations adopted and developed are perhaps more significant than any conscious aim of the artists who created the initial examples. In the hands of 14th-century artists like Pucelle or those working on the *Travels of Sir John Mandeville*, drawing was the chosen means of expression in order to place emphasis on the effects of light on the form, creating volume through monochromatic modelling. While tinted drawing was widely used to convey naturalism, this technique – with its translucent paint application and translucent vellum surface – offered medieval artists a unique approach to light itself. When the broader cultural context of 13th-century England is considered, including studies in vision and light which gained traction in later centuries, it seems inevitable that the practice of tinted drawing would endure as the foundation for so many later painting techniques that capitalise on the translucency of the medium. More research into textual transmission of philosophical, theological, and scientific works may still yield surprising links between the popularity of tinted drawing, workshop practice, and craftsmen's and patrons' knowledge of contemporary ideas about light and colour.

Notes

1 See the Utrecht Psalter (Utrecht, Universiteitsbibliotheek, MS 32) for drawings in text ink and the Harley Psalter (London, BL, Harley MS 603) for coloured outline drawing.
2 See the Eadui Psalter (London, BL, MS Arundel 155), for instance, in which the areas that are fully painted and drawn in tinted outline designate eternal and temporal space, respectively. For the styles combined in the same manuscript, see the Lambeth Apocalypse (London, Lambeth Palace, MS Lambeth 209).
3 See the Westminster Psalter (London, BL, MS Royal 2.A.XXII) for an example of the 'Transitional Style' from c. 1200, produced in Westminster or St. Albans. It contains five full-page tinted drawings (ff. 219v-221v), produced in the second quarter of the 13th century. The 'Transitional' style usually dates from the late 12th century to the 1220s.
4 See Wood, 2001, 190–1, for a discussion of how Carolingian and Anglo-Saxon artists drew upon Roman architectural and artistic antecedents. Also see Dormer 2012, 5 for a discussion of how drawn illustrations are typical in texts with links to Antiquity, such as Prudentius's *Psychomachia* and Terence's *Comedies*. Surviving evidence suggests that roll illustrations were commonly drawings rather than paintings, a choice dictated by technical considerations (e.g. flaking of pigments when rolled). When texts first produced in rolls were copied into codices, their traditional drawn illustrations persisted. For a new fragment of an Early Christian picture cycle from 6th-century Rome which helped to inform the Ottonian Apollonius Pictus cycle of drawn illustrations, see Brown forthcoming.
5 The Sélestat manuscript (Sélestat, BM, MS 17) is an early 9th-century copy of Vitruvius's *de Architectura*, which is preceded by the *Mappae Clavicula*, and M. Cetius Faventinus's *De artis architectonicae liber* in a compilation, demonstrating that medieval copyists associated these craft treatises.

6 For example, see Pächt 1961, 166 for a discussion of the Sigena murals and ties to the scriptorium at Winchester.
7 For example, according to Morgan 1990, 84–85 and Morgan and Lewis 2002, 171–173, the characteristic v-folds seen in depictions of figures' garments in manuscript images from the mid- to late-13th century derived from a French style popularized in the 1230s in sculpture, wall painting, and stained glass that probably came to England through ivories and small sculptural works, which manuscript artists would also have found influential.
8 The Ramsey Psalter Master is the late 10th-century artist whose hand is found in five extant manuscripts with fine drawings: manuscripts attributed to him are Boulogne, BM, MS 11; BL, MS Harley 2506; BL, MS Harley 2904; PML, MS M 827; and Orléans, Médiathèque, MS 175. Based on the style and imagery used in these manuscripts, this artist likely learned his craft in England. His drawings are indicative of the Reimsian tradition of illumination that originated with the Utrecht Psalter around 820, and was imported to Canterbury by 1020–1030. The predominant characteristic of this style is an energetic and refined outline drawing in ink.

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13 From monochrome to polychrome in historical Persian architecture

A comparative study of light and spatial perception in places of worship

Maryam Mahvash

The use of light in historical Persian architecture, and more specifically in religious buildings such as temples and mosques, can be seen to have a qualitative dimension, where the presence of light is informed not only by practical knowledge and expertise, but also by vision rooted in Persian cosmology. Light has played a fundamental role in Persian belief systems throughout history, and as a result, architecture has been transformed into a vessel for light in which its entry, transmission, presence and absence have all been subtly defined. A set of timeless and placeless principles govern this phenomenon beyond formal variations and differences in architectural styles, generating concrete manifestations of light in both medieval and pre-modern periods of Persia. By comparing case studies from two flourishing eras of historical Persian architecture, the Saljuq (1037–1194 CE) and Safavid (1501–1736) periods, this chapter will review how two distinguished architectural styles responded to the presence of light, and will argue how formal expression could vary despite conceptual similarity. By comparing two different architectural styles, it will be illustrated how architecturally divergent responses to daylighting can turn into a convergent spatial perception, on account of the constant place of light in Persian belief systems. Through the review of the four principles of the qualitative presence of light, it will also be explored how the perception of monochromatic and polychromatic spaces could be affected by light, while the sense of place remains intact and the architecture adheres to its concepts.

Light is external to architecture and affects its spatial and formal framework from without. It is therefore frequently overlooked as one of the primary elements of architecture, even though its role is crucial. Light reveals – it defines spatio-formal construction – it facilitates use and creates meaning. As such, architecture and its existence depend completely on light. The play of light in the natural environment, its significance in Persian belief systems and the impact of its various manifestations on the quality of the built environment all inspired the Persian architect to employ light in order to fundamentally enhance the quality and desirability of historical Persian architecture over the centuries – meeting the physical and utilitarian needs and quantitative aspect alone do not sufficiently explain the nature of this presence and its qualitative attributes.

The presence[1] of light in historical Persian architecture is both affirmative and creative. Affirmation mostly emphasises the quantitative features, while creativity corresponds to the qualitative dimensions. Yet these two concepts are never divorced from

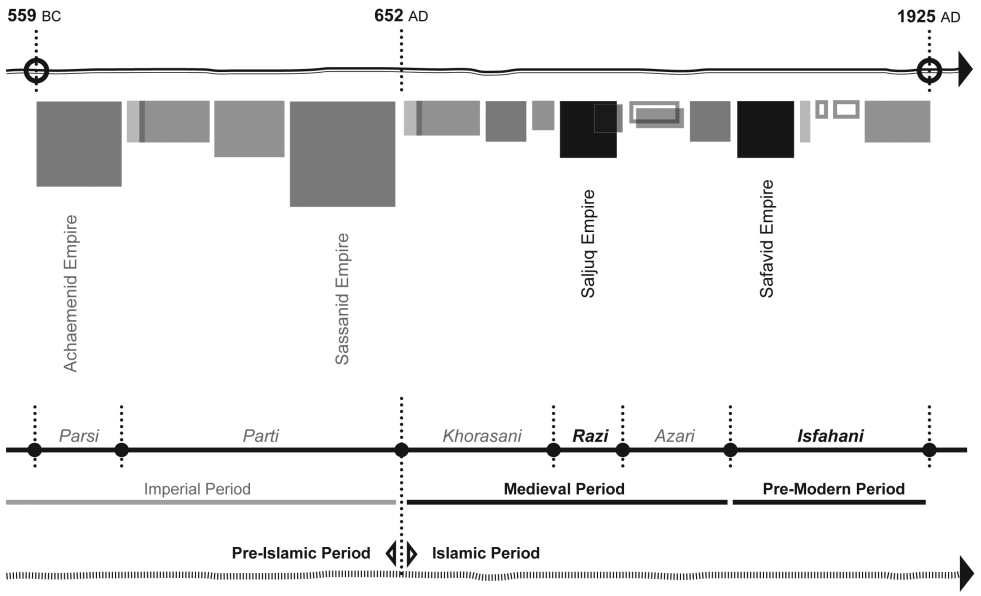

Figure 13.1 Infographic of Persian history and architectural styles.

each other – the quantitative aspects respond to the functional needs of the place, and the qualitative dimensions manifest the sacred and abstract role of light in Persian belief systems. Light, as the symbol of the Divine Intellect, creates form, and, as the sign of *being* (the absolute source of creation), aesthetically informs the space. As a result, the transcendency of light in Persian belief systems transformed Persian architecture into a vessel in which the entry, transmission, presence and absence of light have all been subtly defined.

The shifting tendency from monochrome to polychrome – from the brickwork of the Saljuqs (1037–1194) and the delicate stucco of the Ilkhanids (1256–1353) to Timurid tilework (1370–1507) and eventually Safavid glazed and coloured structures (1501–1736) – is perhaps the most significant indicator of architectural transition from the medieval to the pre-modern era (Figure 13.1).[2] The emphasis on tone, analogous colour, relief and texture is gradually replaced by an emphasis on colour and lustre. The cityscapes are also subject to transition and consequently to a visual change. Işfahan, Persia's capital under a variety of rulers, boasts preeminent examples of both Saljuq and Safavid architecture and exemplifies the urban scale of such distinctions. Despite the evolution of techniques and methods, and the overall inventiveness of Persian architectural style, the constant role of light in Persian belief led to conceptual similarities between majestic structures of various dates. Translating this into the stages of visual perception, the physical and physiological stages of both monochrome[3] and polychrome spaces may vary, but the mental interpretation of the visual data can be similar for both – the result of a remarkable adaptation of techniques and methods alongside the change of materials and colours (see Hatfield 1990).

Abiding principles of the qualitative presence of light

Deriving from the fundamental role of light in Persian belief systems are a set of abiding principles which govern the qualitative dimensions of daylighting[4] in its historical architecture, beyond its formal varieties. The following are principles by which historical Persian architecture could be identified in the context of traditional daylighting (Mahvash 2014, 343–367): *Vitalization*; *Polishing*; *Tracing*; and *Orientation and direction*. These common principles underlying the timeless and placeless qualities of light are form-giving concepts that have consistently generated concrete manifestations of light in traditional Persian architecture. However, during the Qajar period (1785–1925), we witness the decay of this deep impression and an increasing tendency towards modernisation.[5]

Despite the variety of styles, the constancy of the four principles or concepts might be seen to give a sense of convergence to historical Persian architecture. The medieval Saljuq era (1037–1194) and the pre-modern Safavid era (1501–1736) are traditionally seen as the two most flourishing periods of Persian history.[6] In the order of visual perception, Saljuq architecture (*Rāzī* style) and Safavid architecture (*Isfāhānī* style) are distinguished by two initial factors, namely *material* and *colour*, which directly affect surface and ornamentation.[7] If Saljuq architecture can be said to have been dominated by brickwork (See Figure 13.2 in colour plates), then Safavid architecture was dominated by tilework.[8] The latter was largely inherited from the now splintered Timurid Empire, which had ruled large parts of Central Asia between 1370 and 1507.[9] As such, there is a striking visual contrast between the monochrome, brick-built Saljuq buildings and the polychrome tiled architecture of the Safavids. Nevertheless, it can be argued that, by virtue of the qualitative dimensions of light, neither material nor colour can change the essence of the place. In other words, thanks to the four principles of Persian traditional daylighting, the qualitative presence of light remains intact, even if the expressive tools or means vary (Mahvash 2014, 39–69; see also 2007; 2008). Though they manifest different physical forms, monochrome and polychrome spaces can have similar symbolic forms (see Bonta 1979), by vitalizing the body of architecture and polishing the space with light.

Spatial perception and form-giving concepts of daylighting

Vitalizing

Persian theosophy (*hikmat-i Ilāhi*)[10] applies light as the symbol of *being*. Similar to ordinary languages, the language of symbolism represents an expression of the knowledge derived from the intellect (*gnosis*), and consequently the symbols become theophanies of the Absolute which is the ultimate reality: God (Ardalan and Bakhtiar 1973, 5). Persian cosmology has been deeply rooted in light for millennia,[11] and Persian architecture becomes the embodiment of Persian cosmology (Mahvash 2014). Places of worship in particular are often seen as the image of the cosmos, wherein light acts as the main form-giver. In a receptive mood it can be asserted that place, as pointed out by Nasr, becomes a "replica of the cosmos".[12] It is in this light that a Saljuq mosque is regarded as a model of medieval universe, and a Safavid mosque as a model of a pre-modern universe depicting the forces of both human and divine wills, as well as the nature of material and of light as they were experienced and believed.

Light corresponds to the term existence. Light becomes 'genius loci', the spirit of place, and architecture itself becomes an illuminator. Architecture as existential

space represents a means to give the mass of architecture an "existential foothold" (Norberg-Schulz 1980). Light vitalizes the body of architecture, and "light-holding" architecture becomes the location of a spiritual association of *being*. The transcendence of place is granted by light, which not only reveals the presence of architecture, but also highlights its immeasurability. Performing together, light and shadow enliven the mass of architecture, while architecture itself offers innovative solutions for this performance by forms, textures, colours and reliefs. By ritually embracing sacred epigraphs, symbolic patterns, textures and colours, surfaces are vitalized by the interplay between light and darkness. "Points of light entrance" (*madkhal-i noor*) and "place of light presence" (*mahzar-i noor*) are two major criteria through which the transforming appearances and obscurities of surfaces are investigated (Mahvash 2014, 268–342).[13]

The sequences of coming into existence and of evolving by light are exhibited in both Saljuq and Safavid architecture. The elaborate three-dimensional intermixture of light and shadow in Saljuq architecture and the subtle marrying of colour and light in Safavid architecture can be seen to vitalize the architectural whole. Saljuq structures are enriched by ingenious patterns in brick and, in later structures, by magnificent carved stuccos, specifically in the Ilkanid period (Pope 1965). The three-dimensional appearances of surfaces, covering most parts of structures such as the dome chambers, *īwāns* and *mihrābs*, provide the brick-toned Seljuq architecture with the sense of dissolving matter and animating masses. In this regard, one might state that they correspond to Le Corbusier's claim on the definition of architecture as "the correct and magnificent play of masses brought together in light" and contemporaneously Loius I. Kahn's observation when he argues that the start of the material world is at the point where the light stops (Lobell and Kahn 1979, 64).[14]

The comparison between the polychrome architecture of the Safavids and the creation of space in the mostly monochrome Saljuq architecture is almost similar to that between sculpture and painting (See Figure 13.3 in colour plates). The Saljuqs subtly carved into the mass in order to create the architectural space, and the reaction of the carved body to both the presence and absence of light can be seen to recall the vitalization of material by light. Safavid architecture, on the other hand, is strongly dominated by colours (Hillenbrand 1994, 834).[15] This passion for colour,[16] applied on a grand scale to monuments and spaces, creates surreal vistas, in which the pinpoints of light on lustred tiles and the traces of light on smooth surfaces, including floors, unequally correspond to the Persian theosophy of illumination (*Hikmat al-Ishrāq*).[17]

The replacement of the bas-reliefs of the medieval period by a covering of tiles whose range of colours are dissimilar to those of the Saljuqs and Ilkhanids obviously alters the retinal images of viewers, and likely the physiological stage of visual perception,[18] but the final interpretations have much in common. Taking into account the task of using light to represent *the Light*, both Saljuq and Safavid architecture, though visually dissimilar, have their roots in the same concept. In both eras, the viewer, walking into a building, experiences animated images that are the result not only of changing viewpoints, but of changing patterns, and accordingly of strongly contrasted tones, depths and shadows and alternating colours, gleams, shimmers and scintillations in temporal order.

Polishing

Light is given a polishing character in historical Persian architecture, through a kind of transmutation of matter by the *alchemy of light* (Burckhardt 1976, 80). Historical Persian architecture places a heavy emphasis on space, which is "cut out from

the material forms around it and is defined by the inner surfaces of these forms" (Nasr in Ardalan and Bakhtiar 1973, xiii). As noted above, the illumination of these architectural spaces abstractly represents the (heavenly) Light itself. In this respect the architecture is rendered immaterial (see Norberg-Schulz 2000, 108–113), as if the light within it was an elixir which transmutes matter on architectural surfaces.[19] Matter, ennobled by ornamentation and pattern, loses its heaviness before the light. Light immaterializes the mass of architecture, and if vitalization makes architecture from light by light, polishing makes architecture lighter (incorporeal) by light. In this regard, spaces are not merely illuminated, but intended to produce their own light, whether through trapping or reflection, shadows or pinpoints, strongly contrasted tones or multi-coloured reflections, refraction or transmission. In the theosophy of illumination, the degree of a being's light is based on its ontological proximity to the absolute Light – the Divine. Accordingly, the most important parts of buildings, and places of worship in particular, are also the best-lit and the most highly polished.

Contrast and pattern are two initial causes of immaterialization. As shadow holds the light, it is used subtly as the container which also reveals it, either by tones and depths in various degrees of relief, or in colour. The purposeful selection of materials, patterns, textures and colours, with regard to the light's physical behaviour and its points of entrance (*madkhal-i noor*), together create a portrayal of light which is familiar to Persian culture. Absorption is the main phenomenon of light which is replicated in Saljuq architecture to decorate the various surfaces of its monuments. Later, different techniques were developed, and other behaviours of light, relative to material particularities, delicately contributed to the polishing of the space. Architectural elements, including domes, vaults, columns, walls, niches, squinches, *īwāns* and surfaces covered by bas-reliefs, hold the light and create shadows, thereby creating patterned surfaces which seem to be made by light, and secreting light of their own (See Figure 13.4 in colour plates). This is similar to the ancient description of the Persian paradise which is illuminated by both uncreated and created lights, where windows are luminescent and secreting an inner light within (Corbin 1978, 40).

According to Necipoğlu, Ibn al-Haytham's *Kitāb al-manāzir* (the Book of Optics of the 10th–11th century) shows that aesthetic judgments were understood as being embedded in the subjective processes of the psychology of visual perception, which invariably involved the internal senses. Beauty was not seen to be an absolute attribute, but the result of a contextual subject-object relationship involving inner cognitive operations, which did not occur in a cultural void (Necipoğlu 1995, 201). As such, the contribution of light and matter allows us to view the invisibles, i.e. the immeasurable qualities. Patterns (geometric, floral, calligraphic), regardless of whether they are two- or three-dimensional, are sensitized by light and shadows, and play a crucial role in spatial perception.[20]

In the polychrome architecture of the Safavids, colour and reflected light from lustred surfaces became the main media for dissolving matter. In other words, the alterations of tone and shadow in medieval architecture were replaced by the shimmering, flickering and glistening changes of pre-modern polychrome architecture. The qualities of the sunlight entering the building change throughout the day. Architecture of both periods thus possesses a different character from one hour to the next, though the superior iridescence of polychrome surfaces must have contributed to this. Sheykh Lutf Allah Mosque (1601–1628), and the Shah Mosque (1612–1638) of Işfahan

(discussed by Trevathan, this volume) are invaluable case studies in this respect (See Figure 13.5 in colour plates).

Tracing

The tracing of light is also tantamount to the depiction of *being*. In Persian belief, objective light is a sign of the absolute light (the light of *being* also called black light by mystics), which is blinding. Ghazzālī's allegory in his masterpiece *The Niche for Lights* perfectly describes the grades of illumination and trace of light when he states that:

> "one who sees the light of the moon coming through the window of a house, falling on a mirror fixed upon a wall, which reflects that light on to another wall, whence it in turn is reflected on the floor, so that the floor becomes illuminated therefrom. The light upon the floor is owed to that upon the wall, and the light on the wall to that in the mirror, and the light in the mirror to that from the moon, and the light in the moon to that from the sun, for it is the sun that radiates its light upon the moon. Thus these four lights are ranged one above the other. . ." (1998, 100).

This idea is materialised in historical Persian architecture with invisible sources of light, or through placing emphasis on the effects of light rather than light itself. The presence of light is very often indirect, and its traces are the signs of reality marking the origin of objects. The most prominent examples of this are the magnificently designed secondary sources of light of the Safavid period (Figure 13.6). Based on the particularities of a given material, whether opaque (brick, wood and plaster), translucent (alabaster) or glossy (glazed bricks and tiles), the absorption, transmission and reflection of light directly contribute to the hierarchical order of illumination (being 'illuminated', and 'illuminating'). While the brickworks and stucco works of the Saljuq era deal with the absorption of light, Safavid tilework deals with its reflection.[21]

Orientation and direction

'Path' is the simplest but also the most complete term to describe the concept of orientation and direction. Traditional daylighting in historical Persian architecture uses light as the main medium with which to guide the user and to represent space. Whether through features of the points of light entrance (*madkhal-i noor*) or through the choice of locations for their presence (*mahzar-i noor*), the manipulation of the path of light can be used to a number of effects on architectural surfaces. It can emphasize a specific orientation, object or place; distract from unwanted areas or points; and neutralize any inadvertent behaviours of light such as glare. Where light is intended to lead the individual, and points in a specific direction, monochrome architecture has a number of resources which can be used to achieve these effects, including the manipulation of depth and contrast; the use of varying degrees of relief; the density of pattern and the elaboration of detail; the use of tile insets; and the use of latticed surfaces. Polychrome architecture, on the other hand, tends to exhibit a high degree of light-dark contrast between foreground and background, which can be used either to point in a specific direction, or to provide orientation. The achievement of lustre through some of the points of light entrance form unique traces of light which can be contended as a key potential of polychromy.

In urban context, the facades of polychrome architecture sheathed in multi-coloured tiles, if not neutralizing, degrade the active contribution of colours with light, unless they act as a landmark. By contrast, medieval architecture saw a subtle contribution of colour contrast with light in spaces dominated by monochromy.

Correspondences: The aesthetic of daylighting and architectural ornaments

Through a *mise-en-scène* in which the points of light entrance (*madkhal-i noor*) and the places of light presence (*mahzar-i noor*) have major roles, light and darkness are able to collaboratively reveal the unconventional facets of matter. Tangible forms which are embellished by ornament, even in minute areas, can extend insight into the realm of the eternal while offering less palpable reality. Whether through the interwoven patterns of brick, and the delicacy of stucco works and tile insets of medieval Persia, or through the multi-coloured, shimmering surfaces of the pre-modern, visual perception aims at moving beyond physical forms and entering a higher plateau of awareness – the realm of the infinite.

The fact that these surfaces were exploited by Safavid architects and craftsmen with a notable appreciation of colour, reflection and lustre is the crucial element. The gloss of Safavid polychrome surfaces permits them to appear to radiate light, and to illuminate the space. Regarding the dome chamber of Sheykh Lutf Allah mosque, Arthur U. Pope is certainly correct in describing it as: "softened and clarified, reflected on innumerable glittering facets of the wall and dome, light is shed over, the shadowless interior like sparkling dew, revealing a perfection of unearthly beauty. No one in a receptive or contemplative mood can enter without a shock and the sense of being received into a presence" (1965, 219). In the process of light radiation, the traces of light (affected areas), patterns (multi-colour, single material or multi-colour, multi-material), and the pinpoints of light (mostly in dome chambers) play a crucial role.

In the mostly monochrome spaces of the Saljuqs and Ilkhanids,[22] which usually deal with the absorption of light and with shafts of light, illuminated bas-reliefs (embracing geometrical or floral patterns and epigraphs) and contrasts rendered through gradated illumination in various tones are the significant media. In polychrome spaces, on the other hand, daylighting strategies tend to emphasise reflection, so that the viewer's attention is grabbed by areas whose lighting effects are eye-catching. The image received by the eye is dominated in the first instance by colours, and subsequently by patterns. The mentally processed image is further converted to an abstract tool, and through the association of forms and ideas, the process of spatial perception is completed (See Figure 13.7 in colour plates).[23]

Comparatively, what grabs the viewer's attention in monochrome spaces is a three-dimensional image which is dominated by various degrees of relief enlivened by light, and the shadows and tones of a single colour or of analogous colours. For areas such as *mihrābs* or portals where immersion is a priority, the combination of colours (mostly of the two celestial colours, blue and gold) stands out. Interestingly, stress on three-dimensional details with less emphasis on the use of polychromy is one of the major Safavid solutions. In fact, where colours are empowered, dimensions tend to be impoverished and vice versa.

In monochrome spaces, even the shallowest of various carved patterns can create highly multi-dimensional configuration, its visibility owed to wise "stage-management"[24] of

the points of light entrance. Sensitized patterns, opposing light and shadow, highlight the qualitative presence of light in the chromatic void. In the Safavid period buildings are "articulated by colour rather than structural devices" (Hillenbrand 1994, 842). Creative correspondence between lustred surfaces with polychrome patterns (floral, geometrical or epigraphic) and light through dispersion and reflection were major means of constructing architectural environments in pre-modern Persia. The careful selection of colour and contrast rules, together with mostly two-dimensional patterns, allow place to be completely defined and allow space to be visually perceived. This is rooted in a legacy inherited from previous periods, in which a powerful emphasis on three-dimensional monochromatic patterns and forms was essential. Even when colours take part in form-based architecture – which they clearly do in many instances – the harmony of colours, or the emphasis on the inserted colour(s), is rendered in such a way that the patterns and illustrations attract the most attention, rather than the colours themselves.

Conclusion

It can be debated that as a result of the differences between the expressive tools employed, the polychrome and monochrome Persian architectural styles are undoubtedly visually distinct, but they are united in the concepts from which the transcendency of place is derived. Whether the space is predominantly monochrome or polychrome, a sense of synergy is created in the set of formal configurations; the selection of materials; the depth of surfaces delimiting space; and the techniques of embellishment corresponding both to the selection of the physical behaviour of light and to the set of points of light entrance.

Illumination in monochrome spaces suggests that it was the source of light which was most appreciated by Saljuq and Ilkhanid architects. Polychrome spaces, on the other hand, tend to focus the attention on facets of the illuminated mass, as if to lay emphasis on the illuminating power of the materials or objects. In other words, medieval Persian architecture mostly worked by light itself, while the architects of pre-modern Persia (especially the Safavid era) tended to work through the polarization of light and colours. Although numerous modes of lighting were employed in the polychrome Safavid architecture, it might be said that if The Light is mostly represented by its sources and paths in medieval Persia, Safavid architects chose to represent it via dispersion and reflection.

By maintaining the transcendency of place by the use of light, the essence of Persian architecture remained intact over many centuries, despite the marked visual changes which occurred in different periods of its history. Whether being clothed in the variegated colours of the pre-modern era, or the textures of the medieval era, mutual alignments of architectural elements and techniques with daylighting unified the praise of light in their representations.

Though loyal to the qualitative presence of light and its form-giving principles, daylighting techniques and ornaments witnessed a gradual change in style. Among the various means of illumination, medieval architecture deals strongly with directed light, absorbed light, inserted light, trapped light and frozen light. By contrast, under the domination of tile which sheathed buildings in tilework and its consequent domination of variegated colours, reflected, refracted, dispersed and filtered light became the major form-giving facets of light applied to the pre-modern architecture of Persia.

The gradual replacement of the three-dimensional variegated textures of monochrome architecture with two-dimensional particularities of surfaces coated by variegated colours and patterns in a period of seven centuries shows a relativity of applied techniques and methods; this was realized through four synergic factors, including the *physical behaviour of light*, *dimensions*, *materials* and *colour*. By adapting features of the first and the second, the variability of material and colour in both monochrome and polychrome spaces can be subtly managed, in order to consciously ensure that Persian architecture adheres to its four traditional concepts of place-making through light.

Notes

1 The term presence connotes the fundamental place of light in Persian belief systems where the concept of God is defined by the absolute Light, and the state of divine presence is expressed by illumination. In this sense, illumination is referred to as the understanding of truth through light emanating from the source of absolute Light which is God. From an architectural perspective, light which reveals architecture is the giver of presence.

Louis I. Kahn describes architecture as a model of underlying principles of the cosmos from where the architecture comes. In this respect the architecture of each culture becomes a model of that culture's world, not in terms of shape but in terms of underlying forms which shape that architecture (Lobell and Kahn 1979). It is in this light that architectural theorist Christian Norberg-Schulz describes the identity of place (2000; also 1986). For more on the philosophy of illumination see Suhrawardī 1999; Corbin 1978; Nasr 1964a; Nasr and Razavi 2010.

2 See Robert Hillenbrand's argument on the comparison of Safavid architecture with earlier architecture, including Ilkhanid, Timurid and Saljuq (2008).

3 The term monochrome does not necessarily denote the use of only one color or varying tones of one color in Saljuq architecture, but relatively emphasizes the polychromatic architecture of Safavids in comparison. There is also evidence of Safavid monochromes. Safavids consciously adhered to earlier styles at the level of restoration or when extending an existing structure. This can be experienced in Shāh Ni'matullah Vali shrine in Māhān, where the use of single-colour tiles and plain white vaulting by Safavids stand out (Hillenbrand 2008, 828–29).

4 The illumination of building by natural light is called daylighting, where direct sunlight and diffuse light are reflected, scattered, admitted and/or blocked to meet the visual, functional and environmental requirements of a place (Reinhart 2014, 9–27). See also Guzowski 1999; Lam 1986; Tanizaki 1979.

5 According to Chardin, the "decay" sets in at the death of the Safavid Shah 'Abbas I (1571–1629): "when Shah 'Abbas the Great ceased to breathe, Persia ceased to prosper" (Chardin et al. 1927, 291).

6 Many features which are now recognized as part of Persian architecture are rooted in the Saljuq period. Lasting for centuries and spreading to neighbouring regions, the Saljuq era is regarded as one of the most influential phases of Persian architecture during which new techniques, elements and spatial compositions, as well as creative solutions, are introduced into architecture. According to some scholars, including Lorenz Korn, the Saljuq period is an era in which the Islamic art and architecture reached their maturity. As Korn observes, a convenient delineation can be considered between the start of the 11th century and the Mongol invasion in the 13th century (2010). Saljuqs represented the last piece of the Islamic Golden Age (786–1258), when according to Lambton, Persian civilization reached heights of both religious and secular achievements (1968, 203).

Similarly, the Safavids not only defined a significant turning point in the Persianate world, but also marked the last traditional style of Persian architecture. According to Kishwar Rizvi, the Safavids made a long-lasting impact on Iran's political, religious and cultural landscapes (2013). Emerging in the most flourishing era of pre-modern Persia, Safavid

architecture is the last traditional style of Persian architecture, coming to its end with the decline of the Qajar dynasty in 1925.

7 Mohammad Karim Pirnia suggested six distinct Persian architectural styles: the pre-Islamic Pārsī and Pārtī styles, and the Islamic period Khurāsānī, Rāzī, Azarī and Isfāhānī (Pirnia 2004).

8 According to Hillenbrand, "Neither the spatial organization nor the simplifying trend in Safavid architecture is however its most striking feature. Any casual visitor to Işfahan will confirm that the glory of this style is its decoration" (1994, 833).

9 Despite considerable similarities between Timurid and Safavid architecture with regard to the usage of tilework, Hillenbrand points out a notable distinction: "Although tile dominates brick in many Timurid facades, brick is allowed to play several important roles in them: it acts as a reminder of the underlying structure, provides a contrasting texture and acts a chromatic foil to the tilework. Safavid architects surrendered these advantages and frequently relegated brick to the sides of building" (1994, 833).

10 Defined as the science of divine knowledge and the highest form of practical philosophy; it also refers to mysticism. For more on this, see Nasr and Razavi 2010.

11 "The essence of the First Absolute Light, God, gives constant illumination, whereby it is manifested and it brings all things into existence, giving life to them by its rays. Everything in the world is derived from the Light of His Essence; all beauty and perfection are the gift of His Bounty; and to attain fully to this illumination is salvation." (Suhrawardī cited in Nasr 1964b, 175) See also Suhrawardī et al. 1999.

12 For more on this see Nasr 1973 and Nasr 1987.

13 The two terms, whose factors are crucial for analysing buildings with regard to the qualitative dimensions of daylighting, have been first introduced during the doctoral research of the author. Type, function, location and shape are four main factors of the points of light entrance, including lattices, grills, oculis, cupolas, portals and other shape of openings. The place of light presence invites discussions of various physical behaviour of light and architectural responses through selection of materials, colours, textures and decorations.

14 For more on this see also Norberg-Schulz 2000; van de Ven 1978; Zevi 1957.

15 "As a whole, architectural decoration is improvised by the comparative dearth of worked stucco, carved terracotta and ornamental brickwork. All these techniques had an important role in Timurid architecture. Only plain white stucco used to cover vaults, retained a certain hold" (Hillenbrand 1994, 834).

16 In all four resources introduced by McChesney on Shah 'Abbas's building of Işfahan, including *Nuqāwat al-Āthār*, *Tārīkh-i 'Abbāsī*, *Tārīkh-i 'Alam-ārā-yi 'Abbāsī*, and *Rawdat al-Şafawiyah*, there are direct and indirect comments which indicate the passion for colour and painting. In *Nuqāwat al-Āthār* written by Afushteh-yi Natanzi between 1589 and 1598, and describing the delightful days of Abbas's regnal celebrations in the royal square (Naqsh-I Jahān maydan), he writes of wall paintings: "All the upper and lower surfaces of the walls and buildings which surrounded (bar hawāshī) the maydan were all smoothed (past wa buland-i ān-rā musāwī sākhtah). [Then] the painters (naqqāshān) of Bihzad-like pen and portraitists of Mani-like line painted pictures on those [walls] of all the wondrous creatures and marvelous creations. Thus every one of the surfaces became like a copy of the *'Ajā'ib al-makhlūqāt*" (cited in McChesney 1988, 107). According to Hillenbrand "the Safavid period has left a legacy of wall painting incomparably richer than the sum total which survives from previous periods" (1994, 842).

17 For more on this see Hiravī et al. 1979 and Corbin 1978. See also Nasr 1964a.

18 The process of colour perception includes physical, physiological and psychological stages. Physical stage addresses the nature and the quantity of light, while the physiological stage related to the procedure through which the response of cone cells that accept light is transmitted to the brain.

19 Titus Burckhardt classifies the discussion of the common language of Islamic art into five categories, including Arab art/ Islamic art; Arabic calligraphy; the arabesque; the sphere and the cube; and the alchemy of light (Burckhardt 1976).

20 Necipoğlu's (1995, 204) discussion on geometry and the psychology of visual perception perfectly points this out: "Elaborately patterned designs interlaced with geometrized

vegetal, calligraphic, and occasionally figural motifs, constituted magnetic fields designed to attract the gaze with their bewildering vertiginous effects. Their infinitely extendable, non-directional patterns of line and colour, with no single focal point or hierarchical progression toward a decorative climax, required the insertion of subjectivity into the optical field; they presupposed a private way of looking. Such surfaces seduced the eye to alight on harmoniously combined colours and abstract patterns that could stir up the imagination, arouse the emotions, and create moods."

21 The use of alabasters, in other periods, perfectly represent the realization of this concept through transmission and translucency.

22 According to Pope, "Ilkhanid architecture is closely dependent on its antecedents, being in fact a coherent development from previous Saljuq styles and techniques. The relationship between two styles is so close that in some instances, like the Alaviyan od Hamadan, opinions differ as to whether a building is Saljuq or Mongol" (1965, 188).

23 "As examples of immediate recognition through glancing, Ibn al-Haytham cited familiar written words (such as *Allāh*) that have appeared so many times before the eye of a literate person that they are perceived by recognition at the moment of glancing, without the need to inspect the letters one by one. He also mentioned a wall covered with designs and decorations that after being contemplated for the first time becomes so familiar that the next time it is seen the sight will perceive its form by recognition" (Necipoğlu 1995, 203).

24 The term stage-management is pointed out by Hillenbrand in his definition of directed light in Islamic architecture. For more on this see Hillenbrand 2013.

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14 From texts to tiles

Sufi colour conceptualization in Safavid Persia

Idries Trevathan

While art historians have sufficiently dealt with Safavid tiles in terms of historical context and methods of production, very little has been written on the conception and motivation behind the use of coloured glazes. Despite frequent reference to colour in medieval Islamic texts, these sources have rarely been addressed with consideration to the specific uses of colour in the art itself, or of the role of the tile-maker. This paper addresses some possible relationships between the colour theories found in contemporaneous philosophical texts and the tiles adorning the 17th-century Shah Mosque in Isfahan, and provides an introduction to the need to broaden the scope of research into Safavid art through the examination of colour theories.

The tiles that adorn the 17th-century Shah Mosque in Isfahan represent one of the most celebrated examples of the grand scale of colour use in the world. Almost every surface of the interior and exterior of the huge Safavid complex (See Figures 14.1 and 14.2 in colour plates) is covered in brightly coloured tiles. Thus the building bears witness to a tile-making tradition that possessed a highly sophisticated knowledge of the laws of colour from technical and aesthetic perspectives. However, despite sufficient study of the methods of production of Safavid tiles on the part of art historians, little attention has been paid to the conception and inspiration behind the coloured glazes themselves. Colour is frequently referred to in medieval Islamic scientific and philosophical texts, and in poetry, but rarely have these sources been considered in relation to the use of colour in art. Although there is no evidence linking these texts directly to the work of the tile-maker, Safavid art provides an opportunity for investigating this relationship, principally because ideas about light and colour played an important role in Safavid culture.

For the first time in 2009, the world's leading Islamic art historians were brought together to explore the subject of colour at the Hamad Bin Khalifa Biennial Conference 'And Diverse are their Hues: Colour in Islamic Art and Culture' (Bloom and Blair 2011). The approach at this conference was to address colour in Islamic art and culture from historical, aesthetic, and sociological perspectives; others looked at colour from religious and spiritual aspects, in particular, Samir Mahmoud, who drew on a range of exegesis of Qur'anic verses that explicitly refer to colour. Particular reference was made to the Sufi commentaries on the nature of colour by Islamic philosophers such as Najmuddin Kubra (13th century) and Alludawlah Simnani (14th century) in their phenomenology of colours. Mahmoud paid particular attention to Henry Corbin's ground-breaking work on these authors in his 'The Man of Light in Iranian Sufism' and other essays where Corbin explores, amongst other things, parallels between these Sufi texts and Goethe's 'Farbenlehre' (Mahmoud 2011; Corbin 1978). Mahmoud asked the pertinent question, central to this publication: do such

theoretical treatises on colour reveal anything about the use and meaning of colour in Islamic art? It was not Mahmoud's intention to provide a final answer to the question, but to contribute to the debate and, in his words, to 'rehearse many of the arguments put forward by Henry Corbin with the intention of placing his work on colour theory back in the limelight after years of neglect' (Mahmoud 2011).

This paper attempts to keep this debate alive by elucidating some aspects of the phenomenology of light and colour in Islamic culture, namely those found in the writings of Sufi mystics, and attempts to ascertain any possible relationships between these colour theories and the coloured tiles adorning the Shah mosque in Isfahan. It begins by providing a short piece on the historical context to the development and application of glaze technology in Iran, and then, more specifically, to its application in the Shah Mosque in Isfahan during the Safavid period. It suggests that the extraordinary use of polychrome tiles that adorn this mosque is perhaps as much a product of technical and aesthetic achievements, as it is the culmination of metaphysical writings on colour before and during the Safavid period in the 17th century. Attention is given to some works by Sufi mystics and poets in their discussions on light and colour before, leading up to, and during the Safavid era. Colour systems are also investigated, including *Haft Rang* (seven colours – see below), which appears to present crossovers between theoretical conceptualizations of colour by Sufi mystics with the actual practice and use of colour in various crafts, including the making of tiles. From these writings, a modest attempt is made to show how colour contained various symbolic and mystical associations and was often representative of a spiritual state or level of realization. Finally, the implication is that its architect and craftsmen responsible for building the Shah mosque participated, consciously or unconsciously, in this creative and spiritual process through the transformation and application of colour.

Limitations

It is important to be forthcoming about the conceptual and methodological limitations of addressing the question of how premodern Muslims conceived of colour in the Shah Mosque. Firstly, Islamic writings on colour are a vast and complex field that incorporate rich scientific, philosophical, and religious dimensions. Reducing such a complex field to a single argument which is constructed from a small sample of texts and extrapolated, in many respects out of context, to the Shah Mosque is not without its problems. Another question posing a challenge for this study is how widely Sufi ideas about colour were shared amongst lay people in general and artists and craftsmen in particular. This question, relevant as it may be, is not addressed here because the sources and line of research required to provide answers to this question are different to those pursued here. Therefore, this paper treats Sufi colour phenomenology as a legitimate source for the reconstruction of the visual experience and responses to colour in works of art, though it is important to emphasize that the purpose is simply to present some probable interpretations which compare historical texts, material evidence, and a building structure, in order to gather together ideas within a mystical framework of references.

History and context

The ceramic glazing technology has been continuously developed and improved in Islamic Persia since the 12th century. A technique called *haft rang* (seven colours), also known as *minai* (enamelling), emerged in Kashan, central Iran in the 12th and 13th centuries. Later in the 13th and 14th centuries another overglaze technique known as

lajvardina, with its characteristically deep blue colour, was developed and extensively used in such places as the Takht-i Sulayman in northwest Iran (O'Kane 2011, 179).

By the 15th century, architectural tile revetments became widely used in northeast Iran under the Timurids, and then later in the 17th century by the Safavids (1501–1736), particularly to cover the facades of public and royal buildings in their capital of Isfahan. This latter period, according to the historian of Persia, Arthur Pope (1965, 206), 'initiated a new period in Persian architecture in which the rich, sensationally coloured and imaginative details developed by his predecessors became unified into serene and meaningful ensembles of immense scale and grandeur'. Furthermore, the apogee of colour production is embodied in the saturation and intensity of harmonious colours found on the Masjid-i-Shah (Shah Mosque), which Pope (1965, 210) ascribes to a 'culmination of a thousand years of mosque building in Persia . . . the formative traditions, the religious ideals usage and meanings [and the] ornamentation are all fulfilled and unified in the Masjid-i-Shah, the majesty and splendour of which places it among the world's greatest buildings'.

Unlike earlier Persian mosques, in which the tiles had been compiled in mosaic form – a slow and expensive process in which pieces are cut from monochrome tiles and arranged to create intricate designs (Figure 14.3) – the Shah mosque employed a new technique which, again, was named *Haft rang* (seven colours), perhaps in line with the earlier naming tradition. From the author's observations in Iranian tile workshops, this technique begins with the transfer of the entire design to an assembly of square tiles by placing a transfer paper pricked with the particular design and pounced with charcoal through the holes. Once the transfer paper is removed, the faint carbon outline is then traced over with a mix of manganese and a greasy substance (normally mixed with animal fat or linseed oil) (Trevathan forthcoming). The craftsmen then apply the water soluble glazes that constitute the *haft rang* within the areas delineated by the greasy outline (Figure 14.4). When heated in the kiln, the glazes do not run

Figure 14.3 Tile mosaicists cutting geometric shapes from glazed square tiles. These mosaic tiles also limit their colour palette to seven colours.

Photograph author's own.

Figure 14.4 Tile-maker applying coloured glazes to the square tile, tile workshop, Isfahan. Photograph author's own.

together because they are separated by the greasy manganese, iron, and aluminium oxide substance which evaporates, leaving a matte line (Tisatob et al. 2014, 447). Once the glazes have cooled, the tiles were then placed together again to reveal the overall design (See Figure 14.5 in colour plates).

It can also be noted that the tradition of limiting glazes to just 'seven colours' may be traced much further back into Persian history, as evidenced in such references by the Greek historian Herodotus to the palace in Ecbatana, with seven concentric walls of different colours. Herodotus (translated by Waterfield 1998, 46) wrote:

> The Medes . . . they built the place which is now known as Ecbatana – a huge impregnable stronghold consisting of concentric circles of defensive walls . . . the bastions of the outer five circles have all been painted various colours – first white, then black, red, blue and orange. But as for the bastions of the last two circles, the first are covered in silver and the second in gold.

Glazed brick facings was indeed a main feature of ancient Mesopotamian architecture, and the earliest known examples of protective coloured revetment, dating to around 2000 BCE, are fired clay bricks with black, red, and white glazes of the Sumerian temple in Uruk (which is partly preserved in the Berlin Museum). Moreover, like Haft rang, the famous turquoise gate of Ishtar (also in Berlin), dating to around the 7th–6th century BCE, is composed of bricks, each one incorporating different colours and separated in the cuerda seca manner with a black iron oxide lines. Babylonian glaze colours included night blue, turquoise, green, yellow, tan, white, and black (Barry 1996, 251). Barry writes that despite Alexander's conquest of Persia in 330 BCE, extinguishing the art of glazed brickwork facades for the next 1,500 years, craftsmen never forgot this technique of glazing, and its re-emergence from its first hints in the 11th century Seljuk Iran to its full

flowering under the Safavids in the 17th century is 'as if an ancient Near Eastern art had been resuscitated' (Barry 1996, 253). Although such ancient building traditions cannot be linked directly to the Shah Mosque, it is clear that a tradition of colour symbolism goes back much further, and that the peak in the technical and aesthetic use of *Haft rang* (cuerda seca) in the Safavid period did not arise in cultural or scientific isolation.

A study of the period also reveals that the Haft Rang technique emerged alongside, or perhaps as a result of, one of the greatest flowerings of metaphysical conceptualisation on light and colour by the most influential scholars in Islamic Persian history. This period marks a coalescence of four prominent Islamic schools of thought: the illuminist (Ishraqi) school of Suhrawardi; the Irfani (Gnostic) school of Ibn Arabi; the peripatetic school of Ibn Sina; and the school of theology of al-Ghazali. Despite their differences, all schools integrated a comprehensive theosophy permeated with the experience of light and colour (Nasr 1968; 1976), which according to the Iranian architect Ardalan (1974, 74) 'provokes an art that seeks to saturate the senses [with colours] and produces the heralded miniatures of Sultan Muhammad, the Ardabil carpet, the gardens of Fin and the Hasht Bihisht, the Masjid-I Shah and the harmonic synthesis of the Safavid city of Isfahan'. Furthermore these philosophies of light were received and assimilated into Safavid culture by such influential figures as Mir Damad, Mulla Sadra, and Sheikh Baha'i Amili, all known to have founded what is now known as 'The Isfahan School of philosophy', which according to Henry Corbin and Seyyed Hossein Nasr initiated the wider Safavid cultural renaissance associated with the reign of Shah Abbas. The impetus for these above theosophists was to pursue the notion of light developed from the belief that God is Light, in accord with Qur'anic verse:

> God is the light of the heavens and the earth; the likeness of His light is as a niche within which is a lamp, the lamp is in a glass, the glass as it were a glittering star kindled from a blessed tree, an olive [tree] that is neither of the east nor of the west, whose oil well-nigh would shine, even if no fire touched it; light upon light; God guides to His light whom He will. And God strikes similitudes for people, and God has knowledge of everything.
>
> (Qur'an 24:35)

The stated hierarchy of light in this verse, the interpretation of light upon light, and the theme of the light and darkness resulted in several hypotheses about the hierarchy of being, all of which had a significant impact on Safavid culture and belief. Their view of light and colour, which cannot be elaborated upon here (though was far from simplistic), was understood as being both the light and colour of corporeal things, as well as a metaphysical and mystical conception of the Divine (Graham 2015).

Haft rang and the Shah mosque

Situated on the south side of the royal square maydan in Isfahan, the construction of the Shah mosque began in 1611 and was completed around 1630. The unlimited aesthetic possibility of ceramic facing is exploited to its fullest with both its interior and exterior walls fully coated in magnificent colour, applied to an almost unfathomable scale. The colours define and emphasise the different patterns and parts of the building and are fluid and adaptive in both scale and character – indeed the coloured domes, wall panels, arches, *muqarnas*, portals, and dados can all be admired individually up close as well as from afar (See Figures 14.6 and 14.7 in colour plates). Moreover, these

separate but united colour schemes lend movement to the stresses and directions in the structure of the building. Its ornamentation is based on traditional Persian and Islamic themes including trees, lotus flowers, undulating vines, leaf motifs, and many varieties of geometric interlaces of six- and eight-pointed stars. The tiles that adorn the mosque are restricted to a palette of seven colours including yellow and brown (*zard*), turquoise (*ferozi*), white (*safed*), black aubergine, (*siyah*), green (*sabz*), red (*sorkh*), and night blue (*lajward*) (Barry 1996, 34). These colours, when coupled with the fluctuating tones, changing light, and reflections throughout the day and seasons, lend the building an ephemeral atmosphere.

Based on interviews conducted with contemporary craftsmen and academics in Isfahan today (Trevathan forthcoming), the name *Haft rang* refers to the traditional designation of seven colours and its mystical correspondences to various phenomena in traditional Persian and Islamic culture. The belief is elaborated upon by Michael Barry (1996, 33): 'Persian usage imposed this traditional name of the "seven colours", or Haft Rang, because the number seven was held to correspond to that of the Sanctified Holy Bodies of determining importance so identified by all calendars stemming from Ancient Mesopotamia astronomy'. With relation to architecture, Ardalan and Bakhtiar (1999, 49) suggest that the *haft rang* system should be viewed as being composed of two distinct groups: the first comprises three colours including white, black, and sandalwood, while the second includes red, yellow, green, and blue. Together they numerically constitute the super grouping of seven colours (3+4), which, they suggest, is critical to understanding the Islamic colour tradition (See Figure 14.8 in colour plates). Indeed the number seven is considered a deeply symbolic and perfect number in Persia with multiple mystical correspondences, particularly in relation to broad correspondence between terrestrial and heavenly colours. *Haft* (seven) and its cultural significance in Persian history is well documented (Shahbazi 2016).

The anagogic reading of colour

Sheila Blair notes that the inscriptions found in the mosque, as well as documentary texts, reveal three of the individuals involved in its design and construction. The first is Muhibb Ali Beg Lala, who is described as the person who took care of arranging the paving stones (*tarsif*) of its buildings (*bunyan*) and columns (*arkan*).[1] The second is the master (*ustad*) Ali akbar al-Isfahani, described by the portal inscription as one 'who in architecture (*mi'mariya*) is like the engineers (*muhandism*) in execution of the plan and the unique of the age (*al-nadir al-awani*)'. The third, although not mentioned in any of the mosque's inscriptions, is documented in the chronicles of Jalal al-Din Munajjim by the name Badi' al-Zaman, and is referred to as the master (*ustad*) and builder (*mi'mar*). There is reason to believe that all three individuals were involved in the design and construction of the Masjid-I Shah (Blair 2013, 21).

Another architect who had considerable influence in Isfahan during this period, and who may have had a hand in designing the Shah Mosque, was Baha al-Din al-Amili (also known as Sheikh Baha'i). Shaykh Baha'i (d.1621) was not only the chief architect of Isfahan's urban planning, but served as the chief jurist of Isfahan during this period. In the Twelver Shiite tradition, Shaykh Baha'i is considered as the leading scholar of the 17th century, with well over one hundred treatises and books to his name covering topics as diverse as astronomy, mathematics, geometry, philosophy, theology, and jurisprudence (Rahmati 2009).[2] Drawing on the work of Iranian scholars, Andrew Newman attests that Sheikh Baha'i was an active participant in

the development of Isfahan, and his skills in engineering, design, and mathematics merited his position in charge of several aspects of Isfahan's expansion program. He participated in the planning stages of the renewal program, especially the development of the Maydan-i Shah, Isfahan's royal square, and its adjacent quarters. Thus Newman (2008, 379) writes:

> 'Baha'i also laid out the plans for the Chahar Bagh residential area, and took part in the design of the Shah Mosque located on the Maydan-i Shah. He also completed all the calculations for the Sulaymaniyya school inside the Shah Mosque and oversaw the school's construction and the building of a sun-dial inside the school for fixing the correct prayer times. Baha'i also performed the calculations for the directions of many of the city's new mosques to ensure they faced in the proper direction for prayer.'

More importantly still, he is identified by Syed Hussain Nasr and Henry Corbin as one of the founding members of the School of Isfahan and was also a Sufi practitioner, as evidenced by his poem *Kashkul* ('the begging bowl'), as well as other works which contain numerous mystical allusions and allegories (Nasr 1986, 667; Rizvi 2007). Moreover, records show he was an adherent of the Nurbakhshi Sufi brotherhood, which drew many of its members from artisan classes and originated from the earlier Kubrawiyya order (Newman 2008, 370).

Another scholar, Najm al-Din Kubra,[3] was the first to explicitly describe and interpret coloured lights, and he based his interpretation of the spiritual journey toward perfection on a symbolism of colour. Kubra wrote extensively, with seven of his books and twenty-four of his poems surviving to this day. This corpus includes his most important book, *Fawatih al-Jamal wa fawatih al-jalal* (Aromas of Beauty and Preambles of Majesty), in which he records his own personal visionary experiences of colour along with detailed guidance for students of his Sufi doctrine. According to Elias, Kubra developed a science on the perception of such colours and their affinity and correspondence with physical colours. The colour of the Sufi robe is described as an outward sign of the individual's degree of spiritual advancement, with the basic blue or black robe signifying that the wearer has conquered and slain his carnal soul. As Elias explains, the Sufi who has attained the stage of repentance wears a white robe, to signify the washing away of his worldly concerns (Elias 2001, 280–281). Thus, dyers were intentionally dyeing fabrics according to spiritual symbolism: colour symbolism was not only present in the teachings of mystics, but may have been woven closely into everyday life.

This theme of colour as representative of spiritual progression is found throughout Persian Islamic poetry. For example, Kubra's disciple, the mystical poet Jalal al-Din Rumi, also draws on it by comparing God to a dyer who finally dyes everything in his own colour: i.e. the inviable, radiant light (Soucek and Schimmel 2011). The final goal, writes Rumi, is 'the vat of unicoloricity', which he relates to the Qur'anic term 'Sabghat Allah' (Rumi 1993; Qur'an 2:138). Much later, in 19th-century Iran, the theme persists, with Shaykh Karim Khan Kirmani concluding his treatise, 'al-Yaqut al-ḥamra' (The Book of the Red Hyacinth, an esoteric hermeneutics of the colour red), by describing a process for making red dye, which demonstrates a clear link between the theoretical and spiritual ideas of Islamic thinkers and the practice of making of colours in art (Corbin 1986).

Other great Sufi masters further developed Kubra's experimental method of the spiritual perception of light and colours, in particular Ala al-Dawlah Simnani, who

created a mystical physiology which connected seven colours to seven supersensory organs and seven 'prophets of your being' (Elias 1995, 86; Corbin 1978, 121). Concurrently these mystics, as well as many others, viewed the soul on its return ascent to the Divine as passing through seven spiritual stages that corresponded to seven colours. Thus the soul became successively tinted by the seven colours, with each hue being invested with its own set of mystical associations, and ending with the final robe of light. The order of the precise allegorical value attributed to the seven colours of the soul's transformation varies from one mystic to another, but the concept remains the same.

Colour and craft metaphor

This interest in the theory and making of colour in art is also present in the writings of the 13th-century Persian poet Nizami in his epic poem *Haft Paykar* (Seven Portraits). Nizami specifically links *Haft rang* glaze-making to spiritual transformation by describing the Prophet Muhammad as a tile-maker, bestowing colour on the seven planets during his ascension to heaven on the Night Journey (*Al Isra wal Mihraj*). Thus Nizami writes:

> He [Prophet Muhammad] left behind the worldly road, and far above the heavens soared;
>
> Cut through the stations of the sky, with angel's wings, a broad highway.
> From his own verdant nature, he gave to the moon new verdancy.
> His silver-work to mercury gave the bluish shade of leaden glaze.
> O'er Venus, from the moon's bright light, he drew a veil of silvery white.
> His dust, as he attacked the heavens, set on the sun a golden crown.
> Green-robed like Caliph of the West, red garments in bright to Mars he left;
> And, finding Jupiter consumed by pain, rubbed sandalwood thereon.
> When Saturn's crown his feet had kissed, he placed its flag in ambergris. . . .
> He went beyond the radiant Throne, to the mystery 'Praise be mine'.
> When, lost in his bewilderment, God's Mercy came and seized his reins,
> His distance of 'two bowlengths' went from 'he came near' to 'nearer yet'.
> Rending the veil of a thousand lights, that unveiled Brilliance reached his sight.
> Beyond his being's bounds he trod, till he achieved the sight of God (2008, 8, 3:41–47)

The ascent prefigures the poem, which depicts the spiritual progress of the Sufi seeker through the seven spiritual stages that are related to the seven colours, themselves metaphorically associated with numerous phenomena including the seven visible planets, the seven days of the week, the seven metals, the seven climates, the seven parts of the body, and the seven prophets (from Abraham to Muhammad). According to Nizami, the matching colours of the heavenly spheres are slightly different to the glazes, consisting of black, yellow (or gold), green, red, blue, sandalwood (or brown), and white (or silver). In the introduction to her translation of the *Haft paykar*, Meisami (2008, xxv) suggests that the central theme of the poem's journey through the seven colours is self-knowledge:

> 'It is knowledge of the self that leads to knowledge of the world and its creator; as the Prophet Muhammad said, "He who knows himself, knows his Lord." It is

> only through knowledge that the soul can return to its origin in God; the purpose of its sojourn in this world is to perfect itself in preparation for that return.'

Viewing the process of craftsmanship in relation to this suggestion, the craftsman can be thought of as participating in the creative process through the transmutation of matter. The glazer of tiles participates in the alchemical process physically as well as spiritually, and each choice of colour can be thought of as symbolic of a particular state of consciousness. This process of transformation can relate to the ascetic work of the mystic seeking the transformation of the soul. The method is one of reaching a state of purity and then internalizing it. Colours become points of orientation for the mystic; the means by which he judges his 'level of realization'.

The *Haft paykar* was hugely popular during the Safavid period and indeed across the Islamic world, with poets as far away as India modelling their work on it. Moreover, depictions of Nizami's *Haft paybar* are also encountered in the portable arts, including miniature painting, ceramics, metalwork, and carpets, which survive in their hundreds. Yet, aside from the very specific application of colour symbolism in miniature painting, the extent to which Nizami's ideas on colour were employed in a more abstract manner (a non-figurative aniconic manner) in architectural revetment has remained unclear. There are no records that survive to testify to the impact of the poems, and we cannot ascertain just how the transmutation from the realm of poetry and philosophy to the realm of the plastic art was effected, and just how widespread these ideas on colour were with tile-makers and the artisanal classes.

The colour conceptualizations prevalent in the writings of Islamic intellectuals such as Suhrawardi, Kubra, and Simnani, and their culmination in the school of Isfahan, have not yet been fully explored from an art historical approach, which has tended to focus more on the hard data of archaeological epigraphy, historical sources, and standard religious texts, despite Pope's observation that 'poetry, universal and indispensable in traditional Islamic life, together with philosophy, overt and implicit, nourished all cultural expression' (Pope 1965, 133).

As an adherent of a Nurbakshi Sufi order that based many of its practices on these colour ideas, it is possible that Isfahan's most celebrated architect Sheikh Baha'i would have been mindful of these teachings in relation to the colours used in the Shah Mosque. However, whether Sheikh Baha'i or the craftsmen intentionally expressed such colour systems in their work cannot be confirmed by textual evidence. Nevertheless, it would seem incongruous to view the design and application of colour on such monumental buildings as the Shah Mosque as being made in a vacuum in which the main elements of its cultural context, including popular Sufi science and philosophy, played no part. Irrespective of whether the makers were aware of such theoretical writings on colour, could colour in art, as Gage proposed (Gage 1999, 9), be an embodiment of Safavid attitudes to colour expressed in visual form?

The colours, as described by Kubra and Simnani, and subsequently by Nizami, were visualizations of the various levels of the mystical journey in internalizing these Divine qualities. In their writings colour is used as a symbol to indicate a station on the path to the Divine. The colours used on the building were clearly made for contemplation, and this metaphysical aesthetic of light and colour expounded by the Sufis offers a way to the search for God's perfection; it concerns an elevating and intellectual experience in which sensory colour perception constitutes only the initial and necessary level of a process of perception graduated in ascending stages, with the final goal being the luminous

and radiant splendour (light) of the Divine. Viewed in this way, the use of colour on such a grand scale implies a deeper intention than mere aesthetic delight in decoration.

Conclusions

Despite the wealth of scientific, philosophical, literary, and mystical views of colour preceding and during Safavid times, it is striking how little attention has been paid to the ways in which these views intersect with the physical remains of art and architecture. The colours used in Safavid tiles deserve greater analysis in terms of ideological, intellectual, and aesthetic discourses that prevailed at the time of their use. Such an enquiry, supplemented by modern scientific and historical analysis, may help in deepening understanding about the role of colour in tiles. Future research and written sources, accompanied by new scientific evidence and a broader and more interdisciplinary approach to the study of colour in Islamic art, will no doubt clarify and elucidate the nuances of these discourses whose general outlines this paper has only sketched. In addition, a more systematic reading of theological, mystical, scientific, philosophical, and literary sources may reveal valuable insights capable of filling the gap created by the lack of theoretical treatises on Islamic art and architecture.

This paper has tried to show how colour systems used in tiles seem to have a striking resemblance and connection to mystical and poetical writings on colours, which is indicative of a widespread unification of colour expression in Safavid culture. This in turn shows that art and religion were perhaps not as mutually exclusive as proposed by other Islamic art historians, but rather that the picture is more complicated.

Notes

1 He was the tutor of the palace slaves (*ghulams*), supervisor of the royal buildings of Isfahan (*sarka-i imarat-I khassa-yi sharifa-yi sifahan*), and administrator (*mutavalli*) of the endowment of the Shah mosque.
2 Most of his Persian and Arabic works remain untranslated and unstudied. Indeed Sheikh Baha'i is so important and respected that the High Council of Cultural Revolution in Iran designated April 23 as the National Architect Day, marking his birth anniversary (Rahmati 2009).
3 The title of the order is taken from his name.

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